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Julius-Kühn-Archiv

Heinz Ganzelmeier, Hans-Joachim Wehmann

Third European Workshop on Standardised Procedure for the Inspection of Sprayers in Europe - SPISE 3 -

Julius Kühn-Institut
Bundesforschungsinstitut für Kulturpflanzen

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Preface

Ganzelmeier, H.
Julius Kühn-Institut, Federal Research Centre for Cultivated Plants, Messeweg 11/12, 38104 Braunschweig, Germany

Plant protection equipment must dose and distribute products exactly and function faultlessly. In order to achieve this, plant protection equipment should be inspected regularly to be able to identify and eliminate any technical defects.

However, there are three main arguments for the inspection:

- good control of the pest with the minimum possible input of crop protection product
- less potential risk of environmental contamination by crop protection products
- safety hazards for the operator

The inspection of plant protection equipment is becoming more and more interesting for the Member States (MS).

The 1st European workshop, SPISE, took place in April 2004 prompted by the publication of European Standard 13790; the 2nd European Workshop aims to support the MS in introducing inspections for plant protection equipment. This Workshop represents a platform on which to discuss further regulations for introducing, putting into practice and monitoring the inspections in the MS and for co-ordinating them. This can be in the form of lectures, working groups or excursions.

In some MS such as Belgium, Germany and the Netherlands, equipment inspections have been developed and established over the past few years, and although they are organised in different ways (state-run, private sector), they have all resulted in high-quality technical inspections, ensuring reliable and efficient plant protection equipment.

Within the 2nd SPISE workshop, the legal/statutory regulations and technical standards for successful plant protection equipment inspections already in force in the countries stated above have been presented as examples and described in detail. The excursions to the three MS have shown their practical implementation which could be analysed and taken as a basis for implementation in one's own MS.

The 3rd SPISE workshop represented a platform on which to discuss further regulations for introducing, putting into practice and monitoring the inspections in the Member States and for co-ordinating them. In the meantime the Directive of the European Parliament and of the Council establishing a framework for Community action to achieve the sustainable use of pesticides obliges the Member States to ensure that pesticide application equipment in professional use shall be subject to inspections at regular intervals. The 3rd European Workshop informed the participants about the newest legal developments and showed which procedures/documents accompanying the article 8 of the Frame Work Directive under the responsibility of the Member States are required.

Group portrait of the SPISE 3- participants

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Round Table

Session 1: Inspection at regular intervals – Inspection of new equipment (according article 8/1 and 8/2)

Session 2: Member States may apply different timetables and inspection intervals with exceptions following a risk assessment and exempt handheld pesticide application equipment or knapsack sprayers (according article 8/3)

Summary

Ganzelmeier, H.
Julius Kühn-Institut, Federal Research Centre for Cultivated Plants, Messeweg 11/12, 38104 Braunschweig, Germany

The SPISE 3-Workshop took place from 22 to 24 September 2009 in Brno (CZ). The Workshop was organised by the SPISE Working Group (SWG), to which representatives from Belgium, France, Italy, the Netherlands and Germany belong (Chairman: Dr.-Ing. H. Ganzelmeier).

The participants came from inspection and research institutes, administration and private companies and brought with them the necessary technical expertise. This is why the emphasis at the Workshop in Brno was above all on the practical implementation of the European regulations for equipment inspections.

The European Commission's representatives were from DG-Environment and DG-Enterprise. The European organisations ECPA, CEMA and COPA also took part. The SPISE3-Workshop met with a very positive response, demonstrated by the 100 experts who took part from 27 European countries. The new European Directive binds the Member States to introduce a technical inspection for plant protection equipment which takes place on a rotational basis by the year 2016. This does not pose a major technical demand on some Member States as among others Belgium, Germany and the Netherlands since technical inspections on a rotational basis (once every two years) have been compulsory for more than a decade for field sprayers and air-assisted sprayers for bush and tree cultures. However, now on these regulations have to be agreed on together among the Member States.

The draft prepared and presented by the SPISE Working Group, 'Proposal for uniform enforcement of inspection in the Member States', can be seen as a contribution on how equipment inspections according to article 8 of the Framework Directive can be implemented in national legislation. As in the past SPISE-Workshops, the participants then expressed further recommendations and hopes in a resolution.

Information portal: http://spise.jki.bund.de

Acknowledgement: Special thanks

- to the State Phytosanitary Administration at Brno, Czech Republic for the excellent hospitality and co-organization
- to Mrs. Buerig for support in translation of the workshop documents.

Opening

Ganzelmeier, H.
Julius Kühn-Institut, Federal Research Centre for Cultivated Plants, Messeweg 11/12, 38104 Braunschweig, Germany

Dear Dr. Hnizdil from the State Phytosanitary Administration Prague – Head of Division for Protection of Harmful Organism,

Dear Dr. Harasta – Head of the Application Technique Department and local organizer of this workshop – Brno,

Dear Ladies and Gentlemen,

I would like to open the SPISE 3 Workshop 2009 and welcome you all here to Brno, the second largest city in the Czech Republic and a very traditional one at that.

I would also like to welcome you on behalf of my colleagues in the SPISE Working Group. We are also pleased to be able to welcome about 100 participants from 27 countries.

I think the organizers have chosen an attractive place to host the conference which is also fairly central for us all in Europe, and which is also characterised by the fact that the State Phytosanitary Administration – Application Technique Department has been able to gain extensive experience of equipment inspections in the past, building up a high-quality and well organised equipment inspections which we will be able to see tomorrow in greater detail when we go on the excursion.

At this point, Dr Hnizdil and Dr. Harasta, our host, many thanks for letting us be here together with our European colleagues for 3 days, and in addition to the technical matters which will by occupying us over the next few days, thank you also for the opportunity you have given us to gain our own impressions of the city of Brno and of your beautiful country.

The September date for the 3rd SPISE Workshop may have come as a surprise to many of you, since the Workshop on the inspection of plant protection equipment normally takes place in spring.

However, the large number of activities to do with the Czech presidency in the 1st half of 2009 made us decide not to schedule the Workshop for this period.

In the SPISE 2 Workshop 2007 in Straelen, the discussion

- on the Thematic Strategy, in particular on equipment inspections, and
- on the Amendment for the Machine Directive, specially on the certification of new equipment, already were in full swing.

In the meantime, the legislation process for both projects has been completed.

This means that we, as experts, have clear frame work requirements/specifications which we must implement and establish in our own Member States.

Nevertheless, I believe it is helpful for understanding matters better to address both these European Directives properly in order to understand the regulations as a whole and to get to know the expectations which are associated with these by the Commission. And nobody could do this better than representatives from the European Commission themselves.

I am therefore very pleased to be able to welcome with you 2 representatives from the EC to our SPISE 3 Workshop.

- Dr. van Tongelen - DG Environment, who will show us the FWD and explain this to us and
- Mr. Fraser - DG Enterprise, who will talk to us about the amendment directive for the Machine Directive.

Our focus during the SPISE 3 Workshop is as always the inspection of plant protection equipment which is already in use.

Article 8 of the Framework Directive stipulates the framework which the Member States have decided on together with the Commission and which is to be specified further and implemented by the Member States.

SPISE sees itself as a platform for technically orientated experts for plant protection equipment from the Member States who are interested in a technical procedure which is as uniform as possible and who are prepared to offer their expertise in discussions at Member State level.

The word SPISE symbolize this idea; it means "Standardized Procedure for Inspection of Sprayers in Europe". It is not meant for making political decisions, but at the most for making statements or recommendations which could be taken into account for future (political) decisions.

We have set the Round Table session at the beginning of today's workshop so that this technically oriented expert discussion is not one-sided and is not shortened.

To this end we have invited representatives from European organisations/associations who are concerned or affected by this so that they can express their opinions and expectations associated with the introduction of a European inspection and discuss these with us.

I would therefore also like to welcome most sincerely

- Mr. Hagenvall, - European Crop Protection Association- ECPA
- Mr. Oldenkmap, - European Committee of association of manufacturers of Agricultural machinery – CEMA
- Dr. Rademacher - European Farmers Union – COPA and
- Mr. Wehmann - my colleague from the Institute for Application Techniques in Plant Protection.

As we have all learnt, an effective and flexible legislation is not possible in the EU without efficient, competent standardisation. This definitely also applies to the implementation of the legal regulations for plant protection equipment. For this reason, the COM issued the CEN a mandate in November 2008 to compile the necessary EN standards for both directives.

This caused France, how holds the secretariat of the CEN/TC 144/WG 3, to set up two standard projects, whose project leaders are also with us and whom I would also like to welcome.

They are

- Mr. Polvêche, responsible for the revision of EN 13790 and
- Mr. Rousseau, responsible for EN 12761, also chairman of SC 6 of ISO/TC 23.

Following the initiation of important standardisation projects

- the first meeting on the European standards will be on 20 and 21 October 2009 in Paris –

it is now time to talk about

- how the Member States will deal with the additional regulations required and

- how they will handle the leeway which the Framework Directive provides.

Our SPISE 3 Workshop is expected to make a contribution to this.

I think that with the experts present from around 25 Member States, we will be successful at this over the next 3 days.

Once again I welcome you all most sincerely and wish us successful few days.

Welcoming address

Hnizdil, M.
Head of the Division of Protection against Harmful Organisms, State Phytosanitary Administration,
Ztracená 1099/10 161 00 Praha 6, Czech Republic

Ladies and Gentlemen,

dear Guests,

I am pleased to invite you on behalf of the State Phytosanitary Administration on the territory of the Czech Republic, here in Brno on the occasion of the 3rd SPISE Workshop of the SWG.

This working group (SWG) was established on the 1st workshop in 2004 (in Braunschweig) associating experts from the Member states in the field of machinery for pesticide application in crop protection and its inspection. The SWG is dealing with a harmonization and a mutual recognition of test results concerning the EN 13790 as its main activities.

The SWG participated in activity connected with proposal of a Framework directive of the European Council and European Parliament for sustainable use of pesticides, which sets out in article 8 principles for regular inspection of pesticide application equipment in use.

The SWG pursues the same activity in the field of amendments of the directive 2006/42/EC – Machinery directive, which concerns with machinery for pesticide application with regard to environmental protection.

More than 100 participants, representatives of institutions, associations and companies from 23 Member states, representatives from the European Commission and representatives from other European countries are attending this 3rd SPISE workshop here in Brno. The 3rd SPISE workshop is focused on the article 8 of the framework directive proposal as it is indicated in the programme of the workshop. In addition to many professional items of the workshop a field trip is planed for tomorrow. Participants will visit two inspection sites in the Czech Republic and one inspection site in the Slovakia.

Ladies and gentlemen, I believe that this SPISE workshop will contribute to reaching a consensus in preparation of a uniform implementation of the article 8 of the Framework directive to national regulations and for unification of procedures for regular inspection including the mutual recognition of its results across Europe.

I wish you a pleasant stay in the second biggest town of the Czech Republic, in Brno, and successful negotiations.

Thank you.

Introduction to the Workshop

Ganzelmeier, H.
Julius Kühn-Institut, Federal Research Centre for Cultivated Plants, Messeweg 11/12, 38104 Braunschweig, Germany

Dear Ladies and Gentlemen,

before we start with the actual workshop agenda, I would just like to give you some general information about it.

The SPISE Working Group had a catalogue of tasks to complete when the resolution from the SPISE 2 Workshop was passed, one of which was to organise this 3rd SPISE Workshop.

With regard to the SWG's activities, we can say that we were invited by the DG Environment to discussions in Brussels twice.

We were able to present our ideas on the inspection of plant protection equipment already in use and the certification of brand new equipment and to make suggestions for clarifying distribution measurements for field crop and air-assisted sprayers.

- A number of tasks have been completed (mutual recognition, inspection intervals),
- others are still in progress (standards ...),
- and some were not taken up (research work),
- important matters which were not decided on or completed have been put back onto the agenda (Session 6).

The Framework Directive which was accepted on 13 January 2009 by the European Parliament and which will be adopted at the next meeting of the Council of Ministers and which is now available in all the languages of the Member States has made it easy for us to compile a program for the SPISE 3 Workshop.

As you can see, one (or two) paragraphs of Article 8 of the Framework Directive are allocated to each section as the main topic which will determine the content and discussion in the individual sessions.

I am sure that for many of us, the whole spectrum of the FWD, including all its consequences, is still not yet completely clear. In this regard there will be many questions, and interpretations and further specifications by the Member States will be required. I am therefore quite sure that we will all be learning a lot over the next few days, that we will be able to decide on a uniform way of handling the language and interpretation of the Framework Directive and that the need for additional regulations in the Member States will become clear.

In this regard I think it is important to be made clear at the end of each session which other supporting regulations for a uniform enforcement in the Member States are still required – a respective proposal will be presented and explained – and what action is seen as being necessary for the SPISE Working Group.

It is intended to incorporate the results of the workshop in a resolution similar to the procedure for both the previous SPISE Workshops, in order to document these and to provide you with some assistance for the discussion which has already begun with the implementation of the Framework Directive in the Member States or which will do so shortly.

Our colleagues in Belgium, the Netherlands and Germany who have been carrying out a mandatory inspection for years have updated their info packages on the SPISE website so that you can also read up on the current regulations regarding equipment inspections which work well (laws, ordinances, guidelines …).

Our agenda acts on the positive experience from the previous workshops in offering a practical excursion to inspection workshops on day 2 for learning about the organisation and practical work involved in equipment inspections in the hosting country. Following this, there will be a workshop dinner on the evening of the 2nd day, during which national specialities will be served and there will be more time for further talks and discussions.

At this point I would like to thank our colleagues from the Organizing and Scientific Committee who have been involved in a very constructive way in preparations, have taken over leading the sessions, and who will be taking part in the excursion.

The Round Table session will take place first so that our discussions in the sessions also take into account all the important primary aspects. Our guest speakers from COM, ECPA, CEMA and COPA are already in position.

I welcome you once again most sincerely.

It will be led by my colleague Prof. Balsari.

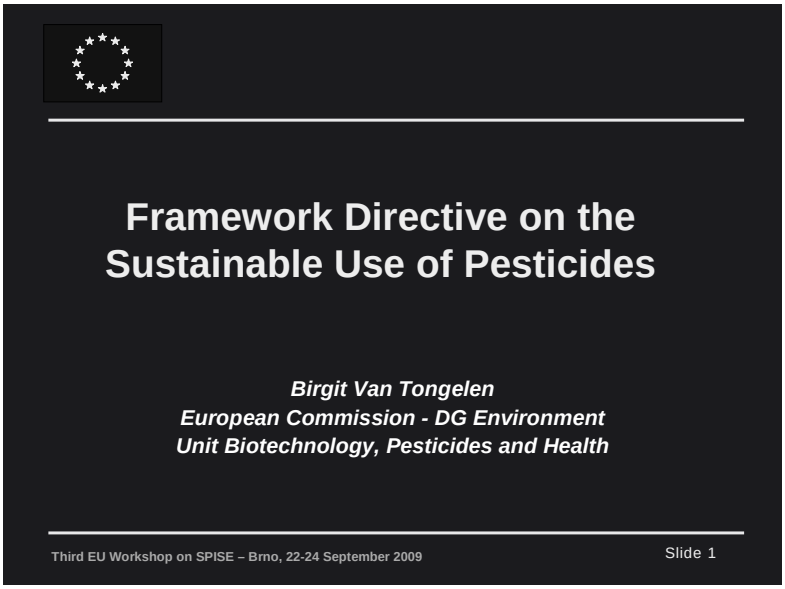
Round Table

Framework Directive on the Sustainable Use of PesticidesEuropean Commission

Tongelen, B. van
European Commission DG Environment, Unit B3 - Biotechnology, Pesticides & Health, Avenue de Beaulieu 9, Office 6/171, B-1160 Brussels, Belgium

The Framework Directive on the sustainable use of pesticides aims to achieve a more sustainable use of pesticides by reducing the risks from the use of pesticides on human health and the environment, and by promoting the use of Integrated Pest Management and of alternative approaches such as non-chemical alternatives.

Member States will have to establish National Action Plans in which they set targets, measures and timetables in order to reduce risks from the use of pesticides and to define timetables and targets for use reduction. Professional users, advisers and distributors must have access to appropriate training. Pesticide application equipment used by professionals will have to be regularly inspected to check compliance of the equipment with requirements of the Directive. Aerial spraying will be banned, however Member States may grant derogations under strict conditions in cases and areas where there are no viable alternatives. Measures to improve the protection of the aquatic environment and drinking water will be taken: giving preference to products which are not dangerous for the aquatic environment and to low drift equipment and establishing buffer strips along water courses. The use of pesticides will be prohibited or minimised in specific areas, which are areas used by the general public and sensitive populations. Safe conditions for the storage, handling and waste of pesticides have to be established. Member States will have to promote low-pesticide input techniques for pest management. Integrated pest management is a sustainable approach for pest management which relies on preventive measures, observation and pest monitoring and targeted interventions using techniques with the lowest impact on the environment and human health. The general principles of IPM listed in the Directive become mandatory for all professional pesticides users as of 2014. Risk indicators will monitor progress made and check whether the objective of risk reduction is reached.




Content
1. Legal basis
2. The Thematic Strategy
3. The Framework Directive
4. Adoption procedure
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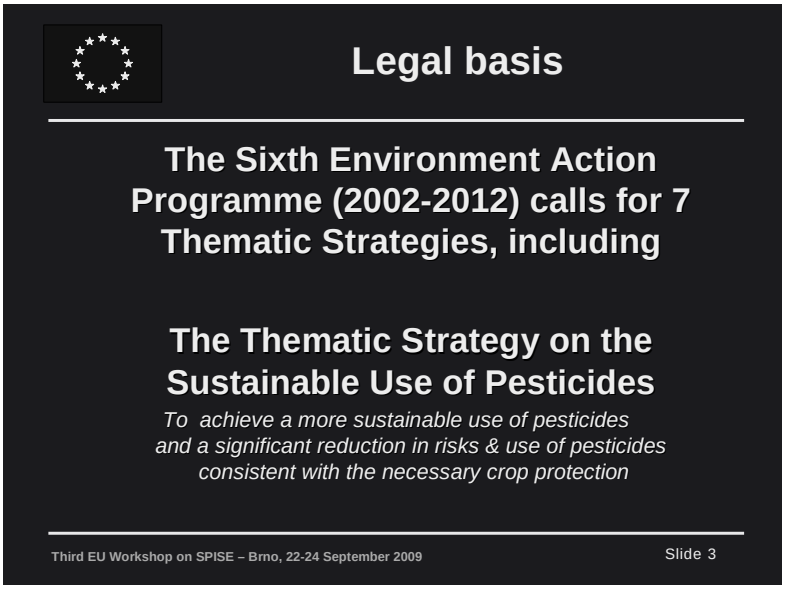
Legal basis
The Sixth Environment Action Programme (2002-2012) calls for 7 Thematic Strategies, including
The Thematic Strategy on the Sustainable Use of Pesticides
To achieve a more sustainable use of pesticides and a significant reduction in risks & use of pesticides consistent with the necessary crop protection
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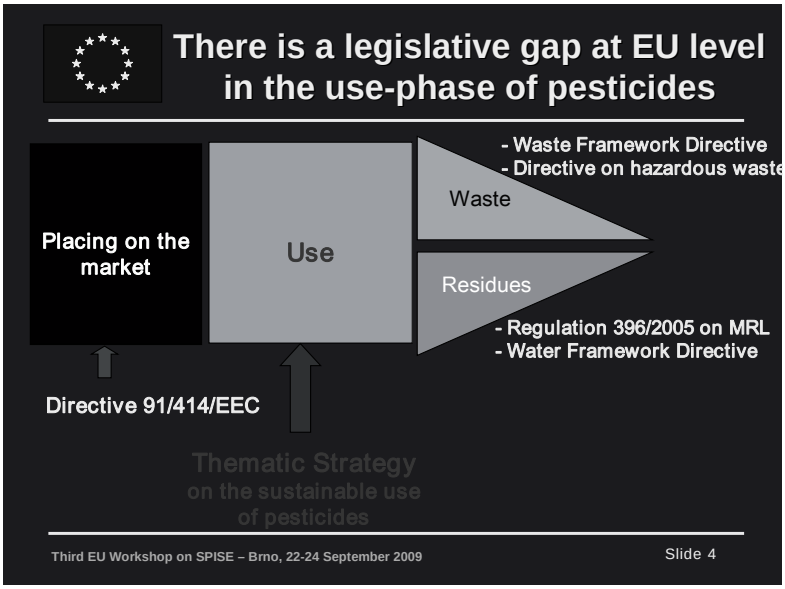
There is a legislative gap at EU level in the use-phase of pesticides
Placing on the market
Use
Waste
Residues
- Waste Framework Directive
- Directive on hazardous waste
- Regulation 396/2005 on MRL
- Water Framework Directive
Directive 91/414/EEC
Thematic Strategy on the sustainable use of pesticides
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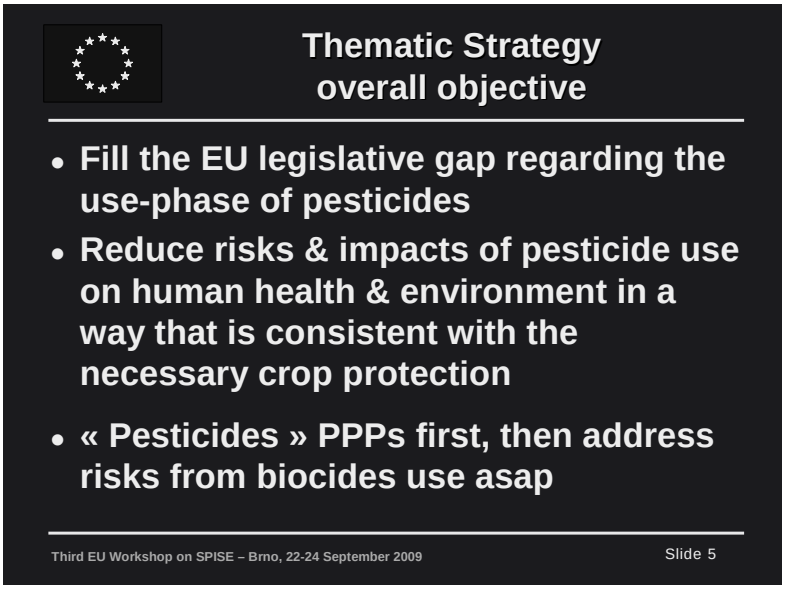
Thematic Strategy overall objective
• Fill the EU legislative gap regarding the use-phase of pesticides
• Reduce risks & impacts of pesticide use on human health & environment in a way that is consistent with the necessary crop protection
• « Pesticides » PPPs first, then address risks from biocides use asap
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The Thematic Strategy on the Sustainable Use of Pesticides

SANCO

Regulation revising Directive 91/414/EEC
COM(2006) 388 final

ENV

Framework Directive on the sustainable use of Pesticides
COM(2006) 373 final

EUROSTAT

Regulation on the collection of statistics on PPP
COM(2006) 778 final

ENTR

Revision of Directive 2006/42/EC on Machinery
COM(2008) 535 final

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The Framework Directive Key elements

- **Nactional Action Plans**
- **Training, Sales of pesticides, Information & Awareness raising**
- **Pesticide application equipment**
- **Specific practices and uses:** *aerial spraying, information to the public, aquatic environment & drinking water, specific areas, handling & storage, IPM*
- **Indicators, reporting and information exchange**

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FWD - Art. 4
National Action Plans

- Member States to establish NAPs
  - Targets, measures, timetables to reduce risks
  - Timetables, targets to reduce use
  - Indicators to monitor use of pesticides of concern
  - Measures to implement provisions under Art.5-15
- Stakeholders' involvement in preparing NAPs
- Reporting obligation: MS to communicate NAPs to COM in 2012; for COM: on NAP content in 2014 / on target implementation in 2018
- Review of NAPs at least every five years

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FWD: Training, Sales, Information & Awareness raising

- All professional users, distributors, advisors access to appropriate training – Certification sytems by 2013
- Restrict sales of pesticides for professional use to persons holding a certificate
- Information & awareness raising for general public

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FWD – Art. 8
Inspection of equipment in use

1. Regular inspection of PAE for professional use: at least every 5 years until 2020, every 3 years after 2020
2. By 2016: PAE for professional use inspected at least once
3. Derogation
4. Inspections to verify that PAE satisfy essential requirements (Annex II)
5. Regular calibrations and technical checks
6. Responsible bodies for inspections - certificate system

FWD - Art. 9
Aerial spraying

- Prohibition of aerial spraying
- Derogation possibility: Member States to define crops, areas and particular requirements for application where aerial spraying may be authorised
- Essential conditions for derogations

FWD: Protection of aquatic environment & drinking water (Art.11)

- Preference to less hazardous pesticides
- Preference to most efficient application techniques in the vicinity of water bodies - Low-drift equipment
- Buffer zones adjacent to water courses and areas for abstraction of drinking water
- Reduction of use when risks of run-off

FWD: Safe handling, storage and waste of pesticides (Art.13)

Member States to ensure that human health & the environment are not endangered by

- Storage, handling, dilution, mixing
- Handling of packaging & remnants
- Disposal of tank mixtures
- Cleaning of equipment
- Recovery/disposal of remnants/packaging in accordance with COM waste legislation

FWD: Integrated Pest Management (Art. 14)

- Promote low pesticide-input pest management: IPM and organic farming
- Establish necessary conditions for IPM implementation:
  - Information & tools for pest monitoring & decision-making
  - Advisory services
- General principles of IPM (Annex III) to be implemented by all professional users by 1/1/2014
- Crop or sector-specific IPM guidelines to be developed - implementation on a voluntary basis

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FWD – Art. 15 Indicators

- Harmonised risk indicators to be established
- Risk indicators to be calculated by using statistical data (Regulation PPP Statistics)
- To estimate trends in risks from pesticide use
- To assess progress in reducing impact on human health/environment

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FWD: Exchange of information & best practice (Art. 18)
• The Thematic Strategy Expert Group
• Priority for discussion: Exchange of information and best practice in the field of sustainable use of pesticides and IPM
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Adoption procedure
• COM proposal for a Directive - 12 July 2006
• EU Parliament vote at 2nd reading: 13 January 2009
• Vote of the Council: 24 September 2009
• Publication in OJCE: October/November 2009 and entry into force 1 day after publication
• Two years for transposition
• Discussions still ongoing on the Statistics & Machinery proposals
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All the documents of the Thematic Strategy are available at
http://ec.europa.eu/environment/ppps/home.htm
Thank you for your attention !
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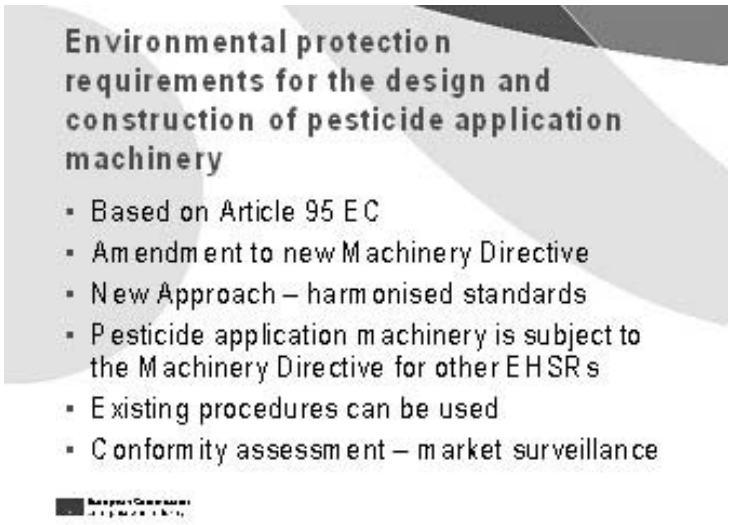
Directive of the European Parliament and of the Council on machinery for pesticide application, amending Directive 2006/42/EC of 17 May 2006 on machinery for pesticide application

Fraser, I.
European Commission DG Enterprise, 200 Rue de la Loi,1049 Brussels, Belgium



Extension of the objectives of the Machinery Directive

Introduction of the objective of protection of the environment in basic Articles:

- New definition of EHSRs - Article 2 (m)
- Market surveillance – Article 4 (1)
- Dangerous machinery – Article 9 (3)
- Safeguard clause – Article 11 (1)

Limit to the extension

- Recital 4
- Article 2 (m)
- Annex I - General Principle 4
- Essential health and safety requirements for the protection of the environment are applicable only to machinery for pesticide application

Scope: the machinery concerned

- Machinery intended for the application of plant protection products - PPPs
- Reference to Community legislation for the placing on the market of PPPs
- Machinery for biocidal products are not covered
- Inclusion of machinery for biocidal products will be considered by 31 December 2012 – Recital 2

Main types of machinery for pesticide application

- Self-propelled machinery
- Towed machinery
- Mounted and semi-mounted machinery
- Airborne machinery
- Stationary machinery
- Motor-powered portable machinery
- Manually-powered portable machinery with a pressure chamber

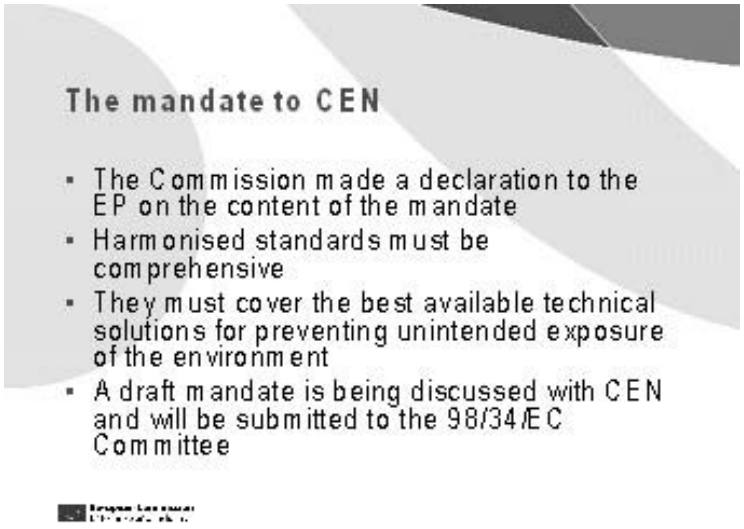
Equipment not concerned

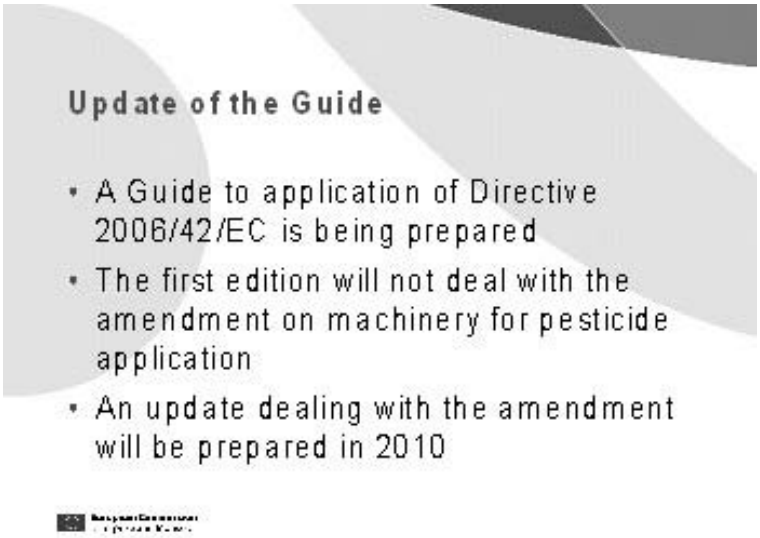
- Manually-operated pesticide application equipment without a pressure chamber
- Simple pesticide application equipment without moving parts
- Such equipment is not in the scope of the Machinery Directive

New essential health and safety requirements: Annex I - section 2.4

- Assessment of risk of unintended exposure of the environment to pesticides
- Limiting application to target areas
- Avoiding leakage, dispersal and drift
- Tests to verify conformity
- Instructions for operation, checks and maintenance
- Reference to the Framework Directive for regular inspections


Timing
Text agreed by Council, EP and Commission at trialogue on 31 March 2009
EP adopted the agreed text at first reading on 22 April 2009
Adoption by Council on 24 September 2009
Signature – publication
Entry into force 20 days after publication
Transposition 18 months after entry into force
Application 24 months after entry into force


The mandate to CEN
The Commission made a declaration to the EP on the content of the mandate
Harmonised standards must be comprehensive
They must cover the best available technical solutions for preventing unintended exposure of the environment
A draft mandate is being discussed with CEN and will be submitted to the 98/34/EC Committee


Update of the Guide
• A Guide to application of Directive 2006/42/EC is being prepared
• The first edition will not deal with the amendment on machinery for pesticide application
• An update dealing with the amendment will be prepared in 2010

Efficient application equipment in good condition - a prerequisite in crop protection - an ECPA view

Hagenvall, H.
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For many reasons the Crop Protection Industry welcomes a European-wide mandatory inspection of sprayers.

Today's crop protection products (CPPs) are efficient tools in a sustainable agriculture. High quality application equipment in good condition is an important part in the CPP management. No chain is stronger than its weakest link. Operator exposure, point sources, spray distribution – all are highly influenced by and dependent on the application equipment.

Good effect of a treatment with recommended doses requires an even distribution and deposit.

One trend in the development of new CPPs is more selectiveness. Another is fine-tuning in the mode of action. This will even increase the requirements on the spray application in the future.


Why?
• Optimum effect of treatment
at recommended dose


Why
•Distribution
•Spray quality

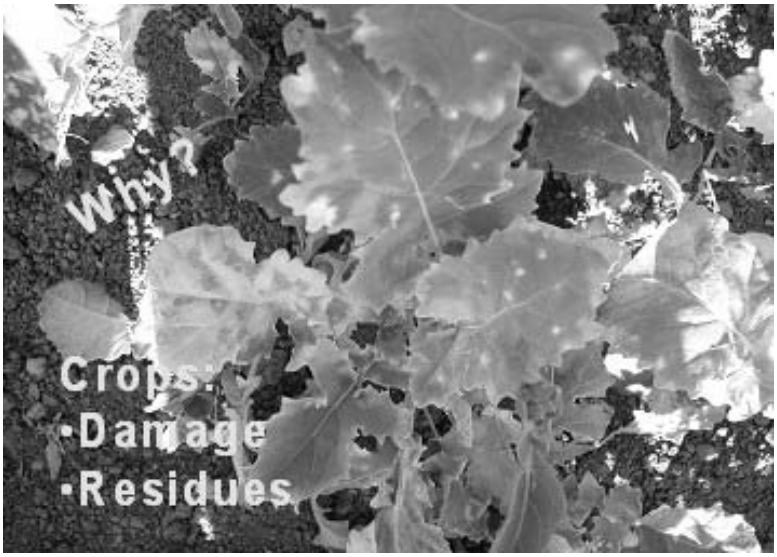

Why?
Minimimum risk for negative
side-effects
and
environmental pollution


Why?
Point sources
Examples:
- Leakages
- Cleaning facilities


Why?
•Find the problems before accidents occur


Why?
Diffuse sources
Examples: - Boom stability
- Spray quality


Why?
Crops:
•Quantity
•Quality


Why?
Crops:
•Damage
•Residues


Some specific needs and
aspects from the Crop
Protection industri


A prerequisite in
sustainable use of
Crop Protection
Products (CPPs)


CPPs are more and more
selective and more fine-
tuned in the mode of action


•Evenness in distribution
and deposit
•Homogenous spray liquid


Complaints management


Reflections about mandatory systems


§§§§§ ?
•Minimum requirements are excellent
•National adaptation also, but: "Don't overdo it"


Don't require "complete new machines"


try to combine the inspections with advisory/information


Try to strengthen the
operators ownership and
responsibility


Gå på vatten!
Make the good tools in crop
protection available for
future growers

Inspection of individual sprayers - recommendation Paper

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CEMA, representing the agricultural machinery industry has always been in favour of more harmonization. The introduction of environmental requirements for sprayers in the Machinery Directive 2006/42/EC is a great example of such harmonization. Persuasion was however necessary to make sure that self-certification was seen as the right conformity assessment procedure and that standards were seen as the right tools to work out the detailed technical requirements and tests according to the state of the art. The procedure of self-certification for machine safety and the innovative freedom it provides to manufacturers makes that Europe has some of the most advanced technologies in the world. Standards as EN 12761, ISO 4254-6 and EN 13790, that are or will be harmonized under the Machinery Directive will support manufacturers to keep providing such uniform high quality in Europe. It should be avoided that these harmonised standards have contradictory requirements. In reviews the content of all involved standards should be compared.

Due to the amended Machinery Directive a European customer is ensured that his sprayer meets the essential safety & health and environmental requirements. And with unification of machine standards and in-use inspection standards like EN 13790 he will know that his product will comply with the in-use inspection. Any equipment manufacturer has testing procedures. CEMA recommends that manufacturers make a sprayer quality test procedure according to EN 13790 as part of their quality check. However it is absolutely necessary that if manufacturers follow a national test procedure based on EN 13790 in a certain member state, the results are recognized in the other member states. And having an easier approval procedure could encourage companies to train own staff in the different countries. CEMA also recommends that in the further developments of EN13790 national variations are reduced so that only one uniform standard remains.

Such unification in legislation/standardisation should also follow for environmental requirements as now imposed by different national authorities on e.g. cleaning of machines, determination of drift, how to handle rest residues... With uniform requirements over all Europe, it will be easier and more profitable for manufacturers to develop the necessary intelligent solutions.

CEMA is pleased that a mandatory European inspection of sprayers in use has been agreed upon, as it will contribute to the continuity of the high performance levels of individual machines. Though only 5 years has been set as a first minimum time period between inspections, a more stringent and uniform time period for all Europe would be recommendable in the future.

Product group sprayers

SPISE workshop

- **Increasing quality level in crop protection**
- **Public attitude towards chemical usage**
- **Environmental awareness**

- Product development, considering all legal and customer demands
  - All aspects of use
  - Safety, environmental and operator
  - Cost effectiveness

Page 2 •

Product group sprayers

SPISE workshop

- Quality of design
- Quality of production
- Quality of maintenance

- Different member states
- Different regulations
- Different procedures

- Need for harmonization
- Both for new and used sprayers
- Tested in one member state, free to use in other member state
- Cost saving administrative procedures

Page 3 •

Product group sprayers

SPISE workshop

- Adding environmental aspects into the Machine Directive could cover all new sprayers

- Harmonized procedure for used sprayers
- Harmonized certification of sprayer test stations

- Investments in product development require European market volume
- Avoiding costs caused by national regulations and procedures
- Increasing quality level of sprayers on the market

- Improved application of agrochemicals
- Improved acceptance by the public

Page 4 •

European farming sector with mixed views of new rules on plant protection

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The farmers and agri-cooperatives represented by Copa-Cogeca have mixed views of the outcome of the three-year discussion process about the legislation on plant protection. The authorisation and marketing of plant protection products and their sustainable use are now under a new legislation. Copa-Cogeac is relieved that the EU will continue to base its legislation on sound science and has not given in to the most extreme voices. Balancing product safety, agricultural and environmental sustainability and the availability of healthy, affordable products is the primary objective. After the vote, effective plant protection of this kind should generally remain possible.

But Copa-Cogeca note with great concern, however, that some cut-off criteria are not based on a sound, risk-based assessment. The decision will also mean the elimination of a number of active substances, which farmers rely on to prevent the build-up of resistance and to ensure a healthy crop. The Inspection of Sprayers has now become part of the directive of the sustainable use of plant production products. In the first time, sprayers have to be inspected every fifth year, from 2020 every third year. This means for farmers more costs and more bureaucracy. On the other hand, to achieve the balance, that consumers expect, the regular inspection of sprayers is a sign to get consumers confidence.

The experiences with inspections of sprayers made in some Member States should be taken into account, when establishing the rules. In an open EU market, farmers need harmonized procedures to avoid distortions of competition between EU farmers.

The implementation must be done in a way, as to meet the aims of protecting health and the environment as well as the competitiveness of the EU Agricultural sector. EU farmers must be provided with workable alternatives, which enable them to have the necessary tools to combat plant health diseases.

The full consequences of the agreement on the EU farming sector depend strongly on how it is implemented. Farmers, policy-makers and industry must continue working together to ensure that we can achieve the balance that consumers expect.

DBV

3rd European Workshop on Standardized Procedure for the Inspection of Sprayers in Europe
September, 22nd September 2009

Position of the European Farmers

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Who is Copa-Cogeca

- 6. September 1958, the first European representative organisation, COPA, was created.
- 24 September 1959, the agricultural cooperatives of the European Community created their European umbrella organisation, COGECA (General Confederation of Agricultural Cooperatives).
- COPA's Secretariat was established in Brussels on 1 April 1959, merging with that of COGECA on 1 December 1962.
- COPA (Committee of Professional Agricultural Organisations) first started with 13 member organisations from the then six Member States.
- Today COPA is made up of **60 organisations** from the countries of the European Union and **36 partner** organisations from other European countries such as Iceland, Norway, Switzerland and Turkey.
- This broad membership allows COPA to represent both the general and specific interests of farmers in the European Union.
- Since its inception, COPA has been recognised by the Community authorities as the organisation speaking on behalf of the European agricultural sector as a whole

Who is the DBV

- The Deutscher Bauernverband (DBV) has been founded in 1949
- Member Organisations are the 17 local associations
- Represents more than 360.000 farmers and their families in Germany
- Headquarter in Berlin, second Büro in Brussels

Farmers Framework

- Economic aspects
- Ecologic aspects
- Consumers wishes
- Environmental aspects
- Sustainability aspects

The Pesticide Package

- First drafts with high Impacts on European Agricultural Sector
  - cut-off criteria without any scientific basis
  - no EU-Wide impact assesment on agricultural production
  - information for neighbours
  - data collecting and storing, everytime available for neighbours, consumers, water industries
  - Forbidden Aereal Spraying

The Pesticide Package – COPA Position

- Protect human health and the environment
- Protection of plant health whilst ensuring sustainable use of Plant Protection Products
- Secure the production of affordable food, financial viability for farmers, and long term sustainability of European Farmers
- Promote the Competitiveness of European farmers
- Non distorting safety measures

The Pestice-Package – The Compromise

- Improvement of the first Packages
- Should continue to p rovide solutions to protect the crops and agricultural in the EU

- The Implementation must:
  - Meet the aims of protecting health and the environment as well as the competitiveness of the EU AG Sector
  - Farmers provide with workable alternatives, which enable them to have the necessary tools to combat plant health deseases
  - Ensure a monitoring:
    - To avoid distortion of competition between farmers

The Inspection of Sprayers

- Located in the directive for the sustainable use of Pesticides
- To avoid competition between EU-Farmers a unique, comparable system have to be established
- This contains:
  - Harmonized Procedures
  - Harmonized Testing Rhythms

The Inspection of Sprayers

- Need of a low cost inspection procedure
- Less bureaucratic as possible
- Some experiences in Germany:
  - Testing Procedure every second year for a sprayer
  - Costs for the Sector appr. 5.000.000 €/a
  - Almost 100 % of Sprayers are tested because of the connection to EU direct payments
  - An established procedure, but not loved by the farmers

Sprayers Inspection – the other side

- PPP are high innovative products
- Prices bring pressure on the production process
  - Less water used
  - Less ppp used
    - High degree of correct distribution is needed
    - We must avoid wrong overlapping, run off, etc
- Inspections are kind of self regulatory

- Implementation of Inspection Procedures must be based on a EU-wide harmonized Procedure (Testing, Time)
- Avoid Competition between Farmers
- Low Cost Inspection Systems will reach broader acceptance
- Less bureaucratic as possible

Actual survey about inspection of sprayers in the European countries

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Summary

During the summertime of the year 2009 a survey in most of the European countries was carried out. In view of the publishing of the Frame Work Directive this survey deals among other with some points regarding the implementation of inspection systems. To get this information the responsible colleagues of all countries - where a contact person is known - got a short questionnaire.

Introduction

On the occasion of the first both SPISE workshops in the year 2004 and 2007 similar surveys were carried out. With that information it was pointed out that the situation regarding sprayer inspections in the Member States and other European countries was marked by great differences between the countries in Europe. With this present survey the colleagues were asked for data (separate for field sprayers and air-assisted sprayers) regarding

1. the number of sprayers in use,
2. the kind of inspection (mandatory, voluntary, experimental state or no inspection),
3. the number of inspections carried out in the years 2004 to 2008.

Furthermore there are some further questions regarding

1. the inspection interval,
2. the average inspection costs,
3. the procedure for brand new sprayers,
4. the indication by stickers,
5. the procedure for sprayers where a defect is stated?
6. the availability of subsidies for the implementation of inspection sites
7. the body which is responsible for implementing the inspection systems
8. the kinds of sprayers inspected at current and planned for next years

26 of 30 asked countries returned during the last months their filled questionnaires. Exactly these countries sent their delegates to attend this workshop. And therefore I would like to take the opportunity to thank all these colleagues for the fruitful cooperation and for their important contribution. I can imagine that especially the determination of the number of sprayers in use and the number of yearly carried out inspections was combined with some problems. The tables 1 to 3 summarize most of the collected data separated for field sprayers and air-assisted sprayers for bush and tree crops.

Tab. 1 Inspection of field sprayers in the European Countries

Current status of the inspections	Number of sprayers in use	Inspections mandatory from	Will be mandatory from	Voluntary from	Number of sprayers inspected (average 2004-2006)	Number of sprayers inspected (average 2006-2008)	After how many years the inspection must be repeated?	Average inspection cost (Euro) from…to …	Brand new sprayers have to be inspected?	May serious defects lead to a prohibition of use?
Austria	35.000		2012-15	1983	9.367	10.529	3	50-160	No	No
Belgium	19.031	1995	-	1989	6.344	6.344	3	12 - 142	yes	yes
Bulgaria	4.005		2015		0	0				
Czech Republic	6.500	1997		1980	1.150	1.437	3	100-350	No	Yes
Denmark	30.000	1993	-	-	151	61	-		No	No
Estonia	?	2000			218	234	3	48 + transp	No	Yes
France	200.000	2009		1990	0	0	5	100-250	-	-
Germany	131.200	1993	-	1976	73.090	72.806	2	55 - 341	Yes	Yes
Greece	45.089	2009	-	-	0	0	-	-	-	-
Hungary	35.000	2005		-	0	0	2	?	No	Yes
Ireland	12.000	-	in future	-	0	0	-	-	-	-
Italy	200.000	1999 - 2001	-	1988 - 2006	2.300	2.333	2 to 5	100 - 200	No	Yes
Latvia	2.300	-	in future	-	0	-	-	-	-	-
Lithuania	15.000	2001	-	-	421	805	3	28-86	Yes	Yes
Norway	16.800	2006	-	1991	1.950	1.000	5	180-300	Yes	Yes
Poland	307.250	1999	-	-	55.941	46.465	3	33-42	Yes	Yes
Portugal	28.000	-	2015	2.007	0	0	3 to 5	33+transp.	No	-
Romania	5.876		in future	-	0	0	-	-	-	-
Serbia	18.800	2007	-	-	0	0	2	?	Yes	?
Slovakia	3.600	2003	-	-	605	685	2	160 - 350	No	Yes
Slovenia	16.003	1995	-	-	7.172	10.053	2	40	No	Yes
Spain	70.000	-	2010?	1990	300	1.433	5	25-100	No	Yes
Sweden	14.500	-	In future	1987	1.700	1.750	2	~ 300	No	No
Switzerland	13.300	1993	-	-	2.980	3.530	4	60 - 90	Yes	Yes
The Netherlands	13.000	1997	-	1976	5.751	6.580	3	120-200	Yes/No	Yes
Turkey	259.475	-	-	-	-	-	-	-	-	-
United Kingdom	44.000	2003	-	1997	11.424	13.447	1	100 - 650	Yes	Yes

Tab. 2 Inspection of air-assisted sprayers in the European Countries

Current status of the inspections	Number of sprayers in use	Inspections mandatory from	Will be mandatory from	Voluntary from	Number of sprayers inspected (average 2004-2006)	Number of sprayers inspected (average 2006-2008)	After how many years the inspection must be repeated?	Average inspection cost (Euro) from…to …	Brand new sprayers have to be inspected?	May serious defects lead to a prohibition of use?
Austria	17.000	-	2012-15	1983	6.000	6.500	3	20-140	No	No
Belgium	2.187	1995	-	1989	729	729	3	12,5 – 62,5	yes	yes
Bulgaria	1.707		2015		0	0				
Czech Republic	1.500	1997	-	1980	74	280	3	100-250	No	Yes
Denmark	?	1993	-	-	0	0	-		No	No
Estonia	50	2000	-		?	11	3	48+transp	No	Yes
France	150.000	2009	-	1990	0	0	-	100-250	No	-
Germany	41.800	2002	-	1983	20.957	18.679	2	25 - 139	Yes	Yes
Greece	107.005	2009	-	-	0	0	-	-	-	-
Hungary	15.000	2005	-	-	0	0	2	No data	No	Yes
Ireland	100	-	in future	-	0	0	-	-	-	-
Italy	350.000	(1997 – 2001)	in future	1988 - 2006	5.967	4.933	2 to 5	100 - 200	No	Yes
Latvia	20	-	in future	-	11	14	-	-	-	-
Lithuania	150	2001	-	-	8	8	3	35-85	Yes	Yes
Norway	1.000	2006		1995	55	50	5	180-300	Yes	Yes
Poland	24.324	1999	-	-	3.843	3.194	3	33	Yes	Yes
Portugal	28.000	-	2015	2.006	180	430	3 to 5	30+transp.	No	-
Romania	2.230	-	-	-	0	0	-	-	No	-
Serbia	2.000	2007	-	-	2	2	2	130	Yes	?
Slovakia	700	2003	-	-	80	102	2	132-250	No	Yes
Slovenia	6.605	1995	-	-	2.881	2.958	2	40	No	Yes
Spain	140.000	-	2010	1990	1.133	933	5	25-100	No	Yes
Sweden	500	-	In future	1995	50	50	2	~ 300	No	No
Switzerland	3.000	1993	-	1987	675	769	4	80-100	Yes	Yes
The Netherlands	2.000	2002	-	1995	831	671	3	120-180	Yes/No	Yes
Turkey	103.490	-	-	-	-	-	-	-	-	-
United Kingdom	46.000	2003		1997	9.360	13.055	1	100 - 650	Yes	Yes

Assessment

It can be stated that the involved 27 countries reported an existence of 2,5 Millions of sprayers. In Italy, France, Poland and Turkey are located about 75% of these sprayers.

A quite important point for managing the mutual recognition seems to be the inspection interval. Following the current survey it can be seen that the values range between 1 year in UK and up to 5 years in France, Spain and Norway. The average value in the meantime increased from 2.7 to 3.0 years.

To have an overview in which extent the farmers take part in the offered inspections the next two graphs are added. The calculation of these values is the following:

Yearly possible inspections means: Number of sprayers in use divided by the inspection interval. From this value the percentage of real performed inspection can be found out.

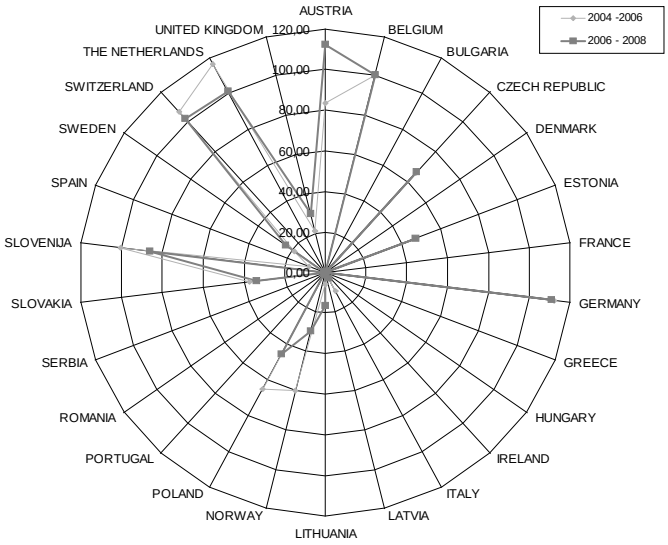

Fig. 1 Inspections carried out yearly (average 2004 – 2006 and 2006 - 2008) as percentage of the prescribed or recommended inspections

For example the Czech Republic has about 6.500 field crop sprayers and an interval of 3 years so there are 2.166 inspections yearly possible. There are carried out 1.437 inspections and therefore the value reported is 66 %. With light green there are shown the results from the survey from 2006.

It can be seen tat in Austria and also in Germany a little bit more than 100 % were reported. Perhaps here the mostly estimated amount of sprayers in use can be the reason for these values. The decreasing amount of inspections in the Netherlands has to do with the changing of the inspection interval from 2 to 3 years.

One of the newer queries dealt with the kinds of sprayers which are to be inspected at present. The following map (Figure 2) shows the assignment of the inspected kinds of plant protection equipment to the countries. All kinds of sprayers which were reported by the contact persons are added as pictures and assigned by following numbers:

1. Field sprayers
2. Air-assisted sprayers,
3. Air-assisted sprayers with spray guns
4. Fogging machines
5. Hand-operated equipment, especially used in greenhouses
6. Sprayers used on aircrafts or helicopters
7. Spraying equipment mounted on trains
8. Knapsack sprayers
9. Seed treaters
10. Slug pellet applicators
11. Sprayers used on pavements

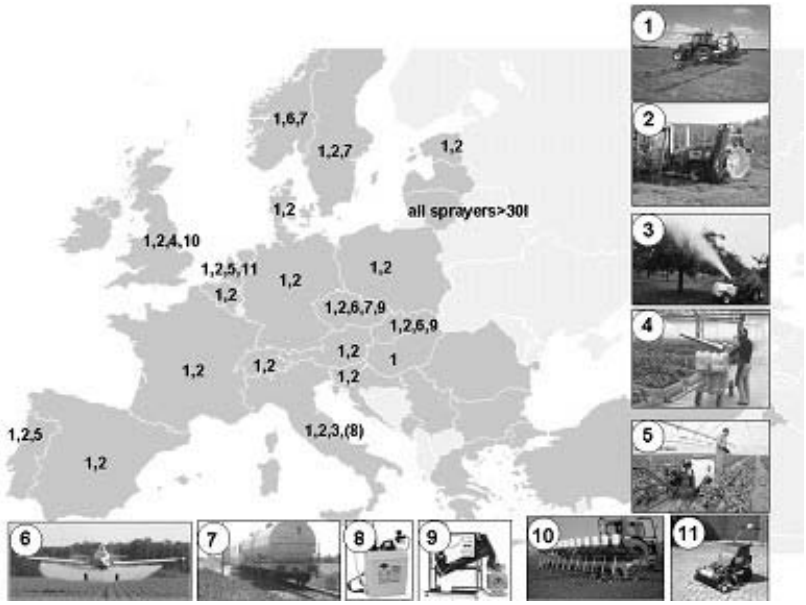

Fig. 2 Kinds of sprayers inspected at current in the countries of Europe

It can be stated that field sprayers and also air-assisted sprayers are inspected in all answering countries. Furthermore up to 3 other kinds are objects of the inspection schemes.

Another question to this field of interest is the range of equipment in future. Here most countries answered that this is not decided yet. Austria named stationary equipment and combined equipment and others. In Belgium sprayers for soil disinfection and boom sprayers used under glass will be inspected additionally in future. Czech Republic reported handheld sprayers. Germany and the Netherlands announced that in future all sprayers according article 8 will be inspected. Following the proposed derogations in paragraph 3 hand held and knapsack sprayers will be except. In Poland and also in Slovenia the inspection of field crop sprayers and air-assisted sprayers shall not be changed within the next future. Romania announced that in future the field crop sprayers and the air-assisted sprayers shall be tested. In Spain sprayers on aircraft shall become additional subject of inspection.

To manage all that inspection work, the governments have to implement a corresponding amount of inspection sites. Our question in that direction was: “Are there any national or regional subsidies for the implementation of inspection sites available?” The only country where such funds are possible is Sweden. I assume that all countries from where no answer to this question was given will have no kind of subsidy here too.

The question concerning the indication of inspected sprayers by a kind of sticker nearly all countries answered by “Yes”. At the moment only Denmark, Lithuania and Bulgaria still use no inspection sticker.

In paragraph 6 of article 8 of the frame work directive is laid down that each Member State shall designate bodies responsible for implementing the inspection systems and inform the Commission thereof. In those cases where a decision already exists the following table lists the names of these institutions.

Tab. 3 Responsible bodies following paragraph 6 of article 8

Current status of the inspections	Which body is responsible for implementing the inspection systems?
Austria	Bundesministerium Für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (BMLFUW)
Belgium	Federal Agency for the Safety of the Food Chain
Czech Republic	the Ministry of Agric.
Denmark	Ministry of Agriculture and Ministry of Environment
Estonia	Estonian Plant Production Inspectorate
France	GIP PULVES
Germany	Federal Ministry of food, Agriculture and Consumer Protection/The Julius Kühn Institut
Greece	Benaki Phytopathological Institute
Italy	ENAMA/DEAIFA technical workgroup
Lithuania	State Plant Protection Service under Ministry of Agriculture
Norway	federal states
Poland	The authority of the state: among others: Plant Health and Seed Inspection
Portugal	Ministry of the Agriculture
Slovakia	- Agricultural Technical and Testing Institute (in Rovinka), - Central Controlling and Testing Institute in Agriculture (in Bratislava)
Slovenia	Phytosanitary administration RS
Spain	Spanish government and individually the 17 local governments
Sweden	not decided yet
The Netherlands	Dutch ministry of agriculture
United Kingdom	NSTS

Conclusions

Since the last SPISE 2 workshop there are 2 and a half years gone. Within this time the following development can be stated:

The number of attending countries could not grow because of missing contacts to the not attending countries.

The second value shows that the reservations against such survey and probably against the inspection of sprayers in general decreased once more during the last years.

Still one country carries out no inspection and voluntary systems are not longer existent.

Remarkable is the increasing number of countries where a mandatory sprayer inspection was introduced or will be introduced within the next time. Following that the number of carried out inspections increased once more.

Session 1: Inspection at regular intervals – Inspection of new equipment (according article 8/1 and 8/2)

Introduction paper

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Summary

With the Frame Work Directive (FWD) the Member States (MS) are obliged to introduce regular inspections for plant protection equipment (PAE).

The FWD provides a framework which allows the MS to implement these stipulations taking into consideration their experience and situations in the past.

The MS are given leeway to set other times and intervals for certain types of construction and to exclude certain types entirely from obligatory inspections..

Because the FWD does not automatically have the force of the law in the MS, but requires a legal regulation for transferring it into national law in each MS, the SPISE 3-Workshop will provide a proposal for discussion which uses the FWD's stipulations and specifies, or rather makes use of, the leeway remaining with the MS.

This specification primarily involves technical matters; in addition, legal/administrative situations in the MS may lead to regulations which deviate from these. It is nevertheless important that the MS agree with one another on the regulations which concern other MS, because otherwise the mutual recognition of inspections is not possible.

Experience which has been gained up until now in other MS is also to be taken into consideration when fixing the scope of inspection and the requirements (EN 13790) to form the basis for these.

The wording of article 8

With the Pesticide Framework Directive the Member States are obliged to introduce regular inspections for pesticide application equipment (PAE). The Directive provides the framework and stipulates essential requirements which have to be specified and adjusted to the situations in the Member States according to the principles of subsidiarity.

In the following both the article 8 of the FWD and the proposal for uniform enforcement of the inspection in the member States are explained.

The key words of the article 8 are listed on the left side of the figure 1:

1) The article 8 indicates the frame and the structure within the inspection of PAE in the MS should comply.
2) Because the FWD does not automatically have the force of the law in the MS, but requires a legal regulation in each MS,
   the SWG is providing a proposal for uniform enforcement of the inspection in the MS, see Book of Abstract, page 28 to 35.
3) However, if such regulations should apply throughout the Member States in an effective and uniform way and the Member States should agree on those regulations amongst themselves.
4) This essential requirements of article 8 gives the MS leeway to supplement the article 8 by additional regulations taking the special situations of the MS into consideration according the principles of subsidiarity.

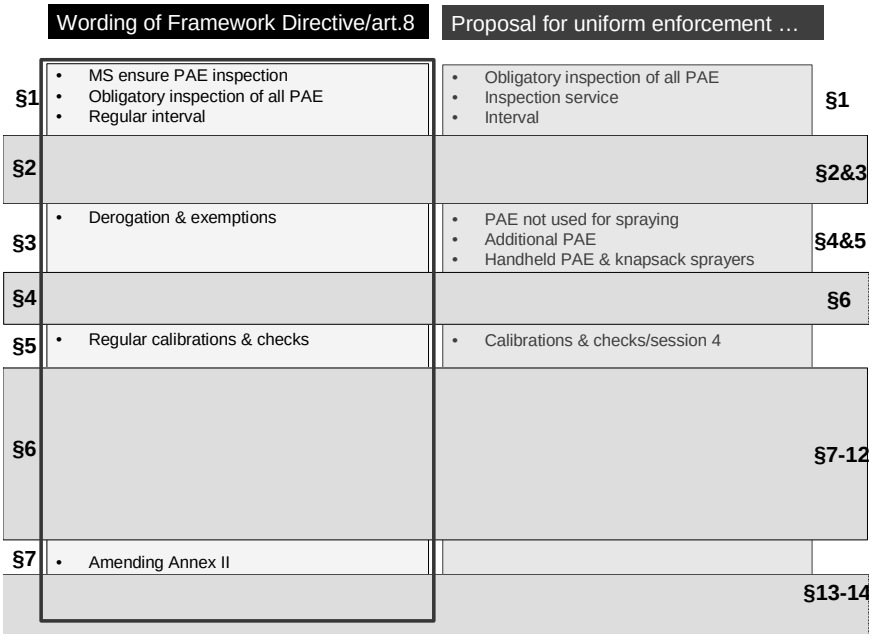


Fig. 1 The article 8 of the FWD consists of 7 paragraphs and provides the framework and stipulates essential requirements

Though such regulations should be applied throughout the Member States in an effective and uniform way there is indeed the necessity for the Member States to agree on those regulations amongst themselves. The key words of this proposal are listed on the right side of the fig 1. This proposal focusing on technical aspects taking the limited availability of harmonized EN standards into consideration.

This proposal is characterized by the following items:

1) First of all the inspection is focused on PAE already included in the European standard EN 13790 P.1 & P.2 (at the moment only addressed to field crop and air assisted sprayers).
2) For PAE not yet included in the EN 13790 series the inspection is according to article 8.3 postponed until the relevant harmonized EN standards are published.
3) Certificate system for mutual recognition of inspection among the Member States is recommended taking sticker, minor defects and test report into account.
4) The use of PAE without a valid sticker is prohibited and non-compliance will be punished.

The complete version of the proposal is attached in **annex 2**

The stipulations of article 8/1 and 8/2

Now I would like to come back to §1 & §2 of the FWD and explain these more precisely. The MS are requested in article 8.1 to ensure that PAE in professional use shall be inspected at regular intervals.

For purposes of interpretation, the definitions in article 2 (e.g. professional use, pesticide application equipment, …) should be used.

This Directive shall apply to pesticides that are plant protection products as defined in point 10(a) of article 3. (article 2(1)).

"Pesticide" means a plant protection product as defined in Regulation (EC) No 1107/2009 (article 3(10)).

“Pesticide application equipment" means any apparatus specifically intended for the application of pesticides, including accessories that are essential for the effective operation of such equipment, such as nozzles, manometers, filters, strainers and cleaning devices for tanks. (article 3(4)).

"Professional user" means any person who uses pesticides in the course of their professional activities, including operators, technicians, employers and self-employed people, both in the farming and other sectors. (article 3(1)).

“PAE in professional use” means a PAE used from “professional user” as defined article 3(1).

What kind of pesticide application equipment shall be subject to inspections at regular intervals: This classification scheme shows a collection of PAE used for the different kinds of plant protection measures grouped according §1 & §3 of the article 8, figure 2.

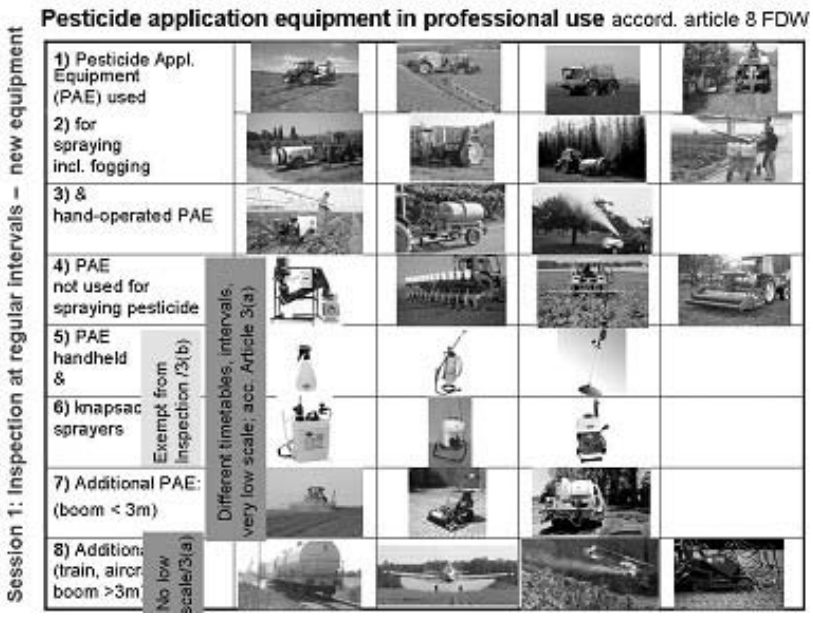


Fig. 2 Pesticide application equipment in professional use according article 8 FWD

This scheme shows 3 categories of PAE:

1) PAE, that have to be inspected without derogations,
2) PAE, that have to be inspected, but with some derogations,
3) PAE, that are exempt from inspection.

By the way of derogation the MS can apply different timetable, different intervals for certain types of PAE or exempt hand held or knapsack sprayers from inspection. The derogations and exemptions from inspection is be explained very clear and detailed in session 2. The regulation in §1 of the FWD at first includes all PAE in mandatory inspections, of which certain constructions can then be excluded according to §3(a) und §3(b). The interval between inspections shall not exceed five years until 2020 and shall not exceed three years thereafter.

The European survey from 2009 in the countries of Europe, made be my colleague Mr. Wehmann, shows that the intervals vary between 1 and 5 years, figure 3.

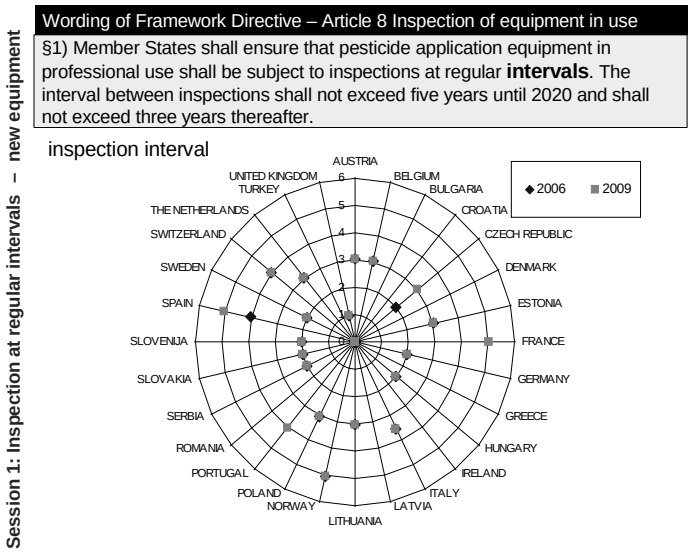


Fig. 3 Different inspection intervals in the countries of Europe

This is a very wide range and I estimate, it will be difficult to come to a harmonized interval for all MS. MS shall ensure that PAE shall be inspected at regular intervals. Nothing is said about, who should do it. However, the MS can decide itself, who and where to have these inspections conducted. To this end it is useful to be able to make use of the experience gathered by the MS on official or officially recognized inspection service.

Particular attention should be paid to the experience and regulations in Belgium, Germany and the Netherlands who reported on this matter on the occasion of the 2nd SPISE-Workshop (theoretically and practically) and also made their experience available in the form of information packages on the SPISE website.

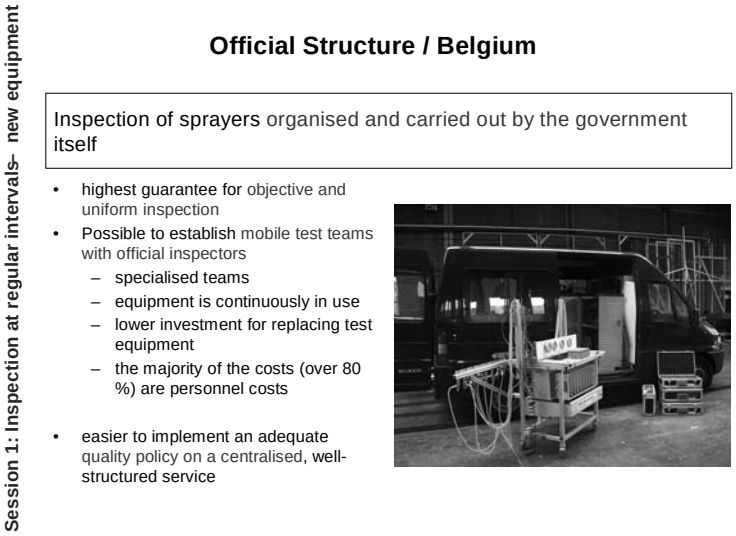


Fig. 4 Example of an official inspection service in Belgium where the inspection is organized and carried out by the government itself

Fig. 5 Example from Germany where the inspection is delegated to the Federal States and carried out by approved agricultural workshops

The following proposal focusing on technical matters shows the action of implementation in the Member States taking the limited availability of harmonized EN standards into consideration. This proposal is characterized by the following items:

1. First of all the inspection is focused on PAE already included in the European standard EN 13790 P.1 & P.2 (at the moment only addressed to field crop and air assisted sprayers).
2. For PAE not yet included in the EN 13790 series the inspection is according to article 8.3 postponed until the relevant harmonized EN standards are published.
3. Certificate systems for mutual recognition of inspection among the Member States are recommended taking sticker, minor defects and test report into account.
4. The use of PAE without a valid sticker is prohibited and non-compliance will be punished.

Please focus on the right side of the figure 1.

As already mentioned the FWD does not automatically have the force of the law in each MS. The SWG will provide you

- a proposal for uniform enforcement of the inspection in the MS
- which is focused on technical matters
- for transferring the article 8 into national law on the MS level
- taking the limited availability of harmonized EN-standards into account

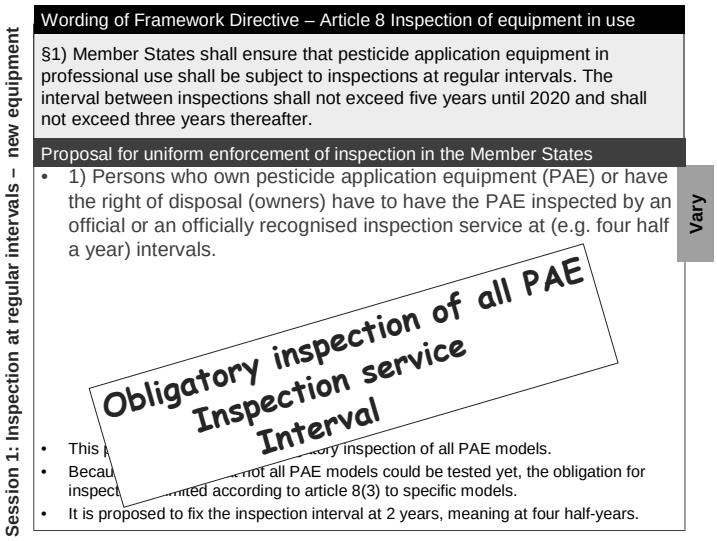


Fig. 6 Wording of Framework Directive Article 8, § 1

FWD: The MS must assure that the inspection intervals not exceed 5 years until 2020 and not exceed 3 years thereafter.

Proposal: In the first § of this proposal, three items are laid down.

1) The proposal obliged the owners of all PAE models to have their PAE inspected, without any exceptions. Because of the fact that not all PAE models could be inspected yet, because of the limited availability of harmonized EN standards, the inspection is limited by derogations and exemptions according article 8.3. These aspects will be discussed more detailed in session 2.
2) It is recommended to keep the door open that the inspections can be carried out by an official or an officially recognised inspection service.
3) It is proposed to fix the inspection interval at 2 years, meaning at four half-years.

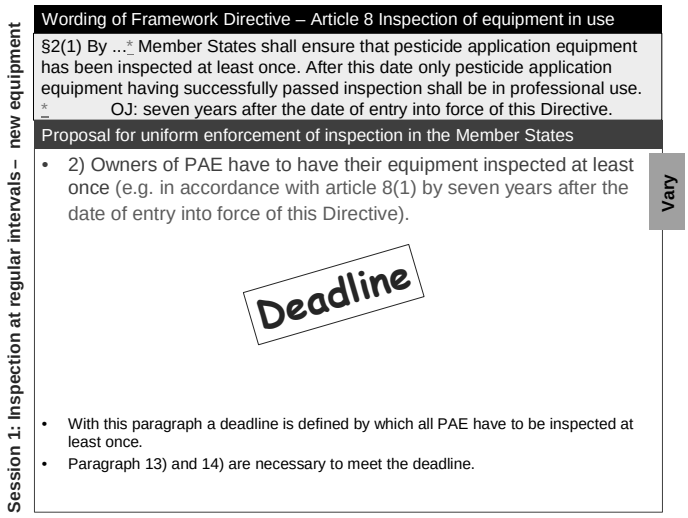


Fig. 7 Wording of Framework Directive Article 8, § 2(1)

FWD: In §2(1) of the FWD the Member States are obliged to make sure that all PAE is inspected at least once within the 7 years after the FWD has entered into force.

Proposal: With this paragraph a deadline is defined by which all PAE have to be inspected at least once.

In order to guarantee this, the MS must set up further regulations concerning bans on use and offences as suggested in §§13 and 14 of the proposal. Example formulations are given in §§13 and 14. The suggestion (§§ 13 & 14) in the proposal addresses this stipulation.

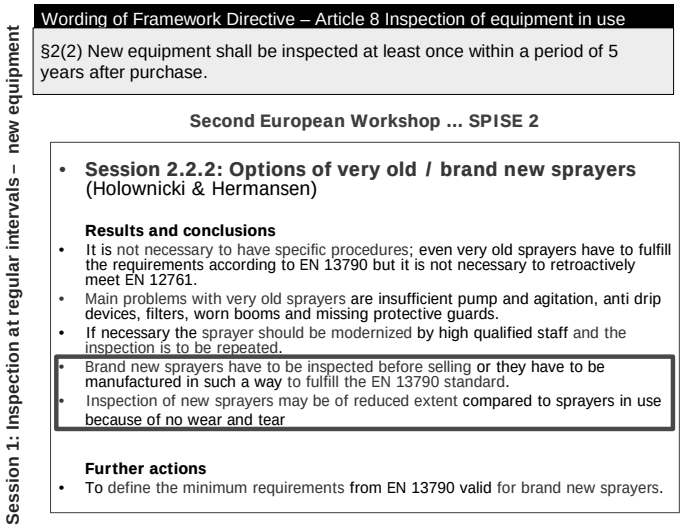


Fig. 8 Wording of Framework Directive Article 8, § 2(2)

How to deal with brand new PAE have been already discussed at the last SPISE workshop in Straelen 2007 with the following result:

1) Brand new sprayers have to be inspected before selling or they have to be manufactured in such a way to fulfill the EN 13790 standard.
2) Inspection of new sprayers may be of reduced extent compared to sprayers in use because of no wear and tear

FWD: New equipment shall be inspected at least once within a period of 5 years after purchase. A time period of 5 years before the first inspection is too long.

Proposal: Due to the positive experience gathered by some MS with the inspection of new equipment it is suggested:

1) to shorten this deadline to 6 months at the longest or
2) to conduct the inspection before the new equipment is used for the first time.

Here my explanations:

1) An inspection before the first use is especially advantageous because this guarantees that new PAE also fulfils the requirements of EN 13790.
2) The regulation in the Machine Directive for new PAE which only provides for certification carried out by the manufacturer himself cannot guarantee this because a technical inspection of the new equipment is not intended.
3) A further reason for favouring the inspection of new equipment is the fact that manufacturers are increasingly conducting performance tests before dispatching their equipment from the factory.
4) Shortening this deadline does therefore not mean additional costs.

However, it means a huge gain in safety for the environment, consumer and agriculture since each new piece of equipment is also inspected technically with regard to compliance with legal requirements.

Proposal: In the German procedure for testing brand new equipment only the features pertaining to

- 2. pump
- 6. pipe system
- 9. nozzles

shall be applied.

Conclusion

The FWD provides the frame for inspection of PAE in the MS with some derogations and exemptions. This enables the MS to implement these stipulations taking their own experiences & situations into account.

The SWG provides a proposal for uniform enforcement of inspection in the MS which have to discussed & improved at this workshop.

There is indeed the necessity for the MS to agree on such regulations amongst themselves. The inspection of brand new PAE before they were taken into use is very advantageous, for this a reduced number of features should be applied.

Annex 1 Directive 2009/128/EC of the European Parliament and of the Council establishing a framework for Community action to achieve the sustainable use of pesticides (extract)

24.11.2009 EN Official Journal of the European Union L 309/71

DIRECTIVES

DIRECTIVE 2009/128/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 21 October 2009

establishing a framework for Community action to achieve the sustainable use of pesticides

(Text with EEA relevance)

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 175(1) thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Economic and Social Committee [1],

Having regard to the opinion of the Committee of the Regions [2],

Acting in accordance with the procedure laid down in Article 251 of the Treaty [3],

Whereas:

(1) In line with Articles 2 and 7 of Decision No 1600/2002/EC of the European Parliament and of the Council of 22 July 2002 laying down the Sixth Community Environment Action Programme [4], a common legal framework for achieving a sustainable use of pesticides should be established, taking account of precautionary and preventive approaches.

(2) At present, this Directive should apply to pesticides which are plant protection products. However, it is anticipated that the scope of this Directive will be extended to cover biocidal products.

(3) The measures provided for in this Directive should be complementary to, and not affect, measures laid down in other related Community legislation, in particular Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds [5], Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora [6], Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy [7], Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue levels of pesticides in or on food and feed of plant and animal origin [8] and Regulation (EC) No 1107/2009 of the European Parliament and of the Council of 21 October 2009 on the placing of plant protection products on the market [9]. These measures should also not prejudice voluntary measures in the context of Regulations for Structural Funds or of Council Regulation (EC) No 1698/2005 of 20 September 2005 on support for rural development by the European Agricultural Fund for Rural Development (EAFRD) [10].

(4) Economic instruments can play a crucial role in the achievement of objectives relating to the sustainable use of pesticides. The use of such instruments at the appropriate level should therefore be encouraged while stressing that individual Member States can decide on their use without prejudice to the applicability of the State aid rules.

(5) National Action Plans aimed at setting quantitative objectives, targets, measures, timetables and indicators to reduce risks and impacts of pesticide use on human health and the environment and at encouraging the development and introduction of integrated pest management and of alternative approaches or techniques in order to reduce dependency on the use of pesticides should be used by Member States in order to facilitate the implementation of this Directive. Member States should monitor the use of plant protection products containing active substances of particular concern and

[1] OJ C 161, 13.7.2007, p. 48.
[2] OJ C 146, 30.6.2007, p. 48.
[3] Opinion of the European Parliament of 23 October 2007 (OJ C 263 E, 16.10.2008, p. 158), Council Common Position of 19 May 2008 (OJ C 254 E, 7.10.2008, p. 1) and Position of the European Parliament of 13 January 2009 (not yet published in the Official Journal). Council Decision of 24 September 2009.
[4] OJ L 242, 10.9.2002, p. 1.
[5] OJ L 103, 25.4.1979, p. 1.
[6] OJ L 206, 22.7.1992, p. 7.
[7] OJ L 327, 22.12.2000, p. 1.
[8] OJ L 70, 16.3.2005, p. 1.
[9] See page 1 of this Official Journal.
[10] OJ L 277, 21.10.2005, p. 1.

Certification systems shall include requirements and procedures for the granting, renewal and withdrawal of certificates.

3. Measures designed to amend non-essential elements of this Directive relating to amending Annex I in order to take account of scientific and technical progress shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 21(2).

Article 6

Requirements for sales of pesticides

1. Member States shall ensure that distributors have sufficient staff in their employment holding a certificate referred to in Article 5(2). Such persons shall be available at the time of sale to provide adequate information to customers as regards pesticide use, health and environmental risks and safety instructions to manage those risks for the products in question. Micro distributors selling only products for non-professional use may be exempted if they do not offer for sale pesticide formulations classified as toxic, very toxic, carcinogenic, mutagenic or toxic for reproduction pursuant to Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations [1].

2. Member States shall take necessary measures to restrict sales of pesticides authorised for professional use to persons holding a certificate referred to in Article 5(2).

3. Member States shall require distributors selling pesticides to non-professional users to provide general information regarding the risks for human health and the environment of pesticide use, in particular on hazards, exposure, proper storage, handling, application and safe disposal in accordance with Community legislation on waste, as well as regarding low-risk alternatives. Member States may require pesticide producers to provide such information.

4. The measures provided for in paragraphs 1 and 2 shall be established by 14 December 2015.

Article 7

Information and awareness-raising

1. Member States shall take measures to inform the general public and to promote and facilitate information and awareness-raising programmes and the availability of accurate and balanced information relating to pesticides for the general public, in particular regarding the risks and the potential acute and chronic effects for human health, non-target organisms and the environment arising from their use, and the use of non-chemical alternatives.

2. Member States shall put in place systems for gathering information on pesticide acute poisoning incidents, as well as chronic poisoning developments where available, among groups that may be exposed regularly to pesticides such as operators, agricultural workers or persons living close to pesticide application areas.

3. To enhance the comparability of information, the Commission, in cooperation with the Member States, shall develop by 14 December 2012 a strategic guidance document on monitoring and surveying of impacts of pesticide use on human health and the environment.

CHAPTER III

PESTICIDE APPLICATION EQUIPMENT

Article 8

Inspection of equipment in use

1. Member States shall ensure that pesticide application equipment in professional use shall be subject to inspections at regular intervals. The interval between inspections shall not exceed five years until 2020 and shall not exceed three years thereafter.

2. By 14 December 2016, Member States shall ensure that pesticide application equipment has been inspected at least once. After this date only pesticide application equipment having successfully passed inspection shall be in professional use.

New equipment shall be inspected at least once within a period of five years after purchase.

3. By way of derogation from paragraphs 1 and 2 and, following a risk assessment for human health and the environment including an assessment of the scale of the use of the equipment, Member States may:

(a) apply different timetables and inspection intervals to pesticide application equipment not used for spraying pesticides, to handheld pesticide application equipment or knapsack sprayers and to additional pesticide application equipment that represent a very low scale of use, which shall be listed in the National Action Plans provided for in Article 4.

The following additional pesticide application equipment shall never be considered as constituting a very low scale of use:

(i) spraying equipment mounted on trains or aircraft;

[1] OJ L 200, 30.7.1999, p. 1.

(ii) boom sprayers larger than 3 m, including boom sprayers that are mounted on sowing equipment;

(b) exempt from inspection handheld pesticide application equipment or knapsack sprayers. In this case the Member States shall ensure that operators have been informed of the need to change regularly the accessories, of the specific risks linked to that equipment, and that operators are trained for the proper use of that application equipment in accordance with Article 5.

4. The inspections shall verify that pesticide application equipment satisfies the relevant requirements listed in Annex II, in order to achieve a high level of protection for human health and the environment.

Pesticide application equipment complying with harmonised standards developed in accordance with Article 20(1) shall be presumed to comply with the essential health and safety and environmental requirements.

5. Professional users shall conduct regular calibrations and technical checks of the pesticide application equipment in accordance with the appropriate training received as provided for in Article 5.

6. Member States shall designate bodies responsible for implementing the inspection systems and inform the Commission thereof.

Each Member State shall establish certificate systems designed to allow the verification of inspections and recognise the certificates granted in other Member States following the requirements referred to in paragraph 4 and where the time period since the last inspection carried out in another Member State is equal to or shorter than the time period of the inspection interval applicable in its own territory.

Member States shall endeavour to recognise the certificates issued in other Member States provided that the inspection intervals referred to in paragraph 1 are complied with.

7. Measures designed to amend non-essential elements of this Directive relating to amending Annex II in order to take account of scientific and technical progress shall be adopted in accordance with the regulatory procedure with scrutiny referred to in Article 21(2).

CHAPTER IV

SPECIFIC PRACTICES AND USES

Article 9

Aerial spraying

1. Member States shall ensure that aerial spraying is prohibited.

2. By way of derogation from paragraph 1 aerial spraying may only be allowed in special cases provided the following conditions are met:

(a) there must be no viable alternatives, or there must be clear advantages in terms of reduced impacts on human health and the environment as compared with land-based application of pesticides;

(b) the pesticides used must be explicitly approved for aerial spraying by the Member State following a specific assessment addressing risks from aerial spraying;

(c) the operator carrying out the aerial spraying must hold a certificate as referred to in Article 5(2). During the transitional period where certification systems are not yet in place, Member States may accept other evidence of sufficient knowledge;

(d) the enterprise responsible for providing aerial spray applications shall be certified by a competent authority for authorising equipment and aircraft for aerial application of pesticides;

(e) if the area to be sprayed is in close proximity to areas open to the public, specific risk management measures to ensure that there are no adverse effects on the health of bystanders shall be included in the approval. The area to be sprayed shall not be in close proximity to residential areas;

(f) as from 2013, the aircraft shall be equipped with accessories that constitute the best available technology to reduce spray drift.

3. Member States shall designate the authorities competent for establishing the specific conditions by which aerial spraying may be carried out, for examining requests pursuant to paragraph 4 and for making public information on crops, areas, circumstances and particular requirements for application including weather conditions where aerial spraying may be allowed.

ANNEX II

Health and safety and environmental requirements relating to the inspection of pesticide application equipment

The inspection of pesticide application equipment shall cover all aspects important to achieve a high level of safety and protection of human health and the environment. Full effectiveness of the application operation should be ensured by proper performance of devices and functions of the equipment to guarantee the following objectives are met.

The pesticide application equipment must function reliably and be used properly for its intended purpose ensuring that pesticides can be accurately dosed and distributed. The equipment must be in such a condition as to be filled and emptied safely, easily and completely and prevent leakage of pesticides. It must permit easy and thorough cleaning. It must also ensure safe operations, and be controlled and capable of being immediately stopped from the operator's seat. Where necessary, adjustments must be simple, accurate and capable of being reproduced.

Particular attention should be paid to:

1. Power transmission parts

   The power take-off driveshaft guard and the guard of the power input connection shall be fitted and in good condition and the protective devices and any moving or rotating power transmission parts shall not be affected in their function so as to ensure protection of the operator.

2. Pump

   The pump capacity shall be suited to the needs of the equipment and the pump must function properly in order to ensure a stable and reliable application rate. There shall be no leakages from the pump.

3. Agitation

   Agitation devices must ensure a proper recirculation in order to achieve an even concentration of the whole volume of the liquid spray mixture in the tank.

4. Spray liquid tank

   Spray tanks including indicator of tank content, filling devices, strainers and filters, emptying and rinsing systems, and mixing devices shall operate in such a way as to minimise accidental spillage, uneven concentration distribution, operator exposure and residual content.

5. Measuring systems, control and regulation systems

   All devices for measuring, switching on and off and adjusting pressure and/or flow rate shall be properly calibrated and work correctly and there shall be no leakages. Control of pressure and operation of pressure adjustment devices shall be easily possible during application. Pressure adjustment devices shall maintain a constant working pressure at constant revolutions of the pump, in order to ensure that a stable volume application rate is applied.

6. Pipes and hoses

   Pipes and hoses shall be in proper condition to avoid disturbance of liquid flow or accidental spillage in case of failure. There shall be no leakages from pipes or hoses when run with the maximum obtainable pressure for the system.

7. Filtering

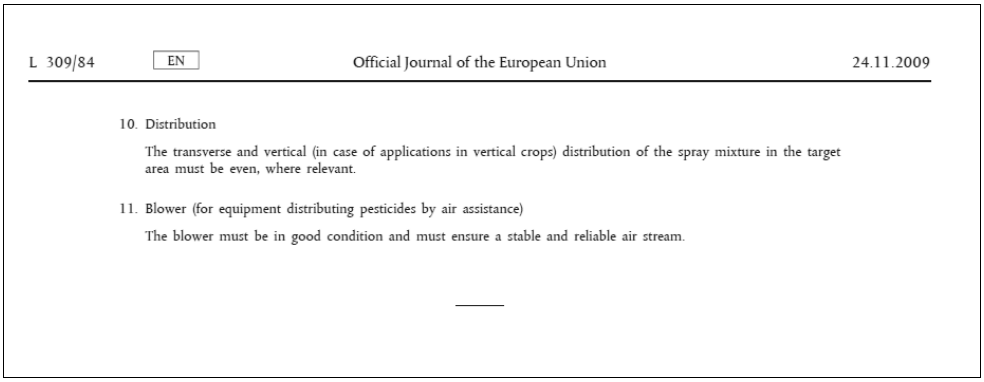
   In order to avoid turbulence and heterogeneity in spray patterns, filters shall be in good condition and the mesh size of the filters shall correspond to the size of nozzles fitted on the sprayer. Where applicable the filter blockage indication system shall operate correctly.

8. Spray boom (for equipment spraying pesticides by means of a horizontally positioned boom, located close to the crop or the material to be treated).

   The spray boom must be in good condition and stable in all directions. The fixation and adjustment systems and the devices for damping unintended movements and slope compensation must work correctly.

9. Nozzles

   Nozzles must work properly to control dripping when spraying stops. To ensure homogeneity of the spray pattern, the flow rate of each individual nozzle shall not deviate significantly from the data of the flow rate tables provided by the manufacturer.



L 309/84 EN Official Journal of the European Union 24.11.2009

10. Distribution

The transverse and vertical (in case of applications in vertical crops) distribution of the spray mixture in the target area must be even, where relevant.

11. Blower (for equipment distributing pesticides by air assistance)

The blower must be in good condition and must ensure a stable and reliable air stream.

Annex 2 Proposal for uniform enforcement of inspection in the MS

Pesticide Framework Directive

- Article 8: Inspection of equipment in use -

and

Proposal for uniform enforcement of inspection in the MS

Preliminary remark

With the Pesticide Framework Directive the Member States are obliged to introduce regular inspections for pesticide application equipment (PAE). The Directive provides the framework and stipulates essential requirements which have to be specified and adjusted to the situations in the Member States according to the principles of subsidiarity.

Though such regulations should be applied throughout the Member States in an effective and uniform way there is indeed the necessity for the Member States to agree on those regulations amongst themselves.

The following proposal focusing on technical matters shows the action of implementation in the Member States taking the limited availability of harmonized EN standards into consideration.

This proposal is characterized by the following items:

1. First of all the inspection is focused on PAE already included in the European standard EN 13790 P.1 & P.2 (at the moment only addressed to field crop and air assisted sprayers).
2. For PAE not yet included in the EN 13790 series the inspection is according to article 8.3 postponed until the relevant harmonized EN standards are published.
3. Certificate systems for mutual recognition of inspection among the Member States are recommended taking sticker, minor defects and test report into account.
4. The use of PAE without a valid sticker is prohibited and non-compliance will be punished.

Wording of Framework Directive	**Proposal for uniform enforcement of inspection in the MS**
1. Member States shall ensure that pesticide application equipment in professional use shall be subject to inspections at regular intervals. The interval between inspections shall not exceed five years until 2020 and shall not exceed three years thereafter.	1) Persons who own pesticide application equipment (PAE) or have the right of disposal (owners) have to have the PAE inspected by an official or an officially recognised inspection service at (e.g. 1 or 2 or 3 or 4 or 5 year) intervals. obligatory inspection of all PAE inspection service intervall
2. By ...* Member States shall ensure that pesticide application equipment has been inspected at least once. After this date only pesticide application equipment having successfully passed inspection shall be in professional use.	2) Owners of PAE have to have their equipment inspected at least once (e.g. in accordance with article 8(1) by maximum of seven years after the date of entry into force of this Directive). Deadline
New equipment shall be inspected at least once within a period of 5 years after purchase.	3) Brand new PAE must be inspected - e.g. at the latest by the end of the XXth calender month after they were taken into use. The owner must produce documents which plausibly show at which time the PAE was taken into use, or - e.g. before they were taken into use Brand new PAE
3. By way of derogation from paragraphs 1 and 2 and, following a risk assessment for human health and the environment including an assessment of the scale of the use of the equipment, Member States may:	
a) apply different timetables and inspection intervals to pesticide application equipment not used for spraying pesticides, to handheld pesticide application equipment or knapsack sprayers and to additional pesticide application equipment, which shall be listed in the national action plan foreseen in Article 4, that represent a very low scale of use.	4) PAE which is not used for spraying pesticides and additional PAE has to be inspected at least once (e.g. within maximum seven years after the date of entry into force of this Directive). PAE not used for spraying & additional PAE

* OJ: seven years after the date of entry into force of this Directive.

The following additional pesticide application equipment shall never be considered as constituting a very low scale of use:	
(i) spraying equipment mounted on trains or aircraft;	
(ii) boom sprayers larger than 3 m, including boom sprayers that are mounted on sowing equipment;	
b) exempt from inspection handheld pesticide application equipment or knapsack sprayers. In this case the Member States shall ensure that operators have been informed on the need to change regularly the accessories, on the specific risks linked to that equipment, and that operators are trained for the proper use of that application equipment in accordance with article 5.	5) Handheld PAE or knapsack sprayers (e.g. are excluded from the inspections at regular intervals). **Hand held PAE & knapsack sprayers**
4. The inspections shall verify that pesticide application equipment satisfies the relevant requirements listed in annex II, in order to achieve a high level of protection for human health and the environment.	6) The inspection has to extend the criteria spelled out in appendix 1. **Inspection acc. EN 13790 series**
5. Professional users shall conduct regular calibrations and technical checks of the pesticide application equipment according to the appropriate training received as provided for in article 5.	**calibrations & checks / session 4**
6. Member States shall designate bodies responsible for implementing the inspection systems and inform the Commission thereof.	7) The(respective Institute of the Member State) is responsible for implementing the inspection system **designate bodies**
Each Member State shall establish certificate systems designed to allow the verification of inspections and recognise the certificates granted in other Member States following the requirements referred to in paragraph 4 and where the time period since the last inspection carried out in another Member State is equal to or shorter than the time period of the inspection interval applicable in its own territory.	**Certificate systems:**

	8) The owner has to prove the (e.g. month or half-year or calender year) when the sprayer has to be inspected according to paragraph (1) sentence 1 by a sticker or label as shown in appendix 2. ▫ sticker
	The inspection service fills the label in with its address and with the (e.g. month or half-year or calender year) when the next inspection is due and sticks it on the machine after the inspection has shown that the machine functions without fault. The inspection service may also imprint an inspection number on the label. The label may also be handed out if the PAE has minor defects which the owner undertakes to remove immediately. ▫ minor defects
	9) The label must be clearly visible and stuck on the machine firmly; it must be of such quality that it is destroyed when it is removed.
	10) The inspection service complete a test report as shown in appendix 3 and hand over the original copy to the owner of the PAE ▫ test report
	11) The test label turns invalid with the end of the (e.g. month or half-year or calender year) imprinted on it.
Member States shall endeavour to recognise the certificates issued in other Member States provided that the inspection intervals referred to in paragraph 1 are complied with.	12) If used PAE subject to obligatory inspections are imported, they have to be inspected before they are first used in the country. Used PAE imported
	PAE which has already been inspected in another Member State of the European Community or within the European free trade zone in accordance with Framework Directive §8(4) is not subject to an obligatory inspection if the last inspection was carried out within the last (e.g. 1 or 2 or 3 or 4 or 5 years) and proof of this can be shown by the owner. PAE already inspected...MS

7. Measures designed to amend non-essential elements of this Directive relating to amending Annex II in order to take account of scientific and technical progress shall be adopted in accordance with the regulatory procedure with scrutiny referred to in article 21(2)	
	13) PAE in the meaning of article 8(1) which has not undergone inspection or does not have a valid test sticker, must not be used. Prohibition of use
	14) Anyone who, intentionally or negligently, uses a PAE in contravention of article 8(1), commits an offence within the meaning of article … of the Plant Protection Act. Offences

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The implementation §1,2 & 3 of article 8 of the sustainable use of pesticide directive in Sweden

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Abstract

This text reflects thoughts and ideas from draft material in the ongoing process of creating a system for mandatory inspection of pesticide application equipment. The idea is to inspect equipment already included in harmonized standards according to the rules of the current voluntary system. For equipment not yet included in harmonized standards we recommend that a risk assessment for human health and the environment according to § 3 to be made. In an ongoing process, as standards are harmonized, we suggest that the equipment is either excluded according to 3§ or included in the system. Finally we give some examples of different perspectives in the decision making.

Background and disclaimer

The Swedish Board of Agriculture has received a task from the Ministry of Agriculture to propose a system for mandatory inspection of pesticide application equipment according to article 8 in the Directive of sustainable use of pesticide. The resulting report will be delivered to the ministry in the end of November. This text is to be seen as a description of some ideas in the draft material that is collected and put together in the process by the Plant Protection Division. The final result of the mission and the final decisions from the government might be different from the thoughts in this text.

Today

Today Sweden has a voluntary system for inspection of sprayers in use. Private companies carry out the inspections according to EN 13790. The workshops are aloud to make necessary adjustments and reparations before the equipment is approved. At the inspections calibration and knowledge of the operator are also stressed in addition to the technical status of the sprayer.

It is mainly boom sprayers that are inspected and the major incitement for the farmers are quality assurance programmes that give the opportunity to better prices for agricultural products. For most sprayers the recommended interval between inspections is two years.

Proposal

Equipment included in already harmonized standards

Our suggestion is that application of pesticide with equipment for which there is harmonized standards for inspection in place, demands an approved sprayer from the season 2012 for one half of the Swedish farmers, depending of what municipality their farm belongs to (figure 1). For the rest this legal demand will come into force 2013.

The two-step introduction is a result of experience. When the voluntary system was introduced in the late 80-s many farmers inspected their sprayers the first year. Following given advice, they didn't inspect their sprayers the second year but the year after that. This wave pattern is still visible in the statistic of inspections and causes problems for workshops to plan their work. With this type of introduction, hopefully the demand on inspections will be more even and thereby equal the working pressure on workshops. Workshops usually have their customers from many municipalities.

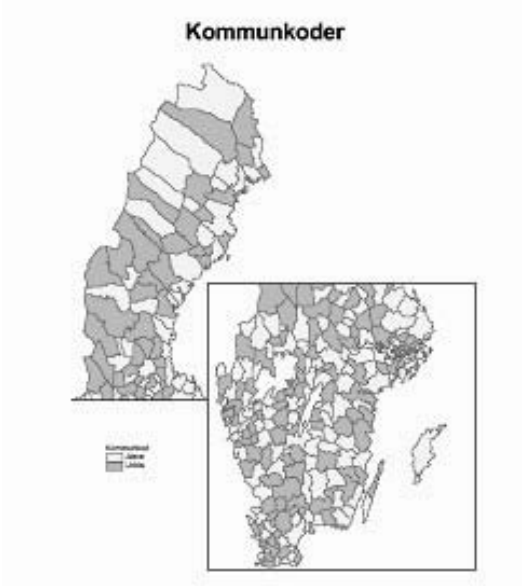

Fig. 1 Swedish municipalities divided in two groups, with different year of introduction of the mandatory inspection system.

Our idea is to inspect equipment included in already harmonized standards according to the rules and recommendations of the current voluntary system. The workforce and equipment in the current system represent an asset in the effort to reach a sustainable use of pesticide.

Since new sprayers according to the changes in the Machinery directive now fulfil most parts of a Swedish inspection for sprayers in use, new sprayers may bee seen as fulfilling the requirements when they leave the factory and are after that dealt with according with regular rules.

Equipment not included in already harmonized standards

For equipment for which there are no harmonized standards the introduction of mandatory inspection will be postponed until such standards are in place.

Knapsack sprayers

Our point of view is that for knapsack sprayers, the operator's technical skills in many cases have more influence on the effect and hazards than the technical status of the sprayer, especially compared to other types of sprayers. The risk for the operator carrying plant protection products and working close to the place of application, nevertheless shows the need for inspections of the status of the knapsack sprayers.

One idea under investigation is to arrange group inspection of knapsack sprayers/education of operators coordinated with the courses that users of plant protection products have to do anyway.

Other handheld equipment

We recommend that a risk assessment for human health and the environment, including an assessment of the scale of the use of the equipment should be made fore this type of equipment. In many cases we believe that this makes it possible to exclude this type of equipment from mandatory inspection. If not so it might be a better idea to include education in the mandatory training (according to §3) instead of constructing an inspection system for these equipments.

For spraying equipment mounted on trains or aircraft

We think that inspections on this type of equipment would benefit a lot from closer cooperation between European countries. At least for equipment mounted on aircraft it is hard to se any market for inspection companies in Sweden alone.

Other equipment

One large subgroup in this category is spray equipment in greenhouses.

We suggest that the risks and the scale of use of this kind of equipment is investigated so that a proper decision can be made close to the release of the harmonised standards.

Different perspectives in the decision making

The requirements in the directive can be followed in many ways depending of the perspective of the decision maker. One may emphasise environment issues. Others might emphasise a low bureaucracy approach or equal business opportunities for Swedish farmers compared to their colleagues from other EU-countries.

From the environment protection side points like “a regulation where the interval between inspections isn’t shorter than the requirements in the framework directive, might in fact lead to fewer inspections in parts of southern Sweden where at present voluntary inspection is common might be heard. That is if the quality assurance programmes, that today demand following of the voluntary rules of the Swedish Board of Agriculture, not make their own rules. This will lead to larger environmental hazards from the use of pesticides. This is probably not the intention of the directive.

The low bureaucracy approach will try to keep the system simple and minimize the required work for farmers. This may inflict for example the registration of the inspections.

There are also aspects of consideration for farmers living in very sparsely populated areas. While the requirements are the same, the cost for the farmer is likely to differ if the person conducting the inspection has to travel 1000 km. The “lonely” farmer might also advocate that the possible pollution from his business should be spread on larger area.

Everyone will use the cost aspect. Sadly there are some shortages in the statistics that inflicts the calculations. We don’t know exactly how many field sprayers there are (and even less about other equipments). A new inquiry of the farmers pesticide use sets the number of boom sprayers to 14000 in the year 2006. It also shows that half of the farmers use an inspected sprayer, indicating that at least 3500 inspections should be done every year. We have never printed more than 2000 stickers per year…so the fact for analyses gives a possibility for some improvements…

As a conclusion the content of the resulting final mandatory inspection system is still a very open issue. When in place it will probably, at least in the beginning, face continuous changes.

Conclusions of session 1

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Topics discussed

First of all the participants asked general questions and statements were delivered on article 8 of the Framework Directive:

- Does it make sense and is it practical to carry out plant protection equipment inspections without mandated EN standards or is it better to wait until the necessary standards are available?
- The EN standards EN 12761 and EN 13790 are treated together in WG 3 of the CEN/TC 144 so that a mutual agreement on the requirements is guaranteed.
- Inspection of new equipment: Does the inspection of new equipment have to include all the requirements of EN 13790 although this equipment has not yet aged and no wear is evident?
- What happens when new equipment which has been inspected by the manufacturer has to be partly taken apart again for transport to the farmer? How far can equipment be taken apart for transport purposes without it having to be inspected again once it has been put together? Who is responsible for the functional safety of the equipment delivered in this state (manufacturer, trader)?
- It is not thought suitable to inspect new equipment for the first time after 5 years at the latest, as demanded in article 8 (2).
- The statement by the European committee of associations of manufacturers of agricultural machinery (CEMA) to the effect that plant protection equipment should possibly be inspected straight away on the manufacturer's premises and provided with a valid inspection sticker is welcomed by the participants and seen as being a practical solution.
- If the Member States have new equipment inspected before it is used for the first time, i.e. on the manufacturer's premises, it is feared that the inspection will violate competition regulations, since according to the Machine Directive, the manufacturer is only bound to carry out self-certification with a conformity declaration, and according to the Machine Directive cannot be forced to have an inspection carried out according to article 8 (2) of the Framework Directive before the equipment is used for the first time.
- Is this overlapping legally admissible?
- Were SPISE's proposals taken into consideration in any way when compiling the Framework Directive or the national action plans or do they have a hope of being considered?
- It has been established that self-certification confirms compliance with the corresponding EN standard (e.g. EN 12761). Similarly, receipt of an inspection sticker is also a confirmation of compliance with the corresponding EN standard (e.g. EN 13790). If it can be assumed in both cases that the corresponding standards are complied with, the conclusion can then be drawn that the essential health, safety and environmental requirements of the Machine Directive or the Framework Directive are also met.
- The recommendations made by the SPISE Working Group/SPISE3 Workshop with regard to inspection intervals, the extent of the equipment to be inspected, etc. should not be too ambitious since many Member States have only just started with plant protection equipment inspections.
  The Member States can, for example, begin with longer intervals and can then shorten these as long as the specifications „5/3 years“ are complied with.
- If plant protection equipment is built with components from external suppliers the responsibility for complying with the requirements of the Machine Directive lies with the manufacturer of the plant protection equipment and not with the component manufacturers.
- Poland sees it as a great challenge to persuade farmers who have old equipment to buy new equipment. Usually, ancient equipment is often repaired at high cost.

Some conclusions

- EN standards are a prerequisite for high-quality equipment inspections which are comparable between the Member States.
- Because EN 13790 does not fulfil the prerequisites for a mandated standard, it is up to ISO/TC 144/WG 3 to advance the work so that EN 13790 can soon be published in the Official European Journal.
- The inspection of new plant protection equipment by the manufacturer himself, i.e. before delivery to the customer, is welcomed and seen as a particularly practical approach.
- To demand a first inspection of new equipment up to 5 years after its first use, as stated in article 8.2., is not seen as being very realistic or practical.
- Less extensive demands can be made on new equipment since it does not show signs of ageing or wear.
- The classification system shown for the different types of plant protection equipment with exemplary classification into the groups, for which other schedules and inspection stages according to article 8.3 can be introduced or withdrawn entirely from obligatory inspection, is seen as being very helpful.
- The Member States who are already carrying out equipment inspections at present on a voluntary or a compulsory basis have introduced very varying time intervals. These vary from 1 to 5 years. It can be assumed that the Member States will move closer together in this respect; but it will not be possible to achieve a uniform time interval. However, this is not seen as being absolutely necessary since article 8.6 states how to handle mutual recognition between the Member States.
- Both officially recognised inspection centres and the official inspection services are equally suitable for carrying out equipment inspections. However, private workshops are bound to comply with official regulations. If regulations are violated, approval is withdrawn.

Draft proposal supplements

- The draft proposal specifies how the Member States can transfer article 8 to national law. This accommodates the fact that the present EN standard has to be published in the Official European Journal first and that further EN standards have to be compiled yet. The proposal therefore only considers the types of equipment for which there are no exceptions to the rules first (lines 1, 2, 3 and 8 of the classification system). Inspections for other types of equipment (lines 4, 5, 6 and 7 of the classification system) could be postponed until the corresponding EN standards are also available for this equipment or until the 2016 deadline as stated by the EU. Moreover, in the text of the proposal, wild-card characters are specified (e.g. inspection interval, official inspection services or officially recognised inspection services) which can be concretised by the Member States and adjusted to the respective situation.
- During the discussion it was suggested that the SPISE Working Group does not set its recommendations with regard to the scope of inspections, inspection rhythms, etc. too high and makes clear that the wild-card characters in the text are only to be regarded as recommendations and not as examples.
- As far as the inspection of new equipment is concerned two suggestions are made in the proposal. At the end of the discussion it became clear that the majority were for an inspection of new equipment before it is used for the first time.

Listing of subjects to be dealt with by the SPISE Working Group

- The participants suggested gathering together existing and new regulations on equipment inspections, putting them on the SPISE website of the JKI and making them available for downloading.
- It is believed practical and helpful to show the authorities/institutes/persons who are responsible for the inspection of plant protection equipment on the SPISE website in order to facilitate communication between the Member States.
- It is believed extremely practical to carry out inspections of new equipment at the manufacturer's plant and before the equipment is used for the first time. It is the SPISE Working Group's duty to specify this procedure further with the manufacturers.
- The exceptions (derogations and exemptions) as stated in article 8.3 allow various interpretations. The Commission ought to be heard on this point and its interpretation sought.

Session 2: Member States may apply different timetables and inspection intervals with exceptions following a risk assessment and exempt handheld pesticide application equipment or knapsack sprayers (according article 8/3)

Introduction paper

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Summary

Article 8/3 of the Frame Work Directive (FWD) on the sustainable use of pesticides allows the Member States to derogate from the mandatory inspection at regular intervals of certain types of pesticides application equipments (PAE) under two main conditions: they should present a low risk for the human health and environment, or a low scale of use.

The derogation can be expressed in two ways. The MS may apply different timetables and inspection intervals, or may purely exempt from inspection the PAE under derogation. The application of different timetable and inspection intervals may apply to PAE not used for spraying pesticides, to handheld PAE or knapsack sprayers and additional PAE that represent a very low scale of use. The pure exemption may apply only to handheld PAE or knapsack sprayers. The exemption has to be accompanied with information and training measures.

The article 8/3 contains also a sub-paragraph which cancels the derogation for spraying equipment mounted on trains or aircraft and boom sprayers larger than 3 m, including those that are mounted on sowing equipment. Those sprayers have to be inspected at regular intervals following 8/1 and 8/2 in any case.

The derogation is based on a risk assessment for human health and environment and an assessment of scale of use. The FWD does not give any clear instruction and/or indication on these assessments. Nevertheless the MS will have to carry out these ones if they want to introduce derogation and without having a clear protocol, an uneven situation may occur within the MS. Risk assessments should be clarified.

Analysing the three first § of the FWD, we could define three categories of PAE:

- the PAE that are exempted from inspection,
- the PAE that have to be inspected, but with some derogations,
- the PAE that have to be inspected without any derogation.

Introduction

Article 8/1 and 8/2 establish the main scope of the mandatory inspection in EU. This scope covers all types of Pesticides Application Equipment (PAE). Considering the MS particularities and the unavailability of standards or valuable protocols, the article 8/3, by introduction derogation possibilities, makes lighter the implementation of the FWD.

Article 8/3 of the Frame Work Directive (FWD) on the sustainable use of pesticides allows the Member States to derogate from the mandatory inspection at regular intervals of certain types of pesticides application equipment (PAE) under two main conditions: they should present a low risk for the human health and environment, or a low scale of use.

Test performance of handheld pesticide application equipment or knapsack sprayers in practical use in Norway

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Summary

In Norway the questions now are raised about testing handheld application equipment and knap sack sprayers i.e. in greenhouses and gardening. However, a detailed test of the equipment alone would not be able to ensure a good spraying result, correct dose and low risk of operator exposure. Additionally, such a test could be rather expensive for small sprayers and reduce the motivation for a proper use in the after hand. Correct calibration, movement of nozzle, nozzle position, spray coverage and correct pesticide concentration among others are also very important factors in order to ensure a good spraying quality. From our point of view a proper use may be solved by a simple test focusing on important factors like; no leaks, anti drip device, good operational functions and no damages. The nozzle should be renewed if the spraying picture is poor. The average capacity in litres/min should be measured. The operator should be skilled in how to perform a precise and safe application, how to avoid residues of spray volume and how to clean the equipment after use. This should be included in a test or control for such equipment. However, a standard for new sprayers should include other important aspects like testing equipment stability, weariness of straps, well functioning pump handle, low flow fluctuations, adapted manometer, low pressure drop, good agitation, low residue amount and no leaks when tilted etc. as described in the ISO19932-1. This paper will describe the Norwegian proposal of control of handheld spraying equipment more in details including the calibration of sprayer.

Introduction

In total there are almost 1,000 greenhouses in Norway and the average size is 2,000 m2. The number of greenhouses above 5,000 m2 has increased approx. 40% during the last 20 years (SSB, 2007). About the half is production of ornamentals, and the rest is different kinds of vegetables, mainly tomatoes, cucumbers and lettuce.

From 1997, all users of pesticides in Norway, including those in greenhouses, have to be educated in the correct use of pesticides. The Department of Mathematical Science and Technology at the Norwegian University of Life Sciences (MST) was responsible for the technical part due to spraying equipment and correct use. The specific equipment and methods for this application had to be studied carefully and adapted teaching material had to be developed. In Norway all users of pesticides are obliged to renew their spraying certificate every 10 years, therefore several users have already been updated.

For crop sprayers and orchard sprayers in use, a technical test, a so-called function test, is compulsory every five years (Bjugstad et al, 2004). During such a test, the user of the sprayer has to join the test, and the test operator normally goes out to the different farms or orchards in order to carry out the test together with the user/owner of the spraying equipment. In this way, the grower gets an increased knowledge and motivation, which make him able to perform the application correctly. Additionally, the grower/user is skilled about how to calibrate his specific sprayer(s) by the use of a certain check list. Hereby the grower/owner is able to fill in his own measurements and is encouraged to carry out this test by himself before every season. Additionally, an inspection is carried out by a testing operator every five years, and simultaneously the technical information may be refreshed and updated. Finally, the user should participate in the aforementioned authorisation course every 10 years, covering all aspects dealing with the use of pesticides.

When developing a test program for spraying equipment in greenhouses, the positive experiences from these tests and conditions ought to be implemented. Our experience is that when a grower meets the testing operator alone instead of attending a compulsory authorisation course where 20-40 people may be gathered, he gets a better adapted knowledge of spraying technique as well as an increased motivation to obtain a more precise and safer application. This is especially important in greenhouses, where the use and types of spraying equipment vary in a large extent as well as the type, size and density of the plant canopy.

Because of these positive experiences the MST and the Norwegian Food Safety Authority find it important to include the calibration process in a forthcoming test of spraying equipment in greenhouses. For these applications in particular, procedures to carry out a correct calibration are unavailable. Therefore the MST has studied the use of different spraying equipment in use for several years (Bjugstad et al, 2009) and suggested methods and procedures to ensure the correct dose. This paper will focus on what kind of sprayers which are in practical use in Norway, experiments carried out in order to study the differences in spraying quality and biological results, and finally how to obtain an easy and exact inspection including calibration of the sprayers used in greenhouses.

Spraying equipment in practical use and their limitations

High pressure spraying equipment: The high pressure system consists mainly of a trolley sprayer with a tank size from 25 to 300 litres, a drum with a 50-100 m long hose with a spray gun/ pipe/ boom and nozzle(s) at the end. The trolley is only moved at one end of the houses. Then the hose and spray gun is pulled out in the length of the house or row normally without spraying. Afterwards, the operator sprays the house, tables or rows when he slowly moves backwards with a minimum of resistance when pulling the hose back. The working pressure of the nozzles is normally 5 to 15 MPa which is almost up to 100 times higher than for a conventional crop sprayer.

The advantage of this equipment is the possibility to adapt a dose and amount of fluid according to different plant size, which often differ in each house. The extraordinary high pressure makes it possible to spray over a longer distance, which means that the operator does not have to move all over the house as much as for the low pressure equipment later described. The disadvantages are mainly that the operator may be highly exposed of pesticides and that the labour costs are high. This type of equipment is much in use in Sweden and Norway today.

Tab. 1 Estimated use of spraying equipment in greenhouses in Norway

Equipment	Pressure range	Estimated use
High pressure equipment	5.0 – 15.0 MPa	45 %
Low pressure equipment	0.5 – 5.0 MPa	30 %
Spraying booms	0.2 – 0.8 MPa	5 %
Knapsack sprayers, knapsack mist blowers, small pressure sprayers, others	0.1 – 1.0 MPa	20 %
Cold foggers		Minor use
Spraying robots		Minor use, but increasing

Low pressure spraying equipment: The low pressure sprayers are built in the same way as the high pressure unit, but the pump is smaller and the pressure range is normally from 0.5 to 1.0 MPa and in some extent up to 5.0 MPa. This equipment may also be used together with a spraying tower or vertical boom, i.e. in cucumbers, in order to get a more even distribution and easier handling of the equipment. Because of the lower pressure, the operator ought to walk between all the tables in order to achieve a proper distribution and penetration. The main advantages are low equipment costs and optimum adapted spray amount and dose due to plant size and type.

Spray booms: In large greenhouses several plants have installed horizontal spraying booms. The main advantages of this equipment are a more even distribution and reduced labour costs. Additionally, a higher capacity is important in order to spray the plants in time and make the area ready for other work needed. However, several growers point out that the lack of adapting the spray volume easily due to different plant height along the similar swath, insufficient penetration through plant canopy as well as unwanted sprayed areas i.e. in the inter row, empty parts of the tables, spots outside the tables etc. make these booms difficult to use properly for such conditions. For these reasons the MST has observed large plants where spray booms have been mounted in the house from the start, but are often not in practical use. However, if the problems mentioned may be solved easily, the spraying booms will be used more in the future than they are today.

Others (knapsack sprayers, knapsack mist blowers, small hand operated sprayers): The MST has carried out operator exposure measurements earlier, which proved that the use of knapsack mist blowers results in a very high operator exposure and should be avoided if possible (Bjugstad & Torgrimsen, 1996). In the '90s, the use of hot and cold fogging equipment was quite popular in Norway. Thus, the MST made several deposit and operator measurements as well as biological studies together with other institutions. In table 2 some biological results are presented (Stenseth, 1992).

Tab. 2 Biological results when using a cold fogger vs. a hydraulic sprayer (Stenseth, 1992)

Pesticide	Application	Dose/concentration	% dead nymphs
Applaud	Wanjet Tornado ULV	50 g per 1000 m2	32.0-82.0 %
Applaud	Hydraulic sprayer	0.05 %	100%
Thiodan 35	Wanjet Tornado ULV	200 g per 1000 m2	34.5 – 55.8 %
Thiodan 35	Hydraulic sprayer	0.15 %	94.0 - 100 %
Dedevap	Wanjet Tornado ULV	360 g per 1000 m2	15.8 - 29.9 %
Dedevap	Hydraulic sprayer	0.10 %	24.3-70.5
No treatment	Wanjet Tornado ULV		2.4-3.6 %

Experimental house size: 12 x 17 m2; Applaud buprofezin, 230 g/kg; Thiodan 35 – Endosulfan 357 6/l; Dedevap – Diclorvos 500 g/l; Nymphs: Bemisia tabaci

From the evaluation of hot and cold fogging machines and the biological results obtained, the following conclusions for such equipment were made compared to a conventional hydraulic sprayer:

- Lower effect when using contact pesticides due to a poorer coverage
- Higher risk of pesticide residues on plants/products
- Have to be tested for each pesticide, due to the high pesticide concentrations used
- More sensitive for break down/ disturbances than for the hydraulic sprayer
- Poorer deposit on the lower side of leaves and underneath tables surfaces
- Not possible to treat limited areas/ plants
- Deposit on greenhouse construction/ walls/ ceilings etc.
- Higher capacity due to higher concentration and lower volume rate
- Low weight
- Good effect where a vapour effect of pesticides is wanted, i.e. for diclorvos.
- Might be run during the night
- Good operator safety for stationary equipment, if not any drift problems occur

Additionally, the following problems/missing details were observed for the movable hot fogging equipment (Igeba 65):

- No agitation
- No visual scale of tank content
- No filtering
- Leaks of spray mix from the operating valve
- Motor stopped frequently when operating in the house
- Uneven flow of fluid
- Pesticide might react with the hot exhaust
- High noise (108 dB)
- Filling of gas near exhaust tube may cause hazards
- High risk of operator exposure if wearing the equipment

Thus, the use of fogging equipment is forbidden in use for food production in Norway, and only approved for a few pesticides for ornamentals, where conventional methods are not sufficient effectively. The movable hot fogging machine is not recommended to be used due to safety reasons.

Proposed content of a function test for spraying equipment in greenhouses

The proposed requirements are based on the EN-13790-1 and 2 from 2003 and own experiences made during the tests of the crop sprayers and orchard sprayers in Norway. Basic requirements as non leaking and a proper function are included for all kinds of equipment. However, the requirements, from our point of view, to some extent ought to be modified for different kinds of sprayers. I.e. when several nozzles are mounted very closely to each other and the distance from nozzles to the canopy is long, minor deviations between the nozzle flow rate capacities have minor negative influence on the biological effect.

The calibration of the flow rate as well as the volume rate and dose of pesticide are misleading in greenhouses in Norway today. Thus, the MST highlights the focus of exact calibration and proper use of all sprayers and the importance of implementing this calibration training into the test of the equipment. From our point of view, the correct use of equipment and dose of pesticide is often more important that the technical test itself, especially for small sprayers and low and high pressure sprayers, which are mostly in use in Norway. If these factors are not included, equipment which has passed a technical control could still cause large dosage failures. If this calibration should be carried out later by someone else, this would result in increased costs for the grower and possible misunderstandings. Probably the equipment then ought to be inspected again to ensure that it works properly before the calibration is performed.

The user will be instructed in how to move the nozzle(s) arrangement to obtain an even coverage and how to rapidly estimate the penetration and deposit. Additionally, the importance of walking backwards, where this is suited, is included, as well as other efforts to avoid a high risk of exposure which may occur during the spraying operations (Bjugstad & Torgrimsen, 1996). The spray result will be demonstrated by using water sensitive paper or non toxic dye stuff to examine how to obtain a good deposit and coverage.

On the label of the most fungicides and insecticides in greenhouses today in Norway, a concentration, i.e. 150 ml per 100 litres spray volume, is written. The original idea of this kind of labelling was that the operator was told to spray until run off. In this way, the volume rate and dose was easily adjusted for different plant sizes. However, this is correct only if different growers apply approximately the similar spray volume to the same plant type & canopy & density. During the last 15 years the MST has detected considerable variations in applied practical doses between different growers, in spite of carrying out the application at equal conditions due to similar pest attack, plant type and growth stage. In table 3 some results are presented (Bjugstad, 2007). The users of pesticide in greenhouses were randomly divided into two groups, A and B. One operator was chosen and asked to spray the plant canopy until run off. The trial included large plants covering a surface of 70 m2. The sprayer set up, nozzles, pressure used and other conditions were similar. Due to the wetness of the plants from the first spray application, the second group was expected to use a lower volume rate in order to spray until run off. In spite of this the second group used 77 % more fluid than the first group.

Similar experiments have been carried out for different plants and equipment. In all these experiments the volume applied differed in the range of 50 to 100 % or more between different groups. This is caused mainly by the different visual assessment of run off which is very difficult to evaluate in a uniform and proper way.

Tab. 3 Variations in dose caused by using different volume rates in similar conditions

	Group A **Low pressure sprayer**	**Group B** **Low pressure sprayer**	**Group C** **Knap sack blower**
Litres used	13.0	23.0	1.36
Plant surface	70 m2	70 m2	70 m2
Litres per 1000m2	185	328	19.4
Dose in %	100 %	177 % (+77 %)	10.5 % (-89.5 %)

Additionally, the movement of the nozzles, the distance from nozzles to plants, the walking speed or long/short legs/hands etc. may influence the applied rate and distribution. It is also important to highlight that the growers are taught not to use such a high amount of spray volume today, in order to avoid run off and get a better spray coverage. The users commonly also use a much lower volume rate in order to increase the spray capacity.

The third group in table 3 used a knap sack mist blower. They applied a volume rate of only 10.5 % of the rate of group A. This means that the average dose would vary from 10 % to 177 % if the concentration factor was not taken into account. Thus, a concentration factor for adapted recalculations was introduced. Additionally, we needed to implement a so-called normal volume rate corresponding to the factor 1.0, which was equal to the concentration on the label. However, this volume rate hardly did exist. Thus, the MST in 1993 introduced such rates in cooperation with a group of growers and biological experts in order to ensure that the use of different equipment and ways of application always resulted in an approximately similar dose. This was used by introducing the factors and values shown in table 4. The volume rates in the table are for large plants and high densities. For smaller plants, reduced pest attack and lower crop densities the volume rates have to be reduced.

Tab. 4 Concentration factor at different volume rates for selected crops

Concentration	**Measured volume rate in litres per 1000 m2**		
Factor	**Small flower plants/Lettuce**	**Roses**	**Cucumbers/Tomatoes**
0.25	400	600	800
0.3	333	500	667
0.4	250	375	500
0.5	200	300	400
0.6	167	250	333
0.7	143	214	286
0.8	125	188	250
0.9	111	167	222
1.0	**100**	**150**	**200**
1.25	80	120	160
1.5	67	100	133
2.0	50	75	100
2.5	40	60	80
3.0	33	50	67
4.0	25	38	50
5.0	20	30	40
6.0	17	25	33
7.0	14	21	29
8.0	13	19	25
9.0	11	17	22
10.0	10	15	20

However, when we evaluated the situation afterwards, we experienced that the growers did not understand how to use this concentration factor properly and more or less used their own empirical values, mainly because such rates previously had given good results. If we compare between different growers, they still use widely different volume rates for the same kind of application today which also result in large variations of the pesticide dose.

It is important to keep in mind that the biological efficacy depends on the amount of pesticide per area of the surface of the plant. The quantity of water acts only as a carrier to transport the pesticide towards the plants and to ensure a sufficient coverage, and might, as presented in table 3, vary widely between different kinds of spraying equipment and for different operators treating the same kind of plants at similar conditions. The label should give sufficient information to all the users in order to apply a correct dose. However, most of the users feel their conditions are normal and apply the concentration given on the label for the sprayer and nozzles used without adapting any changes in the concentration factor. Thus, the MST together with the advisory service and biological department in 1998 and again in 2005 proposed to introduce a dose also for spraying application in greenhouses. This is an important step in

order to ensure a correct dose without any kind of misunderstanding. For hot and cold fogging machines an area or volume dose has existed for all pesticides during the last 20 years. Thus, an area dose may easily be calculated for practical use.

Professional greenhouse production results in a high number of applications on a limited area. Additionally, the floor may be of concrete and the risk of run off by dripping, cleaning or spraying outside the wanted area may cause a high risk of pollution. Thus, it is important to demonstrate by simple means how to avoid this kind of pollution. The solutions will depend much on the spraying system used, the building facilities etc. The testing operator has also to be aware of a possible contamination by the spray water used to carry out the test itself. If such a risk may occur, this water has to be collected back to the main spray tank. One problem is that long hoses are commonly used, which have to be proper cleaned before the testing can start. This is also a problem for the grower himself in practical use when a cleaning operation is needed. When using only a spray gun or similar device the rinse volume may be collected easily. However, when starting to spray again, the initial spray will be too much diluted because water may still be remaining in the system. This can be avoided by using a separate collecting tank, but this may cause much work. Another solution is to use a double hose recycling system, which will be rather expensive. However, a very simple and cheap method is only to put the spray gun into the opening of the main tank and recycle the flush water or spray fluid back to the tank directly. Depending on the kind of spraying equipment used, the best suited solution is to be demonstrated during the test in order to motivate and skill the grower in a proper cleaning procedure.

All growers get a four page check list enabling them later on to carry out a simple and quick control and calibration of their own spraying equipment and store the data. The list shall cover all potential equipment including examples of data and describing how to use water sensitive paper. Additionally, all the growers get a package of water sensitive paper included in the test for later use.

The proposed test for spraying equipment in Norway will include different high and low pressure equipment, knapsack sprayers, knapsack mist blowers, small pressure sprayers and spray booms. The fogging equipment is in minor use. If a test has to be carried out for such equipment, the spray volume has to include the pesticide itself in order to take into account its properties and high concentration. Thus, a test of fogging machines is not included in the test at this stage.

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Pesticide application horticultural and floricultural farms of Liguria Region: Current situation and results of one year of sprayer inspections

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Summary

DEIAFA – University of Turin is the co-ordinator of a Project, financed by Liguria Regional Administration, aimed at realising a permanent service of inspections for hand held sprayers that are mainly used in horticultural and floricultural farms.

A preliminary survey was conducted in 160 horticultural and flowers farms to acquire up to date information about the characteristics of knapsack sprayers in use and, more in general, about the management of pesticides. A specific equipment (test benches) to make the inspections was studied and realised and an ad hoc test protocols were prepared on the basis of the indications provided by the national working group leaded by ENAMA (National Board for Agricultural Mechanisation). During the first year of activity, the technicians of four local cooperatives involved in the Project and trained by DEIAFA carried out more than 250 sprayers inspections.

Results pointed out that most of knapsack sprayers used in Liguria region are obsolete, featured by a poor technological level, unsafe for the operator, and generally not conveniently adjusted, as in many cases there is a lack of knowledge about the correct use and calibration of such machines. 25% of the sprayers inspected however presented inconvenient which impede their correct functioning. This result is related to the very simple technology available on these machines and also to the less severe requirements to pass the inspection, in comparison with field crop and air-assisted sprayers.

Introduction

Several studies (Balsari & Oggero, 2001; Balsari et al., 2008; Cerruto et al., 2008) carried out on spraying equipment used on protected crops in Italy pointed out that the negative results in terms of environmental pollution, pest and disease control and operator contamination are often related to the use of obsolete or not adequate sprayers and to the adoption of not correct operating parameters, especially pressure and volume rate. More in details, it is estimated that in Italian protected crops farms, corresponding to a surface of about 40000 ha (ISTAT report, 2006), 24000 sprayers are employed. More than 70% are hand held spraying equipment, like lances or knapsack sprayers. In order to improve this situation, the Liguria Regional Administration funded DEIAFA – University of Torino for making a research project aimed at realising a sprayer inspection and calibration service on the territory, focussed on sprayers used in horticulture and floriculture. It is the first experience in this sense in Italy, while in Northern Europe some experimental activities about the inspection of knapsack sprayers in use have already been promoted (Kole J. C., 2007; Koch et al., 2007). This initiative complies with the indications of the European Directive on the Sustainable Use of Pesticides, that foresees the mandatory inspection for all the sprayers that are employed for professional use, and it also complies with the requirements from large-scale retail trade, as Global GAP certification for the suppliers.

Thanks to the inspection service, the operator will operate a sprayer properly working and conveniently adjusted, and he'll be able to adequate spray volumes according to the specific needs. A properly adjusted sprayer allows to prevent unwanted environmental pollution, guarantees a better operator safety and enables to save time and considerable amounts of pesticides.

Definition of the methodology for hand held sprayer inspection

The adopted test methodology is divided in two parts: one deals with spray lances, the second part deals with knapsack sprayers. Test methodology related to spray lances takes into account inspections on pump, tank, tank contents indicator, pressure gauge, hoses, strainers, pressure drop and nozzles; the methodology addressed to knapsack sprayers considers inspections on pressure gauge (only for sprayers equipped with a circuit under pressure), hoses, strainers and nozzles.

Requirements and performance limits (Table 1 and Table 2) have been taken out, when possible, from existing documents as EN 13790, ISO 19932, FAO guidelines (Balsari et al, 2007)

Tab. 1 Spray guns and lances: main parameters to be inspected and related requirements

Components to be inspected	Requirements	Type of control
Main pump		
Flow rate	The pump shall have sufficient flow rate capacity in order to be able to spray at maximum working pressure as recommended by the sprayer manufacturer while maintaining a visible agitation	visual
Pulsations	There shall be no visible pulsations caused by the pump.	visual
Losses	There shall be no leakages (e.g. dripping) from the pump.	visual
Pressure safety valve	When there is a pressure safety valve on the pressure side of the pump, this valve shall work reliably.	visual
Spray liquid tank		
Losses	There shall be no leakages from the tank	visual
Emptied spray liquid	It shall be possible to collect the emptied spray liquid simply, without tools, reliably and without spillage (not mandatory)	visual
Non –return device	If there is a non-return device on the water filling device of the tank, this device shall work reliably.	visual
Agitation	A clearly visible recirculation shall be achieved when spraying at the nominal pump flow rate and in the part of tank farer from the pump, with the tank filled to the half of its nominal capacity.	visual
Liquid lever indicator	There shall be a clearly readable liquid level indicator on the tank which is visible from where the tank is filled.	visual
Measuring and regulation systems	All devices for measuring, switching on and off and adjusting pressure and/or flow rate shall work reliably and there shall be no leakages. All devices for adjusting pressure shall keep a constant pressure with a tolerance of ±10 % at constant flow rate and shall be able to achieve the same original operating pressure after the equipment has been stopped and then reactivated.	visual
Pressure gauge		
Presence	Near the pump it shall be present at least one pressure gauge. If possible, one other pressure gauge shall be present also near the lance or spray gun.	visual
Functionality	The pointer on the pressure gauge shall remain stable in order to permit reading-off of the working pressure. The pressure gauge shall measure with an accuracy of 10 % of the real value.	measurement
Scale	The scale of the pressure gauge shall be clearly readable during all spraying and suitable for the working pressure range used. The scale shall be marked: - at least every 0,2 bar for working pressures less than 5 bar; - at least every 1,0 bar for working pressures between 5 bar and 20 bar; - at least every 2,0 bar for working pressures more than 20 bar.	visual
Pipes and hoses	They shall be integral with no visible alterations. Their structural features shall comply with the operating pressure. There shall be no leakages from pipes or hoses when tested up to the maximum pressure recommended by the sprayer manufacturer. In case of pipes and hoses breaking, it shall be possible to stop the spray supply at the beginning of these ones (e.g with one or more valves on the delivery line)	visual
Filtering system		
Strainers	If the filling hole of the tank is present, it shall be equipped with a strainer . There shall be at least one strainer on the pressure or on the suction side of the pump . The strainer(s) shall be in good condition and the mesh size shall correspond to the nozzles fitted according to the instructions of nozzle manufacturers.	visual

Components to be inspected	Requirements	Type of control
Isolating device	If an isolating device is provided, it shall be possible, with the tank filled to its nominal volume, to clean filters without any spray liquid leaking out except for that which may be present in the filter casing and the suction lines.	visual
Pressure losses	If present, they shall be registered	measurement
Nozzle flow rate	The deviation of the flow rate of each nozzle type shall not exceed ±10 % of the nominal flow rate indicated by the manufacturer. If there are more nozzles (spaced at least 10 cm) the deviation of the flow rate of each nozzle shall not exceed ± 5 % of the average value. If it is not possible to know the nominal flow rate, it shall be indicated in the test report and, if possible, it shall be compared its flow rate with the flow rate of a new nozzle.	measurement

Tab. 2 Mist blowers and knapsack sprayers: main parameters to be inspected and related requirements.

Components to be inspected	Requirements	Type of control
General	There shall be no leakages from the sprayer. The tank shall be fitted with a lid in order to avoid liquid losses. There shall be a liquid level indicator on the tank. There shall be present a straps in good condition with length ≥ 30 mm	visual measurement
Measuring and regulation systems	All devices for measuring, switching on and off and adjusting pressure and/or flow rate shall work reliably and there shall be no leakages.	visual
Pressure gauge		
Presence	It shall be present on the hydraulic sprayers (not mandatory)	visual
Functionality	The pointer on the pressure gauge shall remain stable in order to permit reading-off of the working pressure. The pressure gauge shall measure with an accuracy of 0,2 bar.	Visual measurement
Scale	The scale shall be marked- at least every 0,2 bar	visual
Pipes and hoses	There shall be no leakages from pipes or hoses when tested up to the maximum pressure recommended by the sprayer manufacturer.	visual
Filtering system	There shall be present a strainer in a good condition in the filling hole of the tank. There shall be at least one strainer on the pressure side . The strainer(s) shall be in good condition and the mesh size shall correspond to the nozzles fitted according to the instructions of nozzle manufacturers	visual
Nozzle flow rate	The deviation of the flow rate shall not exceed ±10 % of the nominal flow rate indicated by the manufacturer. If it is not possible to know the nominal flow rate, it shall be indicated in the test report If more nozzles (spaced at least 10 cm) are present, the deviation of the flow rate of each nozzle of the same type shall not exceed ± 5 % of the average value.	measurement

Devices to use for the inspection

To avoid that during the nozzle flow rate test liquid losses occur (especially when operating high flow rates), a specific test bench (total weight = 28 kg) has been studied by DEIAFA and developed by AAMS and Salvarani companies. It is composed by an aluminium frame equipped with an aluminium hopper, in which – thanks to a suitable housing - it is possible to place the spray lance to be tested. The flow rate value can be read on a graduated cylinder (capacity = 2 litres) positioned under the hopper and connected to it by a pipe fitting (Figure 1).

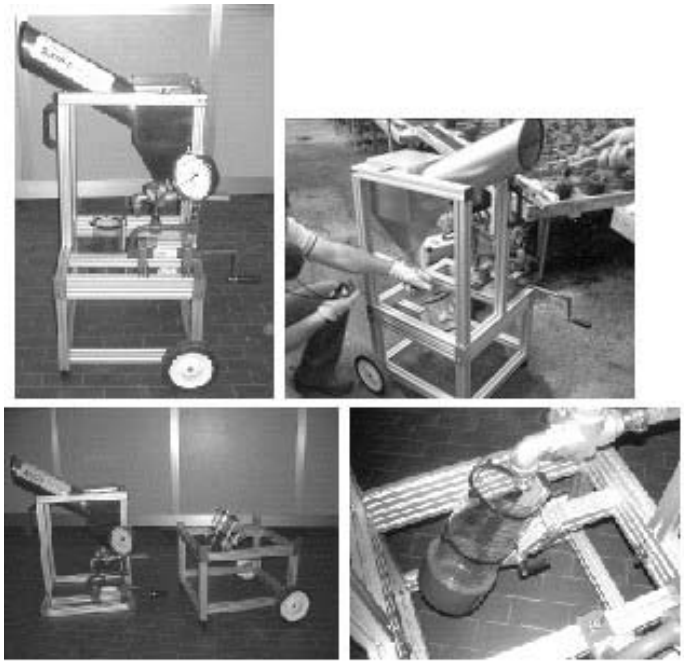

Fig. 1 Test bench for measurement of spray guns and spray lances flow rate

To evaluate pressure drop a very simply test bench has been designed (Figure 2). This device enables to measure the operating pressure close to the lance and to the gun and to compare this value with the pressure registered close to the pump.

Fig. 2 Test bench to assess pressure drop for spray lances

To inspect the functionality and the accuracy of pressure gauge a specific tester has been realized (Figure 3). Concerning the characteristics of the precision manometer to be used for this type of test, it shall fulfil the requirements reported in the EN 13790 standard.

Fig. 3 Pressure gauge tester

Results of inspections carried out in 2008

In the first 12 months of the Project, 279 sprayers (270 hand held spray lances, 7 hand lever knapsack sprayers and 2 motorised knapsack sprayers) were inspected. The farms involved in this sprayers inspection activity were mostly floricultural farms (73 %), the remaining 27 % were horticultural farms. The total surface of the farms inspected was 260 hectares (on average 1.5 ha per farm); 62 hectares were covered by tunnels or glasshouses (on average 0.40 ha per farm). In details, floricultural farms had usually a surface between 0.8 and 1.2 ha, while the horticultural farms were generally featured by a surface of more than 2 hectares Figure 4). About three quarters (77 %) of the spray lances inspected were composed by a tank and a pump installed in a fix position and by a set of hoses, reaching the different parts of the farm, to which the spray lance could be connected when necessary. In the remaining cases, spray lances were linked to a group made of a tank and a motor pump mounted on wheeled frames or on trailers (15 % of cases) or they were connected to a pump directly operated by the tractor PTO (8 % of cases).

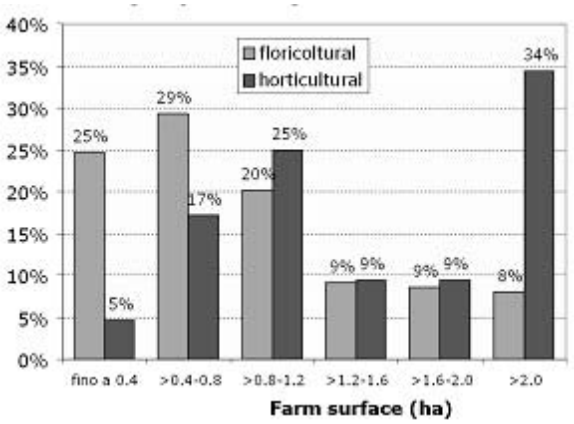

Fig. 4 Average farm surface.

Almost all the knapsack sprayers and 9 % of spray lances resulted not equipped with a pressure gauge mounted close to the pump. The pressure gauge close to the spray lance/gun was never present. Most frequently pressure gauge scale (73 % of cases) resulted the one featured by 2 bar intervals, but in 14 % of sprayers inspected the scale interval was even higher and therefore not complying at all with the requirements of the test protocol. Analysing the inspection sheets where also the end scale value of the pressure gauge was reported, it was found that the most frequent situation was a pressure gauge scale

interval of 2 bar and an end scale value of 80 bar. Over 20 % of the manometers inspected were featured by an end scale value of 100 bar, not adequate for the spray application purposes.

No correlation was observed between the most used operating pressure (18 bar on average) and the pressure gauge scale interval. A new manometer had to be mounted on 20 % of sprayers inspected. This percentage may appear low, but it must be considered that many farmers, despite of the indications from the advisers aimed at reducing the pressures used for spray application, still prefer to adopt high pressures (at least 20 bar). This operating condition therefore allowed a lot of farmers to keep their original pressure gauges that, if used at lower pressures, should be changed. In 3 % of cases the farmer refused to change the manometer, even if it was recommended by the result of the inspection.

Spray lances flow rate resulted between 1.2 and 13.2 l/min, with an average value of 5 l/min. Operator forward speed was on average about 3 km/h. In only 3% of tanks there was not any content indicator, nevertheless in the big tanks (e.g. made of concrete) the systems to indicate the tank content were not adequate to provide an affordable estimation of the amount of liquid present. Due to the small capacity of tanks and to their simple geometrical shape, the agitation of the liquid in the tank resulted always sufficient, even if generally obtained only by the backflow from the pump. No problems were found on pumps functioning (only in one case it was necessary to replace the pump) while some minor defects, as dripping from tanks and hoses, were fixed during the inspections. In 9 % of cases the nozzles of the sprayer were changed. A summary of the defects registered during the inspection activity is reported in Figure 5.

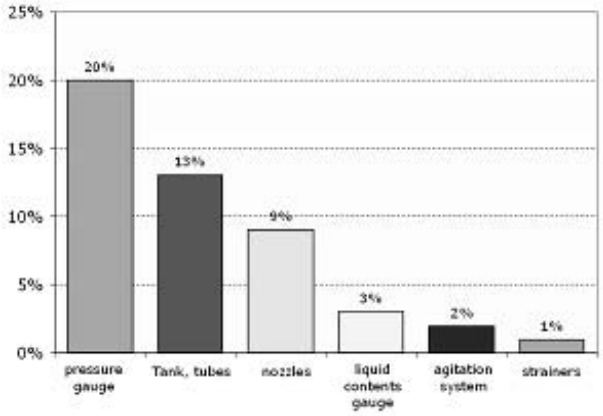

Fig. 5 Defects impeding the correct functioning of sprayers registered during the inspection activity

In general terms about 25 % of the sprayers inspected presented main functional defects that impede their correct functioning. It is a relatively low value, if compared with other inspections survey carried out on field crop sprayers or on air-assisted sprayers, but it's not surprising if we consider the very simple technology of these spraying equipment used in protected crops and if we take into account that the inspection requirements for them are less strict with respect to those adopted for field crop sprayers.

Training and dissemination

In order to awaken farmers about the adoption of more adequate nozzles and operating parameters, to train them to adjust their sprayers at the end of the inspection and to verify the quality of spray distribution using water sensitive papers, ad hoc training courses in the field were organised (Figure 6). The use of ISO nozzles mounted on articulated nozzle holders (single or double) was especially promoted, as these nozzles enable to spray at lower pressure (10-15 bar) obtaining a good target coverage and avoiding spray mixture runoff. At the same time a wider dissemination action towards the farmers of Liguria Region was carried out realising a brochure and a multimedia DVD which describe the scope and the procedure of sprayers inspections and provide information about the correct adjustment of spraying equipment used in protected crops.

Fig. 6 Training of Ligurian farmers (technical meeting, brochure, multimedia DVD)

Conclusions

The results of the activity carried out showed that most of sprayers used on protected crops, even if they passed the inspection, could be operated in a more appropriate way, reducing volume application rates and operating pressures, if correctly adjusted. To do that it is necessary to implement farmers training on this subject.

A general improvement of sprayers technology is however necessary, with special regard to nozzles and presence of a pressure gauge close to the spray lance. Test methods and inspection equipment realised allowed to carry out the inspections and the sprayer adjustment in an appropriate way and within reasonable time (on average 1 hour per sprayer). To further improve the inspection service on this kind of sprayers it would however be useful to issue a specific international standard that, taking into account the situations in the various countries, defines in a more complete and eventually more strict way the test protocols and the requirements to pass the inspection.

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Conclusions of session 2

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Topics discussed

Risk assessment

The derogation is based on a risk assessment for human health and environment and an assessment of scale of use. The FWD does not give any clear instruction and/or indication on these assessments. Nevertheless the MS will have to carry out these ones if they want to introduce derogation. Without clear protocols, uneven situations may occur between the MS.

The inspection of the spray lance/gun and soil disinfection equipment in Belgium may be an example. The Belgian sprayer inspection is mandatory for boom and orchards sprayers since 1995. In 1997, the authorities studied the opportunity to inspect also the spray lance or gun. These sprayer types are quite common in glasshouses for fresh vegetables (tomato, pepper, salad, strawberry…) and ornamental crops production. One estimate in Flanders shows that more than 2800 glasshouses (70.5 % of total) are sprayed by using a gun (Goossens E. and Sonck., 2006). Moreover a great quantity of active ingredient (a.i.) was used in glasshouses. Following national statistics established in 1997, (one or several growers or the growers) used on average 27 kg a.i./ha for strawberry, 45 kg a.i./ha for flowers, from 20 to 260 kg a.i./ha for pot plant… which could cause a potentially high risk of pesticides residue on food plants. Thus the Belgian authorities mandated the ILVO Research Centre to undergo studies on the opportunity to proceed to the inspection of the spray lance/gun.

The main results of this research (Langenakens J. & al, 2001) showed that the applicator using a spray lance/gun has a greater influence on the spray quality than the equipment itself, the inspection of this type of sprayer has a restricted added value regarding the residue, the training and the vulgarisation seem to be the best tools to improve the use of spray lance/gun. On the other hand, Nuyttens & al (2004) showed that the spray lance used in glasshouses is certainly the worst equipment in terms of operator exposure. At the end, even the risk assessment especially for the human health could be quite wrong. Even the scale of use is quite great, Belgian authorities decided in 2004 to exclude the spray lance from the inspection scope, considering that the inspection is not the right tool to improve the situation.

Also in several other European countries a similar situation is detected. The use of lance and/ or spray gun is frequently used instead of horizontal spraying booms because of the flexibility, e.g. easily adapting the spray volume due to different plant type and growt stage and only where plants are gathered avoiding spray to go between tables and on empty parts of the table. The spray gun, pressure, nozzle position and especially the movement of gun and operator are keyfactors in obtaining an optimum result (Bjugstad & Hermansen, 2008).

The soil disinfection equipment used to disinfect the soil by injection before the planting (vegetable, strawberry…). Pesticides used among others are Chloropicrin, Dichloropropene and Methyl Bromide are dangerous (T+, T, N), but the number of equipment in use is low in Belgium (30-40 units). Although any risk assessment for human health and the environment, and even if the scale of use is very low, the soil disinfection equipment have been introduced in the mandatory inspection scope.

These two examples show how opposite decisions can be taken without clear instructions in how to carry out a risk assessment for human health and the environment, and an assessment of scale of use. This issue should need a harmonization or at least clarify.

Analysing these experiences, another question arises; are the risk assessment and the assessment of scale of use the only argumentation to introduce derogation? Other reasons could be valuable as; the real added value of the inspection, the implementation of other more appropriate means or tools (training, information…) to improve the situation, the availability of the inspection protocols, and the inspection capacity of the workshop…

Different timetable and inspection intervals

The MS can apply a different timetable and/or different intervals and then derogate from the paragraph 1 and 2 of the article 8:

- Paragraph 1 request that the PAE has to be inspected at regular intervals that don't exceed five years until 2020 and three years thereafter. By derogation these intervals would be lengthened.
- Paragraph 2 requests that the PAE has to be inspected at least once within 7 years after the date of entry into force of the FWD. By derogation this deadline (= timetable) would be postponed. If the FWD enters into force yet in 2009, the first inspection of certain types of PAE may realize ('within' due to the sentence above??) 2016.

The application of different timetable and inspection intervals will be possible only for the following types of PAE "defined" and listed by the FW:

- PAE not used for spraying pesticides.
- The handheld PAE.
- The knapsack sprayers that is defined by the ISO 5681 (1992) as « Self-contained sprayer carried on the operator's back by means of shoulder straps ».
- Additional PAE that represent a very low scale of use.

The scale of use of one specific type of PAE will depend on the MS. >From one MS to another, the scale of use would strongly vary. Hence, the timetable and inspection intervals of some PAE would vary from one MS to another. For instance in Italy, knapsack sprayers would be a priority because of its intensive use in greenhouses. That would be not the case in Belgium or Germany. Also in the same greenhouse plant the grower will operate a wide range of spraying equipment. Thus, it should be considered to have a kind of quick test and information about correct instruction and calibration (article 5) for equipment also not included in the test in order to ensure a proper use of all kind of equipment at the plant. Practically, the inspection and the training part should be carried out at the same time. This will ensure fully control and proper use, saving of time and optimal correspondence between people carrying out inspection and training and the operator himself.

It would be necessary to clarify the different PAE under derogation. For instance "PAE not used for spraying pesticides" cover certainly equipment applying pesticides in gas, powder, granulate… form. But are the foggers (hot/cold) also covered by this definition or not? Moreover, it does not exist any clear definition of this PAE for the moment. Finally "additional PAE that represent a very low scale of use" is definitively a not clear definition that would constitute a black box which the MS may abuse.

The deadline derogation will give time to the CEN/TC144/SC6 to develop the needed new inspection standards.

Exemption from the inspection

The MS can exempt from inspection the following two types of PAE: handheld PAE and knapsack sprayers. That means for these two PAE types, the MS have two options: inspection with another timetable and interval (§ 3 a) or an exemption from the inspection (§ 3 b).

This pure exemption is a bit mitigated by the fact that the user must be informed on the need to change regularly the accessories, on the specific risks linked to that equipment, and that operators are trained for the proper use of that PAE in accordance with article 5.

This exemption based on a mandatory training and information would be more efficient for handheld PAE and knapsack sprayers than an inspection. Indeed the inspection for that PAE could give a false impression of security and mask the needed good calibration.

The operator training is well described in the article 5 and the knowledge having to be acquired by the users is listed into the Annex 1. On the other hand the FWD is not so clear on the way to inform the users. Will it be a part of the user's training, or will it be a part of the handbook of the PAE? Moreover "change regularly the accessories" is certainly not sufficient. All components should be replaced if necessary.

Therefore, it is still open and has to be clarified how and in which cases the operators have to be informed on the need to change the accessories regularly and how to train the operator according to article 5 of the FWD.

PAE that shall never derogate from the inspection

The § 3 allowing to derogation from mandatory inspection contains a sub-§ that cancels the derogation. Considering the spraying equipment mounted on trains or aircraft and the boom sprayers larger than 3 m (including those mounted on sowing equipment) as never constituting a very low scale of use, the FWD requests for these PAE the mandatory inspection without any derogation (timetable, inspection intervals, exemption).

PAE types and inspection

Analysing the three first § of the FWD, we could define three categories of PAE:

- the PAE that are exempted from inspection,
- the PAE that have to be inspected, but with some derogations,
- the PAE that have to be inspected without any derogation.

a) PAE that are exempted from inspection: The FWD defines already two PAE that would be exempt from inspection: handheld PAE and knapsack sprayer. Nevertheless, this exemption shall be justified by a risk assessment and an assessment of the scale of the use of the equipment that could be varying among MS. The knapsack sprayers are well defined in the ISO 5681 (1992). On the other hand, it does not exist any clear definition of the handheld PAE.

b) PAE that have to be inspected, but with some derogations: The FWD defines already several PAE that would derogate from inspection: PAE not use for spraying pesticides, handheld PAE, knapsack sprayer and the PAE listed in the NAP (National Action Plan) and representing a very low scale of use. Nevertheless, this exemption shall be justified by a risk assessment and an assessment of the scale of the use of the equipment that could be varying among MS.

c) PAE that have to be inspected without any derogations: The Article 8 (3) of the FWD defines clearly two PAE that have to be inspected according to the timetables and inspection intervals defined in Articles 8 (1) and (2): spraying equipment mounted on trains or aircraft, and boom sprayers larger than 3 m. Taken into account the possible derogation, the sprayer types to be inspected could be varying among MS. MS inspect already other sprayer types (orchard sprayers, aircraft sprayers, greenhouse sprayers…).

Conclusions and draft proposal supplementations

The article 8/3 of the FWD is certainly very important. It allows the MS to derogate to the inspection certain PAE under certain conditions. Without calling into question the fully justified of the inspection of the most current PAE (e.g.: boom and orchard sprayers), this Article will give time to the MS to implement the FWD for particular PAE. Moreover, this Article will give also time to the CEN/TC144/SC6 to develop the needed new inspection standards. To remind, until now, only the boom and orchards sprayers are covered by the EN 13 790 standards.

On the other hand, the article 8/3 will certainly introduce an uneven situation within EU. The activation of the derogation will be up to the MS and considering the particularities of the Agriculture and the mentality within the MS, the article 8/3 will apply differently within EU. That is the consequence of the basic principles of a Frame Work Directive. Nevertheless, to equalize the potential unevenness between the users of PAE within EU, some clarification and/or harmonization would be needed as the risk assessment protocols, the listing of the additional PAE of very low scale of use, the proposition of a classification scheme of all the PAE regarding the inspection, the definition of the information and training package for the user of handheld and knapsack sprayer.

List of subjects to be dealt with by SWG

Considering the discussion made during the SPISE III conference and the conclusions around the article 8/3 of the FWD, the SPISE working group is asked to clarify the concept of Risk Assessment, to improve and feed the classification scheme of the sprayer and to establish a kind of list of priority concerning the development of new inspection standards.

Session 3: The inspections shall verify that pesticide application equipment satisfies the relevant requirements (according article 8/4)

Introduction paper

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Summary

The inspection of pesticide application equipment (PAE) according to Annex II of the Framework Directive requires mandated EN standards (article 8/4).

Standards are needed for all pesticide application equipment used by professionals. They should detail the requirements to be fulfilled during the inspection procedure to ensure the protection of health and safety and the environment. Standards for inspection of pesticide application equipment already exist for field crop sprayers and air-assisted sprayers for bush and tree crops (EN 13790-1 and 2), which are the main types of equipment used by professionals. However, concerns exist with this standard in so far as it specifies that the measurement of transverse distribution can be achieved using two different methods (i.e. measurement on patternator or flow rate measurement) which can lead to different results for one same sprayer.

Introduction

- What harmonised standards are available to this day
- What standards are under developments
- Carry out inspections without harmonised standards

Standardisation mandate addressed to CEN for the development of a series of standards on inspection of pesticide application equipment in use. This mandate concerns the development of standards concerning the inspection of pesticide application equipment used by professionals. Equipment in compliance with standards developed in accordance with the procedure provided for in article 6(3) of Directive 98/34/EC shall be presumed to comply with the essential health and safety and environmental requirements. CEN standards would contribute to harmonisation of inspection systems among Member States and facilitate mutual recognition of control certificates for application equipment. Ongoing discussions in the European Parliament and the Council for the adoption of the proposed Framework Directive (since 24th of November 2009 Directive 2009/128/EC) do not challenge the principle of having regular inspections of pesticide application equipment used by professionals. The only outstanding uncertainty regards the actual list of types of equipment for which no derogation from the inspection provision may be obtained.

Article 8/4 (Inspection of equipment in use)

The inspections shall verify that pesticide application equipment satisfies the relevant requirements listed in Annex II, in order to achieve a high level of protection for human health and the environment. Pesticide application equipment complying with harmonised standards developed according to article 20(1) shall be presumed to comply with the essential health and safety and environmental requirements.

Article 20/1 (Standardisation)

The standards referred to in article 8(4) of this Directive shall be established in accordance with the procedure provided for in article 6(3) of Directive 98/34/EC of the European Parliament and of the Council of 22 June1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services.

The request for developing these standards may be established in consultation with the Committee referred to in article 21(1)

1.1 CEN was requested to

A. Develop European standards for the inspection of all types of equipment used by professionals that will enable equipment to comply with the essential health and safety and environmental requirements listed in Annex 2 to the Framework Directive on the sustainable use of pesticides. The most common other types of pesticide equipment to be scrutinised belong to the following main categories:

- Tractor mounted, trailed or self-propelled sprayers (including spray trains).
- Aircraft sprayers (airplanes/helicopters + mixing station).
- Handheld or portable sprayers.
- Others (dusters, foggers, granules applicators, seed treatment equipment, large-scale batch treatment, large-scale continuous application (conveyor belt), mist blowers/generators, wipers, etc.). Furthermore, standards for specific important spare parts of the application equipments like the nozzles could also be developed under this mandate, if deemed necessary.

B. Analyse whether the technical uncertainties that arise from EN 13790 may be easily solved. If this was deemed to be the case, a revision of the standard may be needed.

2. What harmonised standards are available to this day?

These harmonised standards are not available now, at best only for field crop sprayers and air-assisted sprayers through the medium EN 13790, Parts 1 and 2. What standards are under developments. The work have been organised according to the CEN procedures on establishing CEN standards. A technical committee on tractors and machinery for agriculture and forestry has already been established in CEN to develop EN 13790 Parts 1 and 2. ISO standards developed for some equipment should also be taken into account in the execution of the mandate.

CEN have been provide the Commission with a detailed and prioritised work programme and a timetable for the adoption of the standards needed within three months of the acceptance of the mandate. The European standards are to be adopted within three years from acceptance of the mandate. At this time, the three linguistic versions (DE, EN, FR) must be available as well as the correct titles in the other official Community languages. CEN will keep the Commission informed at least once a year following the submission of the work programme of the measures taken to execute this mandate.

The standard should be developed by representatives of operators in the supply chain and public authorities. Representatives of European associations have shown considerable interest in the project (i.e. SPISE). As appropriate, CEN will invite the representative organisations of consumers' interests (ANEC), environmental protection (ECOS), workers (ETUI-REHS) and small and medium size enterprises (NORMAPME) to take part in the standardisation work. Representatives of farmers' organisations (e.g. COPA-COGECA) and trade unions representing agricultural workers should also be involved in the process.

3. Carry out inspections without harmonised standards

It has to be clarified how PAE inspections according to article 8(1) of Framework Directive without mandated standards can be carried out. Example from the Czech Republic is mentioned in Appendix 1.

3.1 Field sprayers and air-assisted sprayers

The best way for an uniform inspection of PAE through the EU member states is use of EN 13 790 requirements for field sprayers and air-assisted sprayers until this standards will be prepared as harmonized.

3.2 Aerial application equipment, seed treaters, railway application equipment

Some of member states use for inspection of aerial application equipment, seed treaters, railway application equipment their own requirements, which are result from national standards.

Appendix 1 – Example of national requirements from the Czech Republic

The technological requirements and the technological procedure of the inspection

4. Special requirements for seed dressers

4.1 General technical conditions

4.1.1 Seed dressers shall reply to operational documentation, pertinent changes shall not oppose to right application of the plant protection products for seed dressing.

4.1.2 All devices for regulation shall work reliably.

4.2 Dressing dosage.

4.2.1 Device for dressing dosage shall reply to operational documentation and shall work reliably and there shall be no leakages.

4.2.2 Deviations of the real dressing dosage shall not exceed ±7 % from the average dosage from seven repeated measurements. This average dosage shall not deviate more than ±10 % from the adjusted dressing dosage.

4.3 Seed dosage.

4.3.1 Device for seed dosage shall reply to operational documentation and shall work reliably.

4.4 Exhaust equipment.

4.4.1 Exhaust equipment, if provided, shall work reliably and there shall be no leakages.

4.4.2 Covers of the moveable parts of the equipment shall reply to operational documentation and shall be not damaged.

5. Special requirements for aerial pesticide application equipment

5.1 Agitation: A clearly visible recirculation shall be achieved when spraying at the nominal pump speed or drive of the agitation, with the tank filled to the half of its nominal capacity. Inlets to every nozzles are closed.

5.2 Spray liquid tank, pipes and hoses and regulation.

5.2.1 There shall be no leakages from the tank, pipes or hoses and every parts of the regulation when tested at the allowable working pressure. Dripping from the nozzles up to 10 drops from one nozzle per 5 s is permitted.

5.2.2 Pipes, hoses and every parts of the regulation shall work reliably.

5.3 Dosage.

5.3.1 Dosage range shall reply to operational documentation. The deviation shall not exceed ±10 %.

5.3.2 Deviation of the second batch of the dosage shall not exceed ±5 % from the average dosage from three measurements. Measurement is done three times at the minimum working pressure and three times at the maximum working pressure.

B. The technological procedure

4. Seed dressers

4.1 The compliance with the requirements defined in the sub-section A. points 4.1.1 and 4.1.2 of the regulation and special devices of the seed dresser shall be checked by inspection and function test.

4.2 The compliance with the requirements defined in the sub-section A. points 4.2.1 and 4.2.2 of the dressing dosage shall be checked by inspection, function test and measurements.

a) For measurement according to requirements defined in the sub-section A. points 4.2.2 shall be on continual seed dressers verified patency of the seed dresser by the seed, namely by the assignment of the seed amount went through the dresser at some time. It’s repeated three times, final rate is the arithmetic mean of this three measurements expressed in ton per hour. Then is dressing dosage powered on and after stabilisation is the dressing entrapped to the suitable container for 60 seconds. It’s repeated seven times in ca 20 minutes. If the dressing is diluted, its batch is derived from its volume in the dressing liquid.

b) For measurement according to requirements defined in the sub-section A. points 4.2.2 shall be on discontinual seed dressers entrapped the dressing for one batch of the seed. It's repeated seven times at least. If the dressing is diluted, its batch is derived from its volume in the dressing liquid.

4.3 The compliance with the requirements defined in the sub-section A. point 4.3.1 of the seed dosage shall be checked by inspection and function test.

4.4 The compliance with the requirements defined in the sub-section A. points 4.4.1 and 4.4.2 of the exhaust equipment, if provided, shall be checked by inspection and function test.

5. Aerial pesticide application equipment

5.1 The compliance with the requirements defined in the sub-section A. point 5.1 of the agitation shall be checked by inspection and function test.

5.2 The compliance with the requirements defined in the sub-section A. points 5.2.1 and 5.2.2 of the tank, pipes and hoses and regulation shall be checked by inspection and function test.

5.3 The mechanisation mean shall be got in the lowest recommended work pressure and the flow rate shall be measured for 15 seconds after stabilisation of the output three times at least. Then the mechanisation mean shall be got in the highest recommended work pressure and the flow rate shall be measured for 15 seconds after stabilisation of the output three times at least too. Calculated arithmetic means shall be compared with the requirements defined in the sub-section A. points 5.3.1 and 5.3.2.

4. Inquiry concerning relevant requirement for PAE in use

Inquiry was prepared in connection with 3rd SPISE workshop realization and sent to the Member States experts. There were received answers from 16 countries. Questions stated in the inquiry table and the MS answers:

1. Is at present inspection of PAE carry out according national regulation (YES/NO)
   YES – BE, CZ, EE, DE, IT, LT, NO, SUI, NL, SR, SK, F
   NO – PT, IRL
2. Is at present inspection of PAE requirements carry out according to EN standard 13790 (YES/NO)
   YES – BE(95%), CZ, EE (not fully), DE, IT, LT, NO, PT, SR, SUI, NL, SK, F
   NO – IRL
3. PAE satisfies the relevant requirements listed in Annex II of FD (YES/NO)
   YES – CZ, EE, DE, IT, LT, NO, PT, NL, SK
   NO – BE, IRL, SR, SUI – what is relevant?
4. Inspection under national requirements (not covered by the EN standards):
   - national standards YES/NO (if yes, specify)
   - other requirements (specify)
   YES – CZ, EE, NO, SK, NL
   NO – DE, IRL, IT, LT, PT, SR, SUI

Only short comments were received from:

SE – the Swedish system inspection should be done according to the EN 13790 and national rules simultaneously. Currently the system is voluntary.
RO – PAE in use are not tested or inspected currently.
HR – no regulation in the Republic of Croatia that obliges the control of sprayers. Establishment of this system is planned in 2010.

5. Types of pesticide application equipment covered by article 8 of the FWD

5.1 Tractor mounted, semi-mounted or trailed sprayers
Design: machine mounted on or trailed by the tractor; powered by the tractor (mechanical and/or hydraulic power).
Main components: tank (up to 6.000 / 8.000 l or more), pump, boom or fan with nozzles and control systems.
MD 2006/42/EC: covered as 'interchangeable equipment'.
Applicable standards: EN 907 then EN ISO 4254-6 (safety); EN 12761 (environment related requirement for new sprayers).

5.2 Self-propelled sprayers
Design: self-propelled machine with integrated engine to power the moving and working functions.
Main components: chassis with engine, operator station, drives and control systems, tank (up to 6.000/8.000 l or more), pump, boom or fan with nozzles.
MD 2006/42/EC: covered as 'machinery'.
Applicable standards: EN 907 respectively EN ISO 4254-6 (safety); EN12761(environment related requirements for new sprayers).

5.3 Aircraft sprayers
Design: airplane or helicopter specifically designed for pesticide application or (and normally) retro-fitted with pesticide spraying equipment (pump, pressurised tank, boom with nozzles, controls).
MD 2006/42/EC: spraying equipment itself is covered as ‘machinery’ (according to article 2 (a), 3rd indent: an assembly -- mounted on a means of transport).
Applicable standards: no.

5.4 Handheld or portable sprayers

5.4.1 With integrated motor.
Design: self-contained portable or handheld sprayer.
Main components: tank, internal combustion engine or electric motor, pump, spray lance with nozzle.
MD 2006/42/EC: covered as 'machinery'.
Applicable standards: EN ISO 28139 (draft) (environment and safety related requirements).

5.4.2 Manually driven with a pressure chamber.
Design: self-contained portable or handheld sprayer with a manually operated pump (activated either prior to or during spraying).
Main components: tank, pressure chamber, manual lever or piston operated pump, nozzle or spray lance with nozzle.
MD 2006/42/EC: covered as 'machinery' (with respect to the pressure chamber).
Applicable standards: ISO 19932 (only applicable to equipment with tanks > 5 l) (environment and safety related requirements).

5.4.3 Manually driven without pressure chamber.
Design: self-contained portable or handheld sprayer with a manually operated pump without a pressure chamber.
MD 2006/42/EC: not covered.
Applicable standards: ISO 19932 (only applicable to equipment with tanks > 5 l) (environment and safety related requirements).

5.4.4 Application by gravity.
Design: handheld container / tank with outlet (for example, watering can); tank volume up 10 to 20 l.
MD 2006/42/EC: not covered.
Applicable standards: no.

Acknowledgment

Special thanks to SPISE Working Group for support and to Mr. Ganzelmeier for consultations.

References

EN 13790 (2003) Agricultural machinery – Sprayers – Inspection of sprayers in use

Machinery Working Group, Doc.WG-2008.15rev1 Types of pesticide application equipment/ Directive 98/37 EC,

Directive 2009/128/EC – Framework Directive on the Sustainable Use of Pesticides

Ganzelmeier H. 2009 – Classification scheme of Pesticide application equipment in professional use according article 8 FWD, JKI Braunschweig

Decree No. 334/2004 Coll. Technical and technological requirements for inspection of sprayers in use

EN 13790 as a basic for inspection of pesticide application equipment (PAE) functioning similar to field crop and air-assisted sprayers.

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The standard EN 13790 – Inspection of sprayers in use – is available since the year 2003. EN 13790 specifies requirements and inspection procedures for field crop (part 1) and air-assisted sprayers (part 2). The article 8 of the Frame Work Directive obliged the Member States to ensure that PAE shall be subject to inspections at regular intervals. Except for the above called sprayers in the moment there is no EN standard available for inspection of all other types of PAE. From the SPISE Working Group point of view the EN standard can also applied to PAE which work similarly to field crop and air-assisted sprayers.

The working group developed in 2007 a guideline for testing of the followed listed PAE:

- Spray gun equipment,
- Mixing stations for aircrafts,
- Aircrafts,
- Interline sprayers,
- watering booms.

These PAE complies with the EN 13790 part 1 and 2. Also the inspection of spray trains is possible, but not yet integrated into the guideline. The table shows the available standard at the moment for the inspection of PAE and the possibilities with an enlargement of EN standard 13790.

Tab. 1 Available EN-Standards for the inspection of sprayers

EN-Standards / Inspection (February 2008)

Kind of sprayer	EN Standard available	EN Standard necessary	EN Standard to be developed
1) Field sprayer	Yes, EN 13790	yes	no
2) Air assisted sprayer	Yes, EN 13790	yes	no
3) Interline sprayer	Yes, EN 13790 (1)	Yes	no (1)
4) Airplane / helicopter	yes, EN 13790 (1)	yes	no (1)
5) Wheelbarrow sprayer	yes, EN 13790 (1)	Yes	no (1)
6) Spray gun equipment	yes, EN 13790 (1)	Yes	no (1)
7) Watering carriage	yes, EN 13790 (1)	yes	no (1)
8) Spray train	yes, EN 13790 (1)	yes	no (1)
9) Pedestrian motor-powered sprayer	no	yes	1
10) Fogging machines	no	yes	1
11) Granules distributor	no	yes	1
12) Knapsack sprayer	no	yes	1
13) Wiper	no	yes	2
14) Seed treatment equipment	no	yes	3
15) Injection system for nematodes	no	yes	4

(1) If the inspection method of EN 13790 will be extended to those equipment whose functioning is based on the same principle

The guideline takes the EN 13790 as a basic and includes special test features and hints and is also introduced with the help of some examples. The features are arranged by design groups of PAE and are numbered correspondingly. Following each feature the assignation to the type of equipment and the

applied test method is given. The features are completed, partly depending on the type of equipment with explanations, notes and examples for minor defects. Also features for equipment, which is not compulsory are given and are shown to a better differentiation in italic. The results of the test shall described in one test report which contains all information for all possible PAE. The assignation of the features are listed in figure 1.

Assignation of the features to the types of equipment and test methods

F	R	S	M	L	U	G	Inspection	Function test	Measurement	Additional equipment

F: Field Crop Sprayers
R: Air assisted sprayers
S: Spray gun equipment
M: Mixing stations
L: Aircraft
U: Interline sprayers
G: Watering booms

Fig. 1 Assignation of the features to the types of equipment and test methods

The concepts

"Inspection" = investigation by eye,
"Function test" = running the machine to simulate the usage,
"Measurement" = measure some items by using special equipment and
"Additional equipment" = additional design groups

should give an assistance for the inspection staff what is to be done with the respective design group. Some examples should make clear the sense and construction of the guideline:

Figure 2 shows the design group "Power transmission" with the feature "Function" and the original text of EN 13790. The feature is valid for the device groups " F"-field crop sprayers, "R"-air assisted sprayers, "S"- Spray gun equipment, "M"- Mixing stations, "L"-Aircraft and "U"-Interline sprayers, not for "G"- Watering booms. The procedures "Inspection" and "Function test" are emphasised, that means that the procedures must be carried out by the controlling staff. The explanations and notes helps in it.

1. Power transmission

K.1.1 Function

The power take-off drive shaft guard and the guard of the power input connection (PIC) shall be fitted and in good condition.
The different parts of the shaft, the universal joints and locking systems shall not show any mark of excessive wear and shall operate correctly.
The function of the guard shall be obvious and the guard shall not show any wear marks, holes, deformations or tears.
The restraining device that prevents the rotation of the power take-off shaft guard shall be present and shall work reliably.
The protective devices and any moving or rotating power transmission parts shall not be affected in their function.

F	R	S	M	L	U		Inspection	Function test	Measurement	Additional equipment

Explanation: Transmission parts like PTO drive shaft, chain, chain wheels, belt, and gearbox have to be inspected.
Minor defects: Minor wear of the transmission parts, poor greasing of the chain, moderately damaged belt, low belt tension.
Notes: Take safety regulations into consideration! Instead of a PTO drive shaft also other transmission parts may be present.

Fig. 2 Function of the power transmission

Another example shows the requirement for the group "Pump" with the feature "Capacity" with the original text of EN 13790 (Figure 3). In this example the procedures "Function test" and "Measurement" are emphasised. The pump capacity is to measured if the pump capacity is known. If the nominal pump

capacity is unknown, the sufficient flow rate capacity can be taken from the maximum nozzle output plus an additional flow rate for the hydraulic agitator.

2. Pump

K.2.1 Capacity

The pump capacity shall be suited to the needs of the equipment.

a) **The pump capacity shall be at least 90 % of its original nominal flow, given by the manufacturer of the sprayer,**

or

b) **The pump shall have sufficient flow rate capacity in order to be able to spray at maximum working pressure recommended by the sprayer or the nozzle manufacturer during test with the largest nozzles mounted on the sprayer while maintaining a visible agitation as specified in feature K.3.1.**

F	R	S	M	L	U	G	Inspection	Function test	Measurement	Additional equipment

Explanation: The measurement is to be done with a measuring device according to Guideline 1-3.1.1 of Part VII of the Guidelines for Testing Plant Protection Products and Plant Protection Equipment of the Federal Biological Research Centre. When the nominal pump capacity is unknown, the sufficient flow rate capacity can be taken from the maximum nozzle output and an additional flow rate for the hydraulic agitator, if existing. The additional flow rate is to take from the following table:

Nominal tank capacity	Additional flow rate
Up to 1000 l	5 % of the nominal tank capacity
between 1000 and 2000 l	60 l/min
more than 2000 l	3 % of the nominal tank capacity

Note: These specifications also apply to pumps which are used exclusively to provide a hydraulic agitator.

Minor defects: None

		S		L	U	G	Inspection	Function test	Measurement	Additional equipment

Explanation: The flow rate is sufficient when the designated spraying pressure is achieved while all nozzles are switched on.

Minor defects: None

Fig. 3 Pump capacity

The figure 4 shows some requirements from the group “Spray liquid tank” with the features “Emptying” and “Filling sluice”. The Emptying of the tank must be possible without tools and shout be inspected with a function test. This requirement is valid of course for all possible PAE, because everyone disposes of a tank for spray liquid. A “Filling sluice” is an additional equipment and is shown in italic. The state of the equipment can be examined without functional tests or measurements and are valid for all PAE.

4. Spray liquid tank

K.4.5 Emptying

It shall be possible to collect the emptied spray liquid simply, without tools, reliably and without spilling (for example using a tap).

F	R	S	M	L	U	G	Inspection	Function test	Measurement	Additional equipment

Explanation: without tools refers to the collection of the emptied spray liquid.

Minor defects: Rough-running tap, unfavourable mounted hose constrains the collecting.

Note: For watering booms with direct injection this applies for the tank of the plant protection product.

K.4.7 Filling sluice

The gate type filler, if provided, shall have a protective grating.

F	*R*	*S*	*M*	*L*	*U*	*G*	*Inspection*	*Function test*	*Measurement*	*Additional equipment*

Minor defects: *None*

Note: *Recommended maximum mesh width of 2 cm or another device with comparable effect.*

Fig. 4 Emptying of spray liquid tank

The test report brings all information of the inspected PAE in one document together and is subdivided into three parts:

The head of the report contains information about the PAE and the test station e.g. machine type, year of manufacture and equipment of the machine like spray tank volume, pump, agitator, controls, spray boom and nozzles with results of the cross distribution measurements.

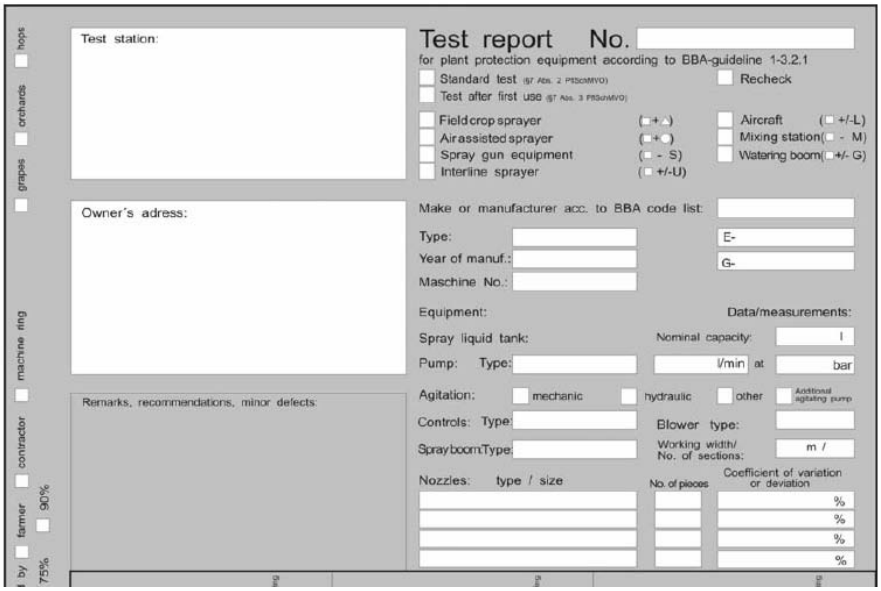

Fig. 5 Head of the test report

All results of the inspection procedure are summarised into the middle part of the report in detail and weak points are marked.

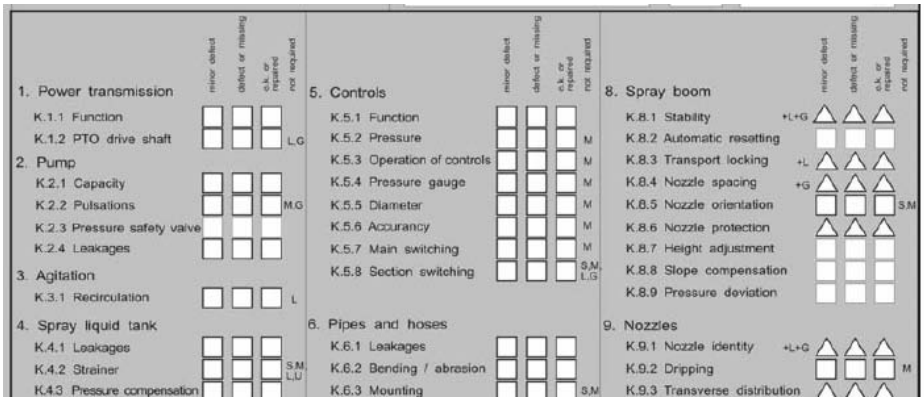

Fig. 6 Middle part of the test report

On the bottom of the report we will find the signature of the inspection staff and the information about the inspection result, e. g. label “yes” or “no”. Several additional information over the PAE is summarised on the left side of the report, e. g. whether it concerns a mounted, trailed or self propelled sprayer or whether it is equipped with drift reducing equipment.

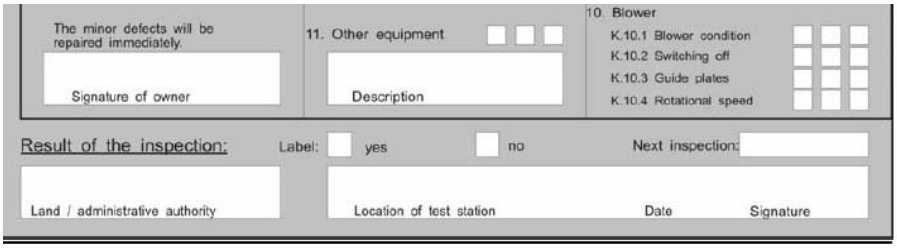

Fig. 7 Bottom of the test report

Summary

The standard EN 13790 is usable not only for the inspection of field sprayers and air assisted sprayers, but also usable for the inspection of other PAE which functioning similar. The guideline of SPISE working group could be harmonized and later on a basic for the inspection process in the European Member States. Therefore the scope of EN 13790 should be extended so that other types of PAE should be included, because this is much more less time consuming than working out a complete new standard.

Conclusions of Session 3

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Topics discussed

- Presentation of article 8.4
- Inquiry 13790 respect vs. national regulations
- Standards applicable on different types of machines
- Possibility to use 13790 (or parts) for other similar sprayers (i.e. German example)
- Possibility to simplify the requirements
- Takes time to develop new standards ➔ use of parts already available
- But maybe difficult to read for inspectors if they do not have the specific procedure

Some conclusions

- Harmonized standards are necessary for uniform inspection of PAE in use
- Impossible to realize dynamic test without specific procedure
- Mr. Osteroth presented proposal should be evaluated as a way to accelerate the updating standardization process.
- Development of harmonized standards for inspection of PAE in use stated in article 8 of the FWD is necessary

Listing of subjects to be dealt with by SWG

The SPISE working group should continue its work on advising on technical aspects of inspections in the Member States, and that it may serve as a pool of experts for questions on PAE, in particular plant protection equipment. The SPISE working group should develop its collaboration with the European Commission and CEN in the near future concerning harmonized standards.

Inquiry concerning importance of creating or extending EN Standards

Immediately after the Session 3 it was carried out an inquiry concerning the importance of creating new standards or updating existing standards. With this the participants were requested to determine for which kind of pesticide application equipment a standard is most important and to allocate numbers from 10 to 0 following the importance. For the following list all data coming from one country were averaged and then the results from all countries added. The list (table 1) of importance shows the calculated points in descending order.

Tab. 1 List of importance of creating or extending EN-Standards

Kind of equipment	Points	Kind of equipment	Points
Boom sprayers	166	Foggers	75
Mist blowers	159	Sulphur powder spreader	72
Motorised knappsack sprayers	110	Cannons	59
Aircraft sprayers	107	Chemical soil treatment	49
Band sprayers including those connected with seeder	103	Whipers	27
Seeders and granular application	97	spray equipment in green houses	10
Seed treatment machine	97	air blast sprayers without hydraulic nozzles	10
Knapp-sack sprayers	88	spray guns	10
Hand operated sprayers	86	spray equipment in vegetables and berries (no boom sprayers or mist blowers)	9
Spray trains	77	nozzles	6
		Others	1

Optional evening activities - Presentations

Training of sprayer inspectors – a Swedish approach

Nilsson, E.

Visavi God Lantmannased AB, Verkstadsgatan 2, 235 36 Vellinge, Sweden

Summary

Sweden has a national regulated system with voluntary inspection of sprayers since 1988. As the purpose with sprayer inspection is risk reduction and reduced use of pesticides, also advising and minor repairs can be made by the inspector. Swedish sprayer inspectors' training consists of two parts:

A four day course for pesticide users, with approved results in written exam. The training shall be refreshed every five year by a one-day course with written exam. A four day technical course for sprayer inspectors with approval in written and oral exams. The training shall be refreshed every second year by a one-day course. Participation in refresher courses are demanded to keep approval as inspector. The training is guided by regulations from the Board of Agriculture who is also responsible for the training course and examination. Inspectors training course has on the agenda; regulations on inspection, environmental background for sprayer inspection, test-methods and test-equipment, practical exercises with test protocol, different test equipment and sprayers, application technique theory and practical on nozzle choice, drift reducing techniques, sprayer maintenance and sprayer calibration, as this is a part of the inspection. A special material for training of sprayer inspectors has been developed based on EN 13790 part 1.

Introduction

In 1988 a system for voluntary inspection of sprayers in use was introduced in Sweden as one part of a national program for reduction of use of pesticides and reduction of risks with pesticides. The activities are regulated by regulations from the Swedish Board of Agriculture. The inspectors are mainly employed as mechanics in workshop or have their own private enterprise. The system was introduced for boom-sprayers only.

The activities on sprayer inspection are financed by a repayment of pesticide tax. Since the start of the activities there has been a financial support to buy test equipment. At present the support is up to 75% of the approved cost for investment, with a maximum of 165000 SEK. In some periods there have also been financial supports for the performed tests in order to get more owners of sprayers interested. As a way of improving knowledge among spray operators the inspectors are trained in application technology and environmental motives for sprayer inspection. The inspectors are also allowed and encouraged to repair the sprayer.

As inspection of sprayers in use is received positive from the stakeholders approved, regularly performed inspections has later been part of demands in Integrated Production, the contract for sugar beet growers and in most water protective areas. Inspection of sprayers has also been introduced into some environmental support systems.

The regulations and guidelines have been national till 2008 when the regulations was changed and the inspection must follow the European norm EN 13790 - Inspection of sprayers in use; part 1: field crop sprayers and part 2: Air-assisted sprayers for bush and tree crops. Some extra national regulations are also introduced. To minimise risks for pollution of water, the place where the inspections is performed must fulfil the same national demands as the place where the sprayer could be cleaned. This can be on biological active ground or on a place where the water sprayed out is collected. To demonstrate to the owner that there are no leakages from the tank, the tank must be completely filled with water. This demand is based on experience that leakages may occur on upper parts of the tank where pipes and hoses are led into the tank. The pump-flow meter must have a transparent part to demonstrate that there are no air-leakages on pipes and hoses to the pump. Air leakage will cause bubbles in the pipes that will be visible in the transparent tube. Furthermore a calibration of the sprayer and tractor speed must be performed. Examples of water rates for all present nozzles must be given

Training of the sprayer inspector

The training of sprayer is demanded in regulations by the Swedish Board of Agriculture. For basic training to be approved the sprayer inspector first has to attend and be approved at a four-day course for professional users of plant protection products and attend a four-day technical course for sprayer inspectors, also with approval in exams. To keep the approval the inspector has to attend and pass exams at mandatory one-day refresher courses for pesticide users every five year plus a one-day refresher course for sprayer inspectors every 2 years.

Since 1990 it is mandatory for all professional users of plant protection products to attend and be approved at training-courses. The approval is achieved by attending a four-day basic course and then the refresher courses. Approval at the written exams is necessary. The course plan is regulated by the Swedish Board of Agriculture. Responsible for arranging the training-courses and exams are Regions and Provincial Government. To pass the exam it is necessary to have answered correct on questions on how to determine wind-based buffer zones and how to calculate dosage and calibrate the sprayer.

Technical course

The technical course for sprayer inspectors is arranged by the Swedish Board of Agriculture who is also responsible for the examination of the inspectors. The course has a mixture of theory and practical. The course is intensive with activities from 8.00 – 17.30 each days and evening studies are necessary for the participants. To allow a level of good training a number of 12 participants is desirable and with maximum of 16 participants. For the course it is necessary to have access to lecture room and bigger hall with space for four tractors and sprayers with boom folded out and different complete testing equipment. It is important to have access to different sprayer components like pumps, pressure gauges, manifolds, filters, nozzles etc for demonstrations during theory sessions. The course plan is as follows:

Day 1:

Introduction to the course:

- Short practical demonstration of inspection and test equipment.
- Background and motives to sprayer inspection.
- Environment protection and environmental risk with sprayers.

Novelties on sprayer market.

Inspection of sprayers in Europe.

The inspection procedure:

- Demands on sprayer parts and test methods.
- Theory on sprayer components that are tested.
- The test protocol.

Day 2:

Test equipments, demands and presentation of available equipment.

Personal protection equipment for sprayer inspectors.

Group practical:

- Inspection and test equipment. Complete inspection according to the test protocol. On four stations with different sprayer types and different test equipment the participants train how to perform a test. Each test last 1,5 hour, total 6 hours. Both patternator-test and nozzle-flow test on the boom are performed.

Application technology: Theory

- Droplets-size, spray quality, spray deposit, liquid rates, spray liquid concentration.
- Boom height, boom stability.
- Nozzle theory.
- Liquid rates in different crops.
- Biological effect of spraying.
- Spray drift and drift reducing technologies.
- Helper for drift buzzer zones and nozzle choice.

Day 3:

Group practical:

- Catalogues on sprayer components.
- Identification of filters, nozzles, droplet-sizes, pump-flow capacities.
- Nozzle properties.
- Nozzle flow, top angle, droplet size, coverage on water sensitive cards.
- Calibration of sprayers.
- Calibration methods, calculation and technical aids.
- Safety and good practise.
- Where to conduct the inspection. Environmental protection and influence of weather.
- Risks and us of personal protection equipment during inspection.
- Recommendation on maintenance on sprayers before and after spraying season.

An inspector's experience:

- An invited sprayer inspectors talks freely and answers question during 1 hour about his experiences around sprayer inspection: sprayer's condition, test equipment, test-protocol, bureaucracy, pricing etc.

Repetition of test procedure and the test-protocol.

Day 4:

Examination:

- Part 1: Written exam 1 (no aids)
  - Rules for inspection.
  - Sprayer components.
  - Application technology.
- Part 2: Written
  - Find errors in an inspection report.
- Part 3: Written
  - Determine wind based buffer zones.
- Part 4: Oral exam at sprayer and test equipment on inspection procedure.

Regulations:

- Financial support for buying test equipment.
- Future for sprayer inspection.
- Quality assurance of sprayer inspection.

Group presentation of results of group practical.

Results of examination.

Evaluation of the course.

Training material

After almost two decades of basic- and refresher-courses for sprayer inspectors a need had grown for a training material specially made for sprayer inspectors. Previous material had been a mixture of regulations, articles, literature in application technique and material from manufacturers of sprayers and components. Also, a lot of experience had been collected from performing the courses, important input from sprayer inspectors and sprayer manufacturers as well as colleagues in European countries. In 2007 the Swedish Board of Agriculture started a work to develop a new training material based on the new coming regulations and test according to the standard EN 13790 part 1 – field crop sprayers.

The objective of the work was to develop a booklet with clear guidance for the inspectors how to perform a test. The task to develop the material was assigned a private consultancy with experience on training of sprayer inspectors, Visavi God Lantmannased AB. As a basis and inspiration for developing a structure and content in the material was used a presentation given at the first SPISE-workshop in Braunschweig 2004 (Ganzelmeier, 2004) where every paragraph in the test-procedure was commented with recommendation how to make the test in practise, ideas from Spanish colleagues who had started to

develop a material presenting the inspection procedure in a clear consistent structure (Gil 2007) and experience from staff training inspectors in Sweden. The booklet is on totally 50 pages. It follows the standard EN 13790-1 and the order in the test-protocol. Each paragraph in the test-protocol is dealt with on two, four or six pages. The structure is for each paragraph:

- an introduction to the feature to be tested,
- the relevant paragraph in EN 13790-1 is quoted regarding its requirements, method of verification and test method.
- description on how to perform the test of the feature e.g. how and where to attach measuring devices, used nozzle pressure depending on nozzle, boom height over patternator
- how to fill in the protocol
- practical guidelines and experiences on test methods, common failures on sprayers
- illustrating photos

One chapter is dealing with General requirements on how to perform the test e.g. the owner should be present during the test, the test has to be performed completely to be valid, how to act if the inspection is interrupted because of failure on the sprayer, which test equipment that can be used and demands on the place where the inspection is done to avoid water pollution. One chapter is dealing with preparations before the test. The inspector should before the test inform the owner that the sprayer shall clean, filled with water and prepared for calibration. The inspection should begin with a “rough-test” to see if there are any major failures that may cause that the inspection could not be performed. An additional recommendation is to visually inspect the sprayer’s chassis, wheels and connections to tractor and inform the owner if there are any damages. A paragraph is dealing with recommendations on personal protective equipment that the inspector should use during the tests.One chapter is dealing with the extra national requirement that the sprayer shall be calibrated. One chapter is dealing with requirements on the test equipments. Examples are given on a completely filled in test-protocol and sticker.

A first version was elaborated and tested on ca 80 inspectors on refresher courses in 2008. The comments from the experienced inspectors where considered in developing the final version. Comments from inspectors where a.o. the need of information on filter colours and corresponding mesh numbers from different filter manufacturers, ISO nozzle colour-code and recommendations on test pressure for different nozzle types. The finished version is the official training material published by the Swedish Board of Agruiculture. The finished version was send out to all approved sprayer inspectors in 2008 and was used first time on a basic course in spring 2009.

Except from the official training booklet also other material is given to the participants in training courses. All representatives of sprayers, sprayer components and test equipment on the Swedish market are invited to provide information material to the participants at the course. National regulations and guidelines relevant to sprayer inspectors are provided as well as relevant articles and research results.

Experiences

The booklet was very well received by the sprayer inspectors who appreciate to have all relevant information collected in one place. The booklet is used as a reference material during inspections and to show sprayer owner in case of discussions about tests. It is assumed that the inspections are made with fewer errors. To develop a material takes considerable amount of time. A lot of work was done to take illustrating photos during tests in order to illustrate the method and to reflect different sprayer types and test equipments. Special attention has been given to solve the matter of copyright for the European standards. The standards can not be quoted without agreements with national standardisation bodies

References and acknowledgements

Ganzelmeier H. Presentation at First European Workshop on Standardized Procedure for the Inspection of Sprayers in Europe -SPISE- April 2004, Braunschweig (Germany)

Gil Moya E. Departamento de Ingeniería Agroalimentaria y Biotecnología Universitat Politecnica de Catalunya, Barcelona (Spain). Personal communication 2007.

The author wish to direct special gratitude to them for their very valuable input during the work to elaborate the training material.

Electronic inspection reports in the Netherlands. Efficient and uniform data transfer of performed inspections to the owner of the sprayer and the supervising organization.

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Summary

Uniform good readable test-reports, easy collecting of the data of all performed tests, creating reliable statistics and saving labor for both the supervising organization and the workshops what perform inspections of sprayers are the key elements in the web-based application SKL has developed. Since the start in 2003 the system evolutes to a user-friendly, complete and reliable application for both the workshops and SKL as supervising organization. Since 2008 all information between the workshops and SKL goes via the application.

Introduction

In the Netherlands SKL is responsible for the organization of the inspection of sprayers. The inspections are done by a network of recognized workshops. In these workshops the inspections are performed by certified test-operators. The test-operators evaluate the sprayers of the farmers according to a uniform test protocol. The results of the tests are filled in on a uniform test-report. If a sprayer is approved, a sticker with a unique number is placed on the machine. This number is also mentioned on the test-report. The farmer will get a complete filled in and signed test-report after the inspection.

Past situation

From the start of the inspection scheme in the Netherlands SKL supplied the workshops with blank inspection forms. The test-operators filled in the results of the inspections on the inspection report and handed it over to the owner of the sprayer. A copy of each inspection report was send to SKL. SKL entered the data of the test-reports in a central database.

This system had some disadvantages:

- Double labor, all inspection reports must be filled in by hand by the inspector and the data was entered in a database again by the SKL organization.
- Not complete or unreadable inspection-reports. Not all inspectors filled in the inspection reports completely and not all inspectors had good hand writing skills.
- Extra costs for workshops: Purchase blank inspection reports and mail costs for sending the copies to SKL.

Objectives to create new solution.

In 2003 SKL has started with the development of an electronic version of the test-reports. The objectives were:

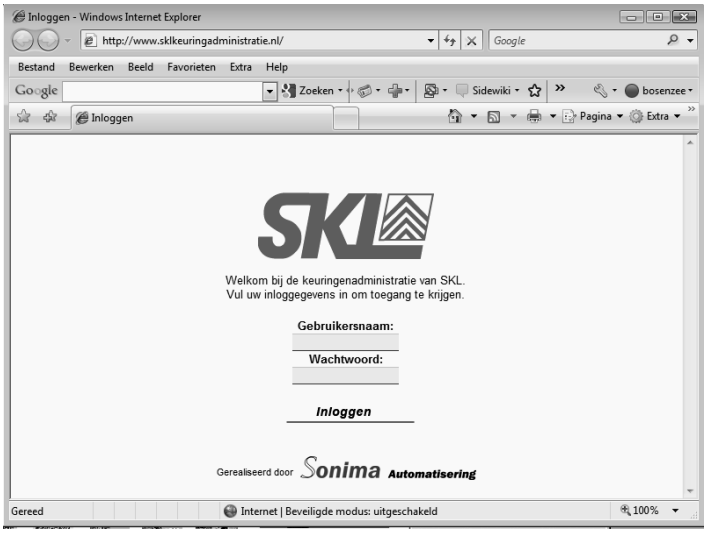
- More quality:
  - Uniform test-reports, no problems with different versions of test-reports.
  - All test-report are complete filled in, it is not longer possible that test-operators forget to fill-in some parts.
  - Good readable test-reports on A4 format, no more problems with unreadable handwritten test-reports on A3 format.

- More efficiency
  - Workshops.
    - Use of data (address owner, data of sprayers) from previous tests.
    - Build-in tools (nozzle library, calculator, etc) which makes it easier and faster for the test-operator.
    - All historical test-reports are always available.
    - All data from owners of sprayers is available to send invitations to their customers for the next inspection.
    - It must be possible to use the system both on-line and off-line on testing sites where no internet connection is available.
  - SKL
    - No labor needed for entering the data in the database.
    - Direct communication with test-stations.
    - Entering the database from every location.
    - Creating reliable, real-time statistics about number of inspected sprayers, needed repairs, etc.
    - One system for both the communication with the workshops and the internal administration.
- Safer data-storage
  - All data is stored in a central database which is hosted by a professional hosting company.

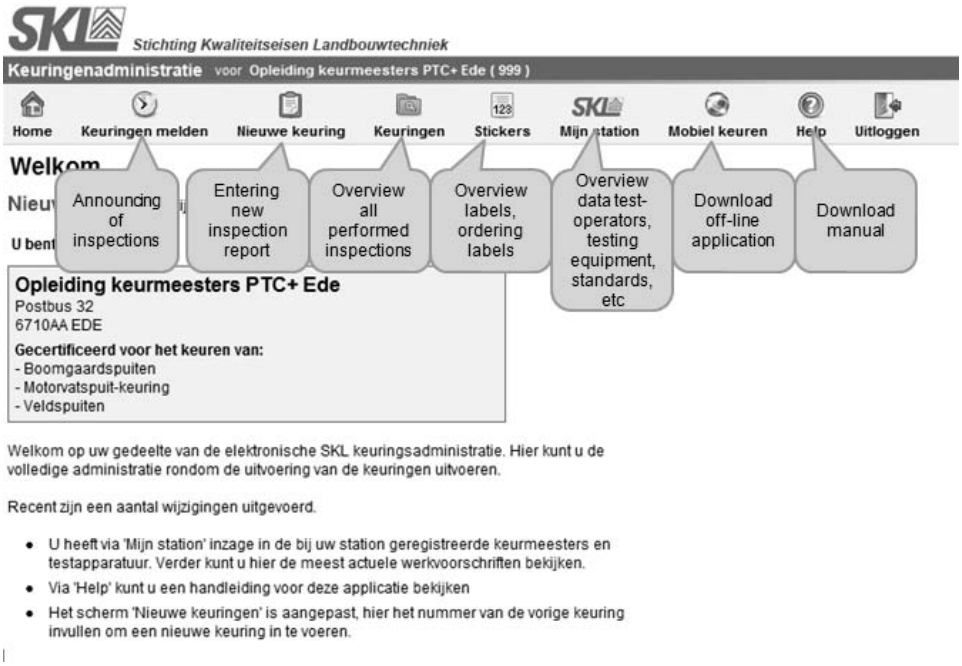
Developed system

With these objectives in mind a system was developed. The system exists of a central database where both SKL and the workshops have admission to. SKL has admission to all data and the workshops only have admission to their own data. The best solution was to develop a web-based solution. With this solution there are no problems with distribution of software to the workshops, no problems with different versions and no problems with data-transfer. For the use on test-sites where no internet connection available is and the use of the web-based application not possible is, an off-line version is developed. Workshop can download this off-line application from the SKL website on their own computer. With this application they can create test-reports and print it out for the farmers. When they have an internet connection it is possible to transfer the data to the central database.

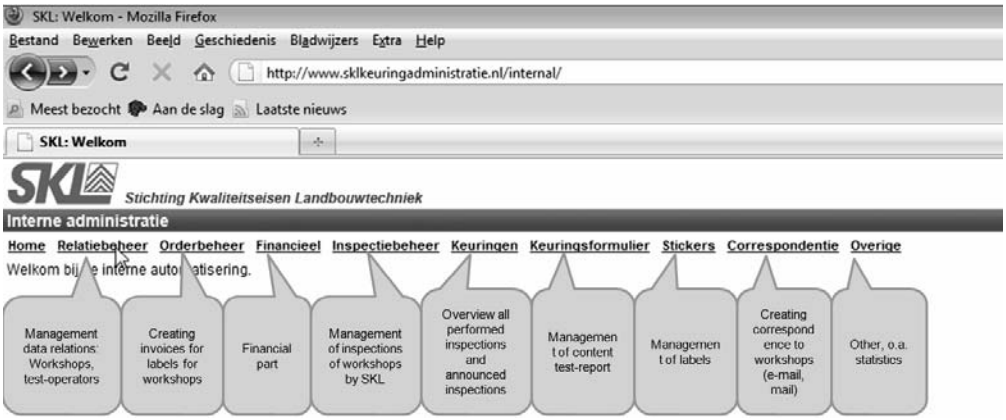
Workshops enter the application via the SKL website, after entering their username and password they enter in their own area.



In this environment the workshops have the following possibilities:



SKL as supervising organization has the following possibilities:



Conclusion

The system is operational since 2005 and is obligatory to use for the workshops since 2008. All workshops and test-operators are positive. They save on administrative time and costs and have a better view on the inspections they performed. The owners of sprayers get a clearly readable and completely filled in inspection report on A4 format.

The results for SKL are also positive because of:

- Savings on labor
- A better overview on results of inspections
- Improved quality of testing reports

A demonstration system is available on: www.sprayer-inspections.com, ask SKL for a user name and password.

Acknowledgements

Special thanks to Mr. Niels Dubbelboer of Sonima Software Solutions for support and development of the demo-version

Sprayer-Testing - Electronic analysis of the test reports

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Inspection with electronic measuring devices

Preparation of Test Report automatically.

Optional Software for Analysis.

Current State in Bavaria.

Possible Alternative Option:

- Herbst Electronic Analysis Software on a central computer.
- Data transfer from the test computer to the central computer at the end of the work via internet.
- Different access rights to the datas for the different users: checkpoint, official agency , Federal State, BBA.

Advantages:

- Established & Proven system for over 15 years:
  Pilot project was installed for the „Beratungsring Südtirol“ prior to the obligatory testing in Germany.

Advantages for the test station

Reduction of handling costs by

Advantages for Official Agencies:

- Test datas of their area are available in the internet in time.
- No labour cost for the analysis of the reports.
- No labour costs for retransmission of the results to the higher-level agency.

Advantages for the Agencies of the country:

- Access to the test results in realtime.
- Immediate access to the total number of sprayers tested.
- Easy accounting of the stickers without exposure of time and money.
- No exposure of costs for the preparation of statistics for the higher-level agency(BBA).

Advantages for the Federal Government:

- Easy overall survey
- Easy preparation of statistics
- Easy verification towards the Federal Environmental Agency

Already realized possibilities

Within every released access level screening according to:

- Period.
- Type of sprayer (field or orchard sprayers).
- Sticker (Yes/No).
- Type of testing (new machine, periodic testing, re-examination) etc.
- Additional criteria can be realized.

Already realized use at JKI test reports

Software for inspections of sprayers: needs and solution.

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Introduction

AAMS is a manufacturer of testing and calibration equipment for sprayers since 2002. The products are ranging from simple mechanical tools up to complete automated devices, steered and controlled by PLC's and computers. Since its start, AAMS has established business all over the EU (26 of the 27 countries), Eastern countries, North-Africa, US, South America and India.

With all electronic devices, a software package is supplied to be able to transfer the measured data to a PC and simplify reporting of the different measured values. More specifically an inspection software has been developed to execute a complete inspection and complete the corresponding inspection report. The software has been developed so that it is easy adaptable to the local requirements as local criteria, test protocol, type of measurements and of course the language. It is even possible to use the software in one language and print the reports in another language.

As governments want to receive the data of the inspections more and more in a digital format, a special export function is foreseen to be able to export the required data in general file format that can be read by every standard database-program. With a second export function, selected data can be exported for commercial or marketing purposes by the inspection station.

Inconveniences with the different European inspection systems and protocols

The European countries with a mandatory inspection of sprayers have all their own inspection protocol with large differences in criteria and even larger differences in the protocols. The differences are varying from measurements of the pump flow or not, measurements of agitation return, measurements of the flow sensor, measurements of pressure at the first nozzle of the spray sections, at the last nozzle of the spray sections, pressures at different pressure levels, flow rate of nozzles mounted and/or dismounted, liquid distribution under the spray boom, vertical liquid distribution of orchard sprayers.

Of coarse have all these differences an effect on the corresponding report, with more or less parameters that need to be included. Unfortunately for both AAMS and their colleagues, only a few countries follow the proposed report and protocol by the EN13790. Nevertheless, AAMS has supplies the software in all of these countries adapted to the local requirements.

Many test stations want to supply the owner of the sprayer with more data than the official reports provide. Mostly the details of the measured parameters and resulting graphs are seldom included in the official reports, while this information is most valuable for the owner/user of the sprayer. Extra pages are created for those users of the AAMS software package. The reports are always created in a pdf format so that the inspector has still the choice which pages of the report are printed, similar with the number of copies. The creation of a pdf report simplifies the software and its usage, as f;ex it doesn't require any extra installation of printers and printer drivers.

Structure of the AAMS software package

The software is built in different levels: a first level for general configuration and a second level with all specific data of the individual inspections.

In the first level all criteria are configured, as well as the data of the inspection station, the different inspection locations (in case of mobile inspection), data of the different approved inspectors and all database management (as back-ups, exporting merging, etc.)

In the second level, a tabular structure has been established with following contents: general inspection data, data of the owner of the sprayer, inspection type (field crop, orchard, vineyard sprayer), data of the sprayer, measurement details (as pressures at the nozzles, manometer verification, pump flow rate check, spray computer check, flow meter verification, speed meter verification etc but no data of the nozzles), test protocol (that changes based on the selected type of sprayer), flow rate data of nozzles of orchard

sprayers, flow rate data of nozzles data of field crop sprayers, liquid distribution data of nozzles mounted on a spray boom, steering of the electronic flow rate measurement system for orchard sprayers, steering of the AAMS scanner with radio-link, specific invoicing tool for inspections and a reporting page.

Specific examples

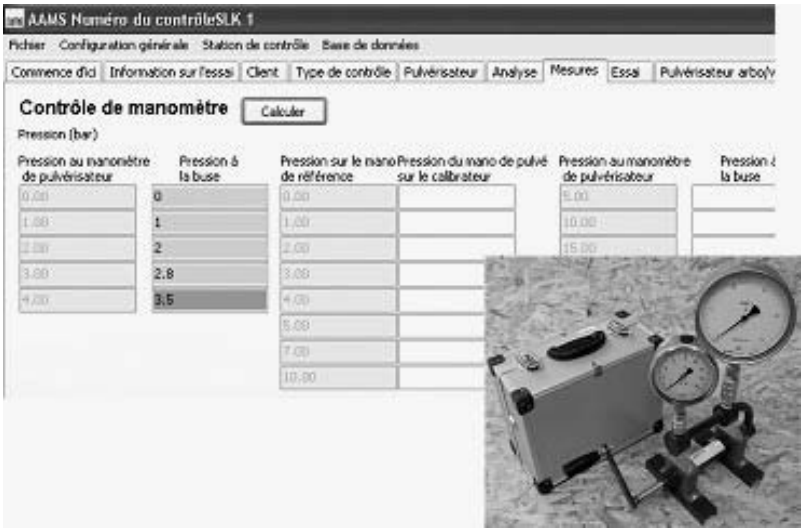


Fig. 1 Data of manometer verifications (up to 4 manometers, 8 different pressure levels possible for every individual manometer etc).

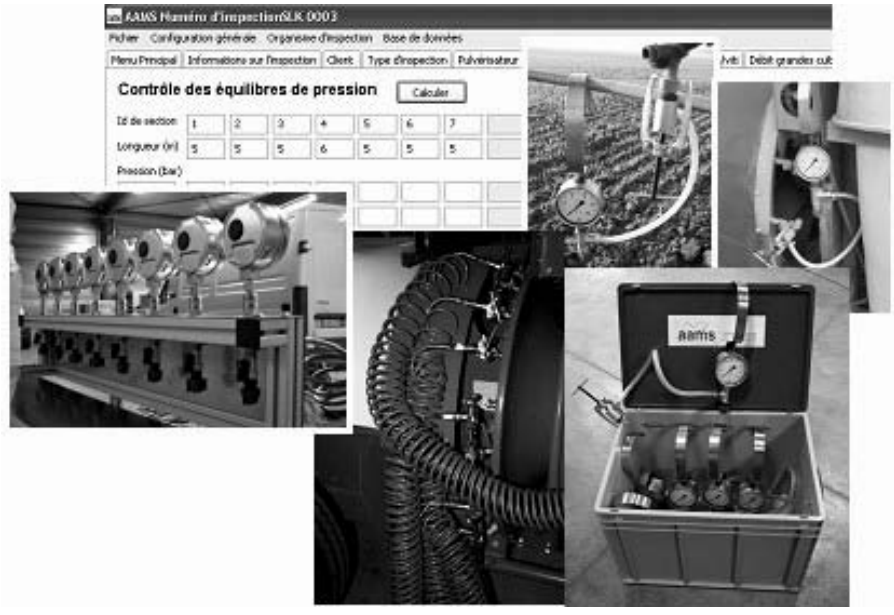


Fig. 2 The hydraulic equilibrium for both field crop as orchard sprayers.

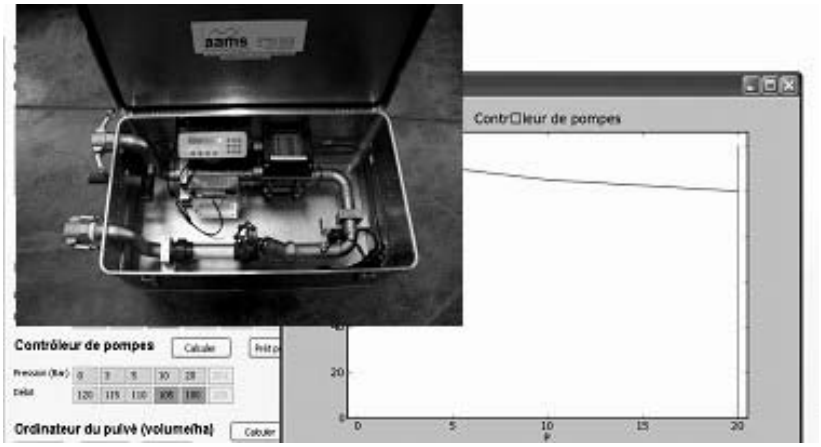


Fig. 3 Pump data can be entered manually or being integrated after data have been send with blue-tooth from a pump tester.

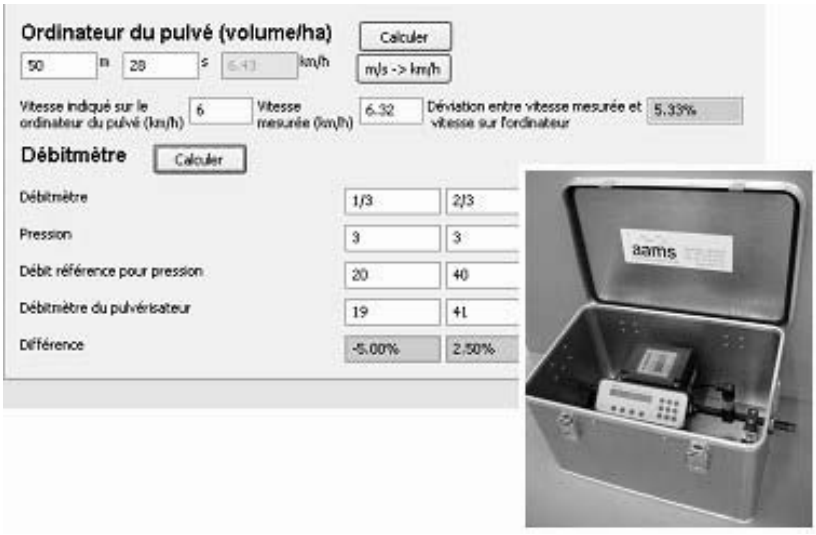


Fig. 4 Spray computer with data for flow sensor and or speed indicator.

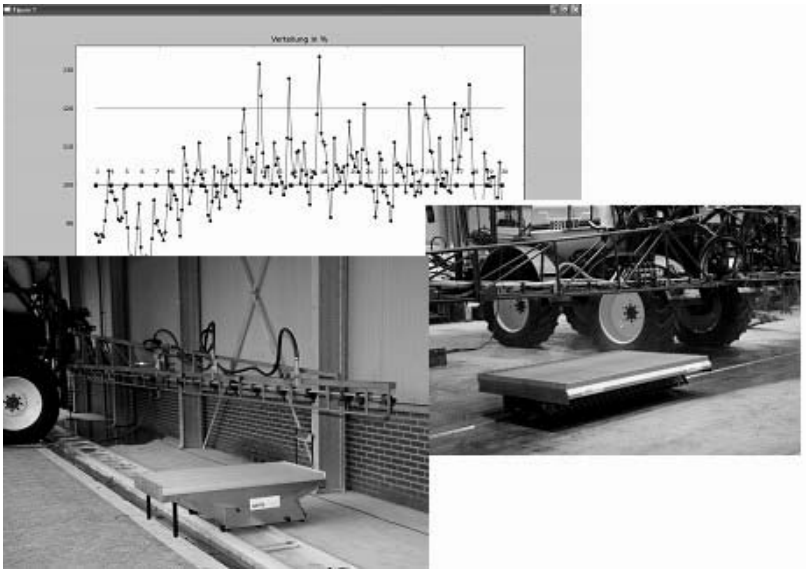


Fig. 5 Liquid distribution can be integrated from mechanical patternator, spray scanner of 80 cm working width with memory box or radio-link (including former Hardi Spray Scanners) or the Spray Scanner Plus with a working width of 2m40.

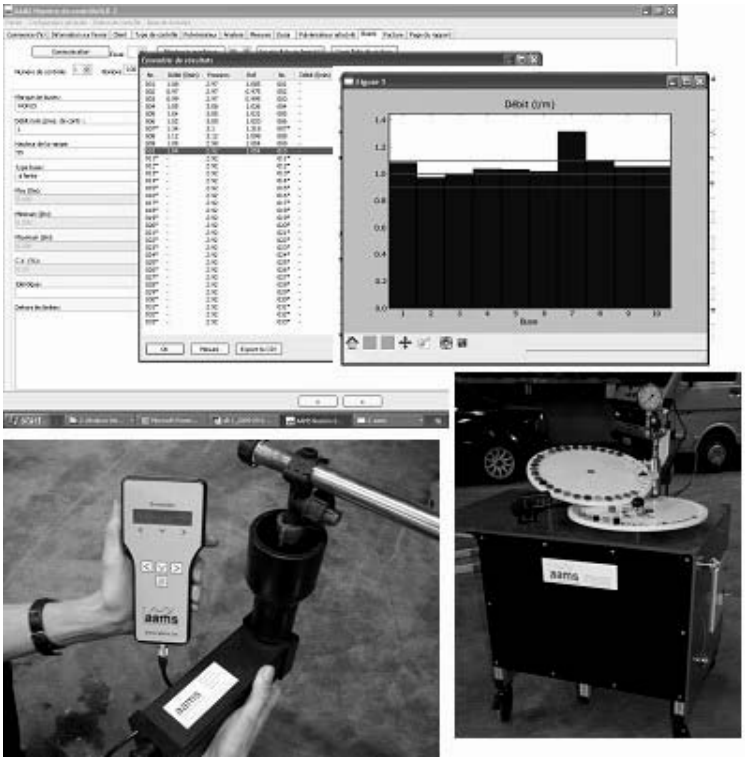


Fig. 6 Flow rate measurements of nozzles of field crop sprayers, mounted or dismounted

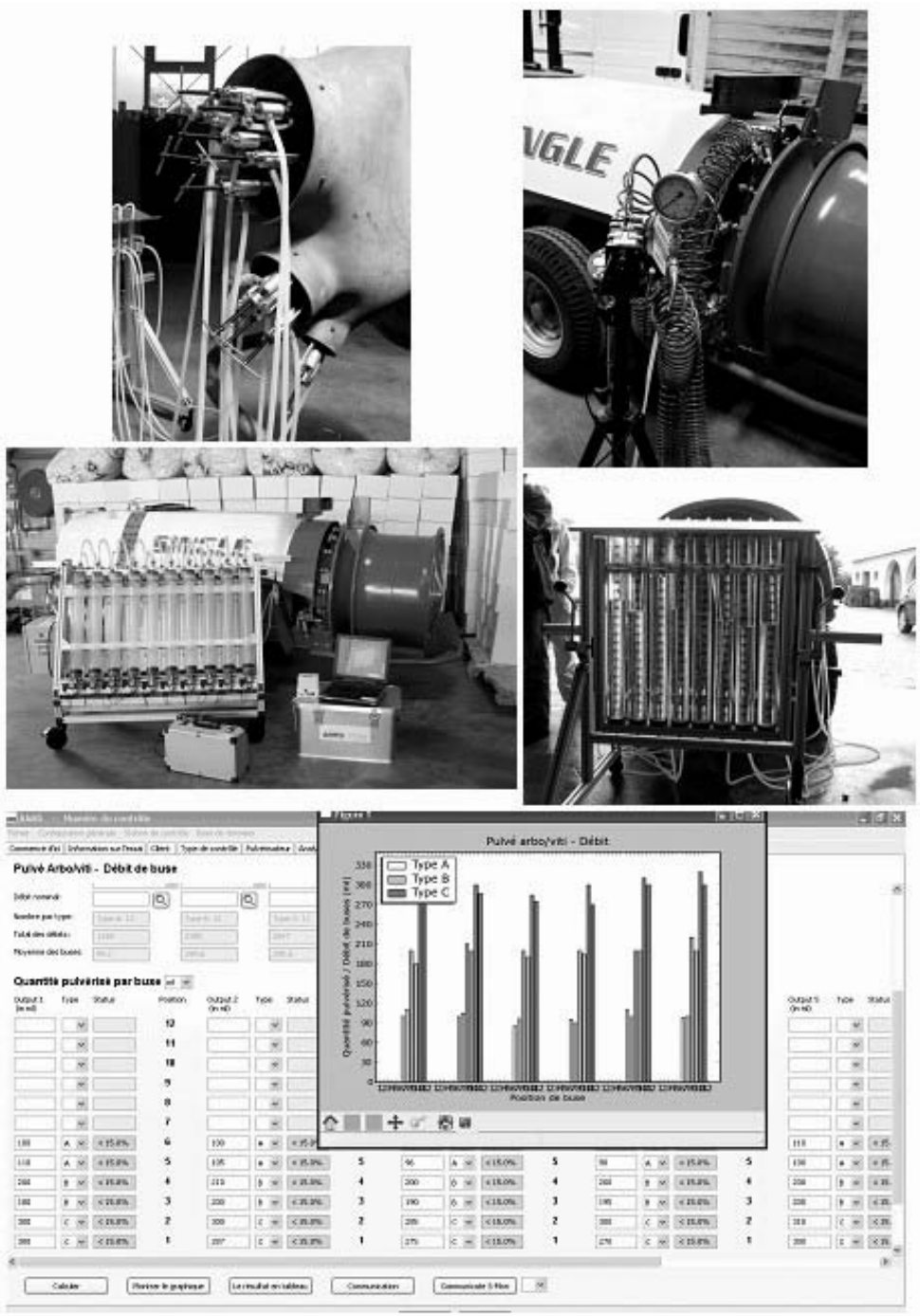
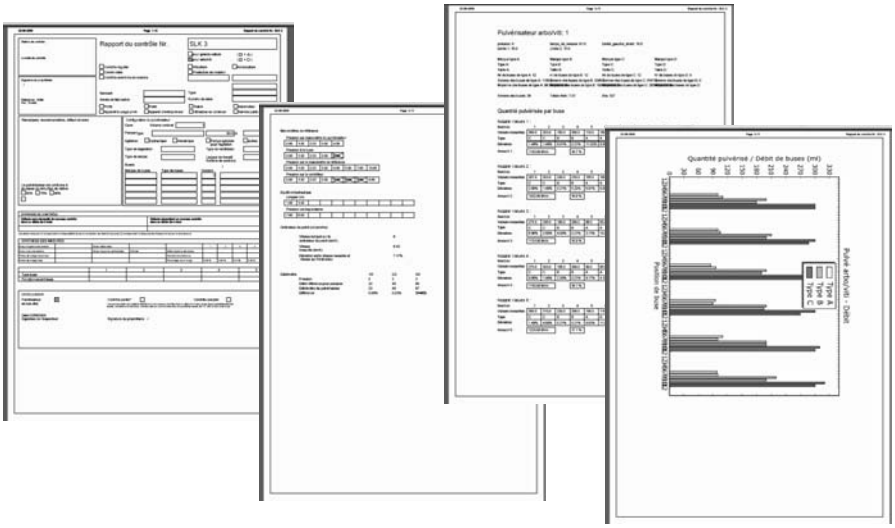


Fig. 7 Flow rate of nozzles on orchard sprayers or vineyard sprayers, mounted or dismounted.

Reporting



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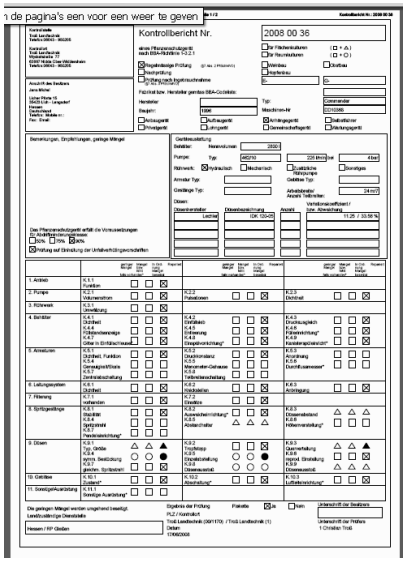

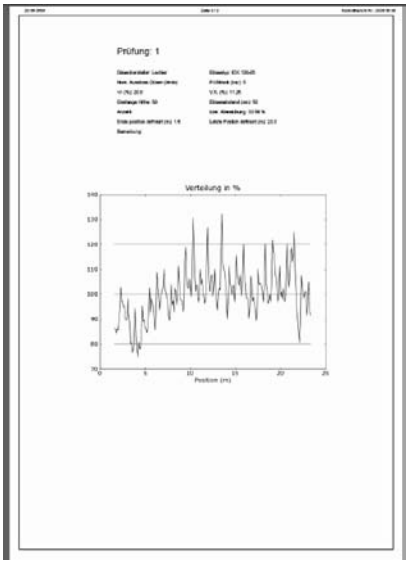

or

Conclusion

AAMS has developed a multi-functional software package that allows different inspections with different protocols. It hopes that countries not having a mandatory inspection yet, take advantage of the developments in other countries for establishing a correct and complete protocol and create a report that is both useful for official purposes as for a good interpretation of results by the operators of the sprayers. AAMS has a broad experience regarding inspections of sprayers in mandatory and voluntary systems, both on organisational level as technical level for protocols. AAMS is a unique player in the market that only focuses on spray testing and calibration tools.

Posters

IrroMono-IrroNet: a software to manage the inspections of sprayers already in use

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Abstract

After the issue of the new national guidelines on the inspections of sprayers already in use in Italy, a software to manage correctly the tests, to store the data and to analyze the results has been realized. The software has been made in collaboration with a software company (Ithan srl). The work has been divided in different steps: 1) the analysis of current situation in terms of existing software; 2) the setting of a parameters list to be included in the software; 3) the architectural design of data management; 4) some practical tests at the test stations. The IrroMono software consists of two parts: the first one is a stand-alone programme for the inspection, the second one is an intranet interface for managing the archives. In the paper are presented the main characteristics of the software and the possibility to study and monitor the inspection activities both at local and national levels.

Introduction

The periodical inspections of the sprayers already in use consist of a series of standardized procedures including technical and administrative contents (Biocca, 2007; Gil, 2007; Wehmann, 2007). During the inspections many parts and components of the sprayer are checked and sometimes it is necessary to make some simple calculations to control the tolerance threshold of some parameters. In addition, official documents, reporting at least the result of the inspection, are needed at the end of the inspections. The results have to be stored, monitored and studied. Moreover a transparent and impartial procedure has to be applied to the all users. As a consequence, an application software to manage the whole activity is highly demanded from all the subjects involved: the inspector, the sprayer's owner and the Administration in charge of the controls.

In the year 2004, the Italian Ministry of Agriculture funded a program related to the national coordination of activities of the sprayers inspection, coordinated by ENAMA. A national technical committee, coordinated by the University of Turin (Balsari et al., 2007a), has produced the national guidelines for the control of sprayers, replacing the different approaches currently adopted by individual Regions within their activities (Biocca and Severini, 2004). Among the activities provided by this program, an application software to manage the inspections according to the new testing protocols, Document No. 6 (field sprayers) and No. 7 (orchard sprayers) (Balsari et al., 2007b) has been projected and realised.

The main aims of the project were to obtain a software planned to:

- conform to the national test methodology (standards) for the functional test of sprayers;
- assist the inspector during the controls (e.g. providing a "checklist", calculating some control parameters, providing a database of nozzles and components properties, etc.);
- provide the necessary documents for the users and for the regional Administrations;
- allow the creation of a database to be shared between different regions;
- monitor the activity at a regional and national level.

The purpose of this paper is to illustrate the steps that have led to the realization of this software and to describe its main characteristics.

Design of the software

The first phase of the work consists of an analysis of existing software currently adopted in Italy. In this stage several applications were examined in terms of usability, reliability and agreement to the standard

requirements (Biocca et al., 2008). Since none of the existing software satisfied completely the requirements needed, it was decided to start the design of a new product.

The work has been divided in different steps. At the beginning, starting from the study of each part of the inspection protocol included in the national guidelines, it was created a list of parameters and controls to be included in the software. In addition to the list of functional and mechanical controls of the sprayer's components, the software includes: 1) the data for the identification of the sprayer owner; 2) the description of the main features of the sprayer. As a general criteria, it was decided to include a minimum required set of parameters and data in order to make simpler and faster the filling.

The software was compiled by the company Ithan srl using products licence free to third parties. It can be run in multi-platform (Windows or Linux), can be downloaded from the Internet and can work either on-line or off-line. The software consists of two parts: the first, called IrroMono, is a stand-alone application for managing the inspections, while the second part, IrroNet, is the intranet interface for managing the archives by means of a browser. IrroMono is divided into several sections (owner identification, sprayers description, functional working data, visual and instrumental controls and reports).

Three different documents can be printed at the end of the inspection:

1) a certificate of inspection, which has the value of determining that control has passed, not passed or has been suspended;
2) a test report, which contains in details the results of each control;
3) a memorandum, which is released when control has not passed, including a list of actions to be carried out by the owner of the machines in order to conclude successfully the control itself (list of requirements).

The documents are produced in pdf format. The confirmation of printing of the final documents blocks the further continuation of the changes on the control itself and allows the storage and historicizing.

The second part of the software, the application IrroNet, can manage:

- - the database of the inspected sprayers;
- - the history of controls on each sprayers;
- - the database of national inspection centres;
- - the database of owners;
- - the synchronization of data from the workshops to the central database.

With the same application it is possible to download data in a format suitable for a spreadsheet (e.g. Microsoft Excel) to obtain reports and statistics.

The architecture of data management is illustrated in the following figure.

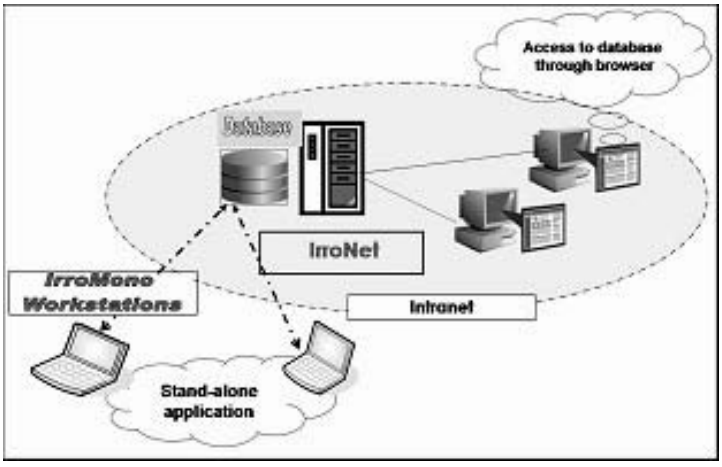

Fig. 1 Architecture of data management

Conclusions

The structure of the software includes the dual nature of the control of sprayers in use: the "inspection" on one side and the "technical service" on the other side. IrroMono software, developed in line with this philosophy, enabling it to operate at the control centre, in a flexible way, adapting to different operational situations present.

IrroNet software is an essential tool in managing and monitoring of control activities. In fact, with the application of the European Directive on sustainable use of pesticides, the ex-post evaluation and the planning activities of functional tests, may be monitored, allowing the competent authorities to carry out the scheduled investigation.

Further development of the software may include a version suitable to be run in a palm computer and the development of a programme devoted to the regulation (calibration) of the sprayer.

Acknowledgments

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An overview of the compulsory inspection of sprayers in Belgium

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In Belgium, the compulsory inspection of sprayers in use was implemented in 1995 in the framework of the reform of the Agriculture Policy as a consequence of the CAP reform and GATT negotiations. Profitability, quality, security and environment were the key points of this reform.

The inspection concerns «all the sprayers that could be used to spray registered agricultural pesticides on the Belgian territory». It oncerns mainly field crop and orchards sprayers but also greenhouse sprayers. The inspection is on a three-yearly basis. The average cost for the user is 98€.

The inspections are performed by official and mobile teams from the regional authorities (Agricultural Research Centres). The management of the inspection is done by the federal Ministry for Consumer Protection, Public Health and the Environment. There are 6 inspection teams in Belgium which inspect about 24 500 sprayers every 3 years. Between 10 and 14 sprayers are inspected each day by one team of 2 persons.

Based on the analytical principle, the inspection method consists in measuring separately and independently the performances of the different parts of the sprayer to determine possible defects and to establish a precise diagnosis.

A defect leads to a rejection only when its origin is ascribable to the user, when it disturbs the spraying in a significant way and when it has been determined in an indisputable and objective way. The repairs must be done within 4 months, before a second inspection of the sprayer.

At this moment less than 15% of the inspected sprayers are rejected during the first passage. The users repair their sprayer beforehand, taking the notification into account. Technical improvements of the sprayers as well as a positive evolution in people's attitude has been observed.

A balanced and realistic project has been finalized by taking into account the constraints of the different partners.

A compulsory inspection of sprayers using pesticides for agriculture is successfully on the way since 1995 in Belgium.

Sprayer inspection in Portugal

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In spite of the non existence of recent statistical data concerning the pesticides application equipments (the last, respecting 2001, appointed about 56 000), according the most important Portuguese equipment manufacturers, roughly half of them are sprayers for field and horticulture crops and the other half for perennial crops (vineyards and orchards).

For the last ones, the air assistance hydraulic are very common, but vertical booms (lower height) and hand held application, owing the difficult of the access at some regions, are also used.

In 2001 the proposal of the Portuguese legislation previewed the compulsory training of the operators to be able to apply pesticides. These legislation was only approved in 2005. (Decreto-Lei 173/2005). In consequence several training application courses were developed, initially by Official Service of the Agriculture Ministry, in which the scale and the accuracy of the pressure gauge (making possible to read lesser pressures) and the eventual difference from the theoretically nozzle output and the real output, measured in the field, were some of the aspects more enhanced.

Based on the Directive 2001/45/EC of the European Parliament and of the Council, concerning the minimum safety and heath requirements for the use of the work equipment by workers, to ensure the health and safety, the national manufacturer TOMIX began to test the accuracy of its sprayers in use, by requirement of their farmer customers. The pump capacity to ensure a stable and reliable application rate, the acceptable maintenance of the spray liquid tank, of the pipes and hoses and the airflow created by the fan, were some of the details checked at more than 300 sprayers (near by 70 % orchards sprayers) during 2004 and 2005.

However, the voluntary sprayer inspection service, enlarged to all constructers, began in Portugal in 2006 *, by COTHN (Centro Operativo Tecnológico Hortofrutícola Nacional), with technical support from official Service DGADR (Direcção-Geral de Agricultura e Desenvolvimento Rural).

In the beginning the inspection were almost made at the orchards sprayers. Actually, COTHN has a mobile inspection process for orchards spray equipment and, also, horticulture crops, in different regions of the country. The inspections are being done according to the exigencies of the market.

Although the inspection of the typical tank-pump-lance sprayers is not established, owing the farmers (mainly greenhouses growers) request, at 2007 and 2008, several inspection of that sprayers were done by the referred COTHN and a by a new private association, the AMBI3Q, operating in the northern country, that began the inspections also with the official technical support granted by the DGADR. Recently, at the southern country, another private corporation, A.CANO, is organized to get going to inspect, mainly, sprayer booms for the cereals.

At the moment the inspections of the all mentioned enterprises are made by mobile process and specific workshops for sprayer inspection are inexistent.

Due to the requests of the Directive of the Parliament and of the Council establishing a framework for Community action to achieve the sustainable use of pesticides, a proposal of the national law about the plant protection equipment is in the process of governmental authority submission.

* Martins M.C., Moreira J.F. (2007): The first year of the sprayer inspection in Portugal. Abst. Standardized Procedure for the Inspection of Spraers in Europe. Straelen (Alemanha), p. 77.

Inspection of pesticide application equipment in Czech Republic

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Inspection of Pesticide Application Equipment (PAE) - field sprayers, air-assisted sprayers for orchards, vineyards and hop-fields, seed dressers, equipment for railway, aerial application equipment has been obligatory since 1997 in the Czech Republic.

New sprayers must be firstly inspected at the latest by the end of the two years after they were taken into use on the present.

Interval of the following inspection is three years for all groups of PAE, which are covered by Czech current legislation. It is new interval in the Czech Republic amended in the June 2009. Inspected PAE is marked by inspection label and certificate of functional capability is issued to operator.

Requirements and methods for the inspection are stated according to EN 13790 Agricultural machinery – Sprayers – Inspection of sprayers in use – Part 1,2. Requirements for seed dressers, equipment for railway and aerial application equipment are stated on national level. Inspection is carry out by 54 private inspection sites, which are approved and supervised by the State Phytosanitary Administration (SPA), Application Technique Department. Nine of these sites carry out only seed dressers inspection.

The inspection of PAE in use is a functional system in the Czech Republic. The SPA manages database of inspected PAE. There is almost 8000 PAE used as results from this database in the Czech Republic.

UK National Sprayer Testing Scheme (NSTS)

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The NSTS was launched in the UK in 2003. Base on the scheme launched in 1997 by the AEA. NSTS was launched as part of the UK's Voluntary Initiative (VI) – a range of measures agreed with Government to reduce the effects of pesticides on the environment.

The NSTS is an annual independent inspection of spraying and application equipment, undertaken by a qualified examiner to an agreed protocol and applies to both new and machines in use. The protocol has been devised following discussion by machine manufacturers, farming unions and contractors as well as other stakeholders involved with the VI. The protocol also takes into consideration the requirements of EN13790 although does not mirror all requirements.

Since launch NSTS has become a requirement of the UK crop assurance schemes and major supermarket protocols. Requiring all farmers and growers selling produce through either have to have the sprayers tested by NSTS.

Since launch NSTS has carried out over 60,000 tests on application machinery. The annual number accounts for machines covering 85% of the sprayed area of the UK. The majority come from arable farming, although a significant numbers of machines working in horticulture and amenity are also tested. NSTS majors on vehicle mounted machines.

NSTS has recently devised protocols for machines applying granular pesticides, fogging machines and slug pellet applicators.

NSTS has 568 qualified machine examiners working out of 334 registered UK based test centres. The NSTS test is also carried out in Germany, Denmark and Netherlands by those manufacturers supplying the UK market. NSTS tested machine are also working in many countries worldwide.

All NSTS tests are entered onto a database which holds details of the machine, owners name and address, faults found and rectified. Crop assurance certification bodies have access to this database for verification purposes.

For further details of NSTS and a full list of test centres visit: www.nsts.org.uk

Inspection, calibration and other ways of improving the efficiency of air assistance sprayer in the purpose of applying small and medium application rates in fruit production

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In the last twenty years in Serbia there is noticeable trend in the increase of orchards. Planting and caring of the orchard demands significant financial resources, but as well it secures gain. Special attention to the care of the orchard deserves the protection against illnesses and pests. Chemical protection is the most commonly used of all measures of plant protection. Chemical protection of orchards usually is performed by air assistance sprayers. In the world, there is actual minimize usage of liquid per hectare, that is treating orchards with small application rates from 150 to 500 l/ha or even smaller from 150 to 250 l/ha. In Serbian practice is most commonly used medium application rates from 500 to 1000 l/ha or large application rates from 1000 to 1500 l/ha. Inspection of air-assisted sprayers, correct calibration, different ways of there adaption can help fruit growers in Serbia to introduce small and medium application in fruit production.

In May 2009. inspection of sprayers and air assistance sprayers according EN 13790 become obligatory measure in Serbia. Last 3 years Faculty of Agriculture from Novi Sad done over 30 inspection and calibration of air-assisted sprayers on voluntary level. Good Agricultural Practice (GlobalGAP Standard) can help us to do these inspections. Most of this inspection and calibration was result of introducing GlobalGAP standard in Serbian fruit production.

Authors of this paper-work has made a „Guideline for handling and calibration of equipment for pesticide application“ to be used by farmers in Serbia. Last 2 years we have held a lot of training courses for fruit growers in aim to help them to improve pesticide application with there air-assisted sprayer.

This year we started with experiment in 13 years old apple orchard. In half of this orchard we apply small application rate (381 l/ha) during whole vegetation period and in second part of orchard we use medium application rate (759 l/ha). In October we will have results which will shown us is there any different in biological efficiency of this two application rates.

We hope so that all this activity will help us to introduce small and medium application rates instead of large in fruit production.

Exhibition

Ernst Herbst Prüftechnik e.K. - Plant protection equipment, test engineering, agricultural technology

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Summary

Ernst Herbst Prüftechnik e.K. is the leading manufacturer of test equipment for testing sprayers in Europe. Measurement devices for every kind of plant protecting equipment is produced and delivered worldwide using a network of distribution partners. On the occasion of SPISE 3 the Company Ernst Herbst Prüftechnik e.K. was showing some devices of its test equipment program.

Products

- The company Herbst is producing following equipment:
- Sprayertest 1000 horizontal distribution test equipment 1 m working width (figure 1)
- Sprayertest 2000, horizontal distribution test equipment 2 m working width
- ED20/900EL, single nozzle test bench electronic
- ED16/2L-K, single nozzle test bench mechanical
- ROT-650/16/10, pump test device from 7,5 up to 1200 l/min (figure 2)
- ROT-650/60/40/10, pump test device from 7,5 up to 1200 l/min
- ROT-1200/10/10 pump test device from 7,5 up to 1200 l/min
- VV3000, vertical distribution test equipment (figure 3)
- VV3500. vertical distribution test equipment
- For manometers testing or pressure testing Herbst is the only manufacturer worldwide who delivers an electronic measuring device gauged according to the German law of gauging with a measuring range from 0 up to 60 bar and an accuracy of 0,01 bar.
- For testing nozzles according to the French guidelines, Herbst is offering a measuring device with a measuring range from 0,3 l/min up to 7 l/min. The device is equipped with a water tank and a special pump. This pump is able to create a pressure of up to 10 bar with an absolutely constant discharge. An electronic pressure measurement with automatic measuring function is standard extend of delivery. This device is able to save the results automatically and transfer to the computer wireless.

All test equipment from Herbst meets the conditions of EN 13790. Test equipment, which is used for the official sprayer inspection, is approved by JKI. For the pressure measurement the display device is easily removable and by adapters connected to the sprayer which is tested. The French Institute CRODIP checked the accuracy of this measuring device and it is admitted for the use in France.

To all electronic test equipment Herbst is delivering a complete operating and protocol software. The printable test reports are according to the demands of EN 13790 and it is no problem to adapt it to special demands of different countries.

The software is multilingual and is to be delivered in the wished national language. For manufacturer of sprayers the software can be delivered in a changeable language format. Optional the test reports can be printed in the language the customer wants to. In this case the tester always is working in his native language and for the print, he is able to select in a list between different languages. Even it is possible to print one test report in different languages.

Also for manufacturer of sprayers Herbst is offering an expanded data base to save all components of one unit.

To make the work easier for the tester Herbst is offering a software module for fast selection of test reports according testing time or sticker. The function form letter makes it possible to write invitations to customer for the next testing sprayers.

To make the national controlling of the sprayer testing easier, Herbst is offering the online transfer of the test results directly of the test station towards a central server.

The controlling authority has got an internet access to this data base and is able, by an analysis software, to make special selections. Already in 1995 this online version was developed for the Beratungsring Südtirol (Italy) and is also used by German test stations in Bavaria, North Rhine-Westphalia, Hessen and Thuringia. This proceeding was introduced during the SPISE workshop in an own lecture.

Fig. 1 Sprayertest 1000 at work

Fig. 2 Little presentation of testing devices in Brno.

Fig. 3 Testing an atomizing sprayer with a vertical distribution test bench.

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HERBST

ITEQ - Comprehensive solutions for the inspection of sprayers

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Summary

ITEQ is a Belgian company developing and manufacturing measurement equipments and associated innovative software solutions.

ITEQ has a huge experience in the field of sprayers inspection. Its products are professional equipments of the highest quality and have demonstrated accuracy and robustness.

ITEQ proposes a range of equipments to control ALL types of sprayers (field, bush and tree crops).

All ITEQ products fully comply with European requirements.

Purchasing ITEQ products will give you a high return on investment due to their reliability and ergonomy.

ITEQ is committed to continuously improve their products to meet customers' needs and evolving regulatory requirements.

Localization of ITEQ products

France: Inspection of sprayers has become compulsory since 1st January 2009. Ten equipments have been purchased on a voluntary basis before the enforcement of the law. As of November 2009, thirty-six full equipments have been sold throughout France. ITEQ offers quality and compliant products coupled with professional training and support. As a consequence ALL the ITEQ customers have been accredited by the GIP (official body coordinating the inspection of sprayers). ITEQ is the leader on the French market.

Belgium: Inspection of sprayers is mandatory since 1995. seven equipments are used throughout Belgium by the Ministry of Agriculture. More than 15000 sprayers have been inspected with each test bench since 1995! ITEQ is now selling improved models of these equipments.

Poland: Two equipments are used: University of Lublin and Ministry of Agriculture of Warsaw.

Spain: Seven equipments in Spain: Universitat Politècnica of Catalonia in Barcelona, Research Center – CMA in Lleida, Plant Protection Unit in Galice and 4 units at DAP of Andalusia in Seville.

Morocco: The Ministry of Agriculture has chosen ITEQ products to initiate inspection of sprayers. One equipment used in Rabat since May 2008.

ITEQ – A wide range of equipments to fit customers' needs

Inspection of sprayers (field, bush and tree crops) is performed through:

- overall visual inspection
- simple measurements (height, distance between nozzles, …)
- checking spraying flowrate and pressures.

ITEQ is providing professional equipments that fully comply with the EU regulations to:

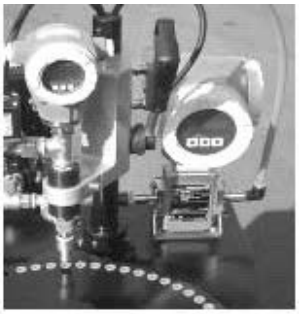
- measure the flow rate of nozzles removed from the sprayer
- measure pressures on the spray boom
- control the working pressure gauge

Flow rate test benches

Two mobile models of nozzles flowrate test benches: pallet and compact

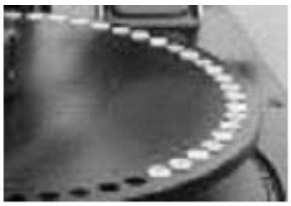

Two different types of sensors

Analogue sensors - Manual data acquisition of flow rate and pressure with the ITEQ software or **digital sensors** - with automatic data acquisition of flow rate AND pressure by ITEQ software (with double adjustment: calibration and pressure).

Multi-purpose test bench - to measure the flow rate AND pressure of ANY type of nozzles removed from the spray boom: the perfect combination of speed and accuracy





Pressure equipment for field crop sprayers - Analogue pressure gauges/0–6 bar/class 1/∅ 100 mm. Sets of fast coupling connections specific for any make of sprayers




Pressure equipment for air-assisted sprayers - bush and tree crops - Foldable aluminium frames for easy set-up and transportation/fast coupling connections/spiral pressure gauges/0-20 bar/class 1/∅ 100 mm,



Calibration equipments - Reference nozzles to calibrate the flow rate test bench and Reference digital pressure gauge to calibrate the manometers used during inspection. Rem: All calibration equipments are certified by an accredited laboratory ISO 17025 (BELAC – Belgian Accreditation Body)



ITEQ – Software and services to fit customers' needs

SDSoft (Sprayer Diagnostic Software) has been developed to complement ITEQ equipments and to greatly facilitate the control of sprayers on the field. SDSoft complies to the European regulation and can be easily customized to your specific needs - country specific protocols and languages. Alongside the wide range of equipments and software solutions, ITEQ team is also committed to provide top level training and support services to public or private operators for the management of any activity linked to the inspection of sprayers.

Conclusions - Integration and reliability demonstrated

As the best demonstration of the reliability and integration of the test bench and software solution, a live exhibition was performed by the ITEQ team during the SPISE conference in Brno, September 2009.

ITEQ sprayer diagnostic software

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Summary

ITEQ has developed a software to efficiently manage all technical data as well as administrative data related to sprayers inspection. With SDSoft – Sprayer Diagnostic Software - the operator will easily plan appointments with users, manage all measurements (inspection results and calibration data) and easily print clear and comprehensive reports directly at inspection site. SDSoft can be used in standalone mode for manual data encoding or connected to ITEQ digital sensors for automatic data acquisition.

SDSOft is composed of 4 inter-related modules.

Core module (European protocol and reporting)

- Covers all administrative data (date, location, users and sprayers data,…) and technical data (results of visual inspection and all measurements with automatic calculation).
- Contains by default all acceptance criteria and limits proposed by the European protocol. Also the operator may easily customize the inspection protocol in line with country specific recommendations.
- Contains a database of more than 1600 reference flow rates from all nozzles manufacturers.
- Allows to automatically create (in pdf file) and print on site a full report for the user giving the overall outcome of inspection – pass or fail – and highlighting deficiencies and weaknesses to be watched.

Planning module

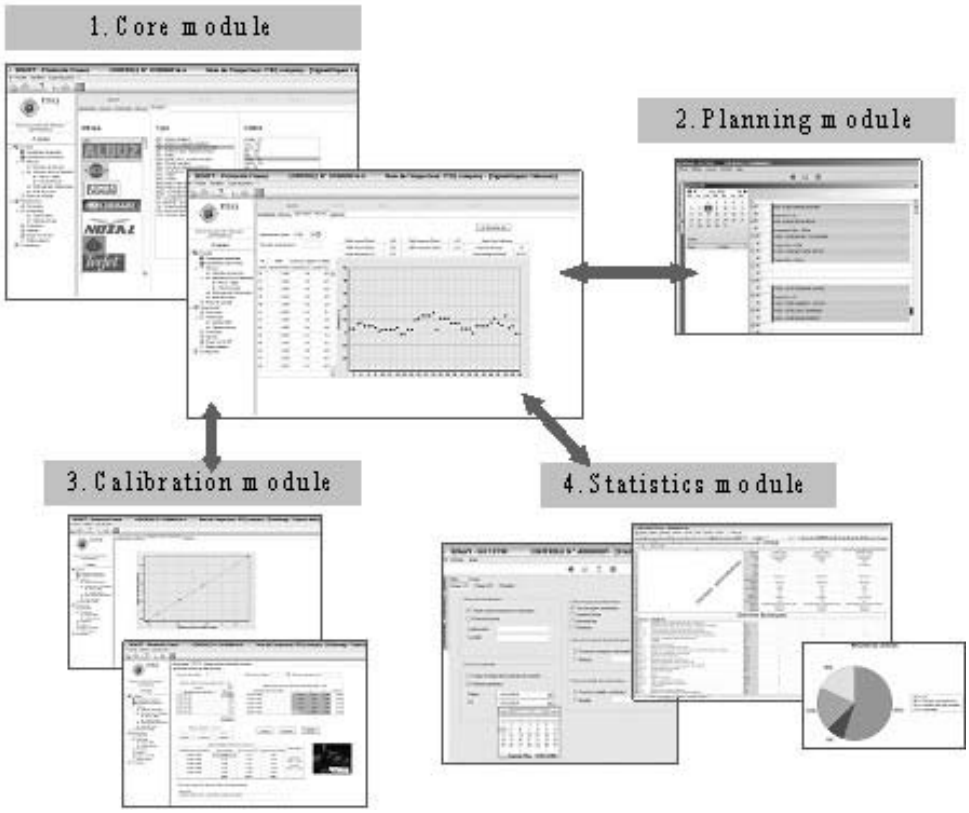
- Easy management of the central user/sprayer database
- Dynamically create inspection planning for operators
- Print labels for sending appointments to the users

Calibration module :

- This module is a “must” to perform the calibration of measurement materials (flow rate and pressure measurement equipments).
- It establishes the correlation/deviation between reference and measured values by the ITEQ equipments.
- A calibration report is provided for each verification (pdf file) and can be printed.
- The traceability of the calibration is guaranteed by the use of calibration materials certified by reference accredited laboratories (ISO17025 - BELAC/DAP/COFRAC/CAI/...).

Statistics module:

- Consolidates all information from the core module.
- Output can be exported to tabular format (Microsoft Excel).
- Such consolidated information is useful to:
  - Generate feedback reports for manufacturers, authorities,…
  - Create periodic activity reports: number of inspections, statistics on recurrent defects, …



Conclusions:

SDSoft is a software that manages all data related to sprayers inspection - from appointment to inspection report. It has been developed in parallel to ITEQ equipments to ensure reliable automatic data capture. SDSoft exists in French, English and Spanish. It can be easily translated to any language. It fully complies with the European protocol and can be customized to country specific recommendations.

Session 4: Regular calibration and technical checks of pesticide application equipment (according article 8/5)

Introduction paper

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Introduction

According to the Framework Directive on Sustainable use of Pesticides, 2009/128/EG (FWD) article 8:5: "Professional users shall conduct regular calibrations and technical checks of the pesticide application equipment according to the appropriate training received as provided for in Article 5". The purpose is to keep the equipment in good condition between inspections and to ensure correct dosage and distribution of the plant protection product. Furthermore the operators will have higher knowledge of the equipment and its use as well as higher awareness of failing equipments influence on environment.

From a legal point of view there is a clear demand on the user to conduct the calibration and technical checks. The training that member states are obliged to offer is not mandatory for the user of plant protection products to participate in. However, if the training is not mandatory in a Member State, it can be assumed that at least agricultural users will participate in the training, as the demands in FWD are subject of Cross Compliance. Other users may participate in training if it will be demanded in national regulations or by demands from market.

Due to the fact that the calibration and technical checks are mandatory there is a need to provide the users with reasonable, simplified methods and protocols yet assuring a high level of protection of environment and good effect of the treatments with plant protection products. Also it has to be considered that the methods shall be part of training and that the protocols are subject for control and therefore also must be possible to understand for control staff. At best, harmonised methods are developed for calibration and technical checks of the equipment as well as their part in training are agreed on. The legal aspects of the time when the different parts of FWD are put into force and how the situation can be solved before all users have had the possibility to attend training and methods are available for inspection has to be considered.

Calibration

The essence of calibration is to know the output per area unit or treated mass. Mainly this is expressed as e.g. l/ha for sprayers or kg/ha for granule sprayers. Methods for calibration exist for all kinds of equipment. They can be found in operator manuals and are generally a part of training courses. Also technical aids for calibration are available e.g. tables, Calibration Disc or Calibration Slides. For sprayers: to get the output as l/ha it is necessary to know the flow, measured at the outlet or nozzle as l/min and the travelling speed as km/h. Formulas or technical aids can then be used to determine the output per ha. The users need guidance for calibration for different types of equipment. A checklist or protocol used for calibration can also be used for audits and controls. An example of protocol for calibration and examples of calibration methods are given in Annex A. Calibration of sprayers is further developed by Andersen and Jörgensen (2010).

Technical checks

Regular technical check should be carried out by the operator of the equipment as simple visual checks and functional tests without technical aids. The technical checks should consider relevant parameters in order to make them understood, accepted and useful for the user and guarantee a high level of safety to the society. The level of checks should be on a realistic level for the user and make it possible to control that the checks have been performed. The regular technical checks should be linked to the content in the inspection of the equipment in use reflecting the demands in FWD Annex 2. For the user of the equipment it is also essential that the check consider demands in quality assurance systems like Integrated Pest Management, IPM, and GLOBALGAP. As it can be assumed that it will take

considerable time to develop the methods for inspection of all kinds of equipment in professional use, also methods for technical checks may be basic in the beginning and later on further developed as methods and training are developed. It has to be considered that the methods for technical check also must be suitable for regular training courses. Basic demands for all kinds of equipment are that there shall be no leakage from the equipment, all the different parts shall be suitable for the appropriate application, in good condition and work reliably. A good basis for regular technical checks can be found in GLOBALGAP control points and compliance criteria, Guideline for visual inspection and functional tests of application equipment. These parameters are based on the requirements in the inspection of sprayers in use according to EN 13790:

1. There shall be no leakages from the pump, spray liquid tank (when the cover is closed), pipes, hoses and filters.
2. All devises for measuring, switching on and off, adjusting pressure and/or flow rate shall work reliably and there shall be no leakages.
3. The nozzle equipment shall be suitable for appropriate application of the plant protection products. All nozzles shall be identical (type, size, material and origin), form a uniform spray jet (e.g. uniform shape, homogenous spray) and there shall be no dripping after switching of the nozzles.
4. All the different parts of the equipment (sprayer), e.g. nozzle holder/carrier, filters, blower, etc shall be in good condition and work reliably.

Proposal for parts of sprayer to be checked on boom-sprayer, mist blower, band-sprayer, handheld sprayer with engine and other sprayers working with same principles:

Part	**Check method and demand**
Power transmission parts:	Visual check that there are no damages and that guards are in place and working properly.
Pump flow and agitation	Check with tank half full with clean water. Spray with the biggest nozzle on the highest used pressure. Visual check of the agitation in the tank. No leakages from the pump.
Tank	Visual check for leakages No leakages. Lid in place.
Armature	Check by operating that on-/off adjustments and measuring device work reliably. Manometer shows pressure stable. No leakage.
Pipes and hoses	Visual check. No leakages. Not disturbing spray pattern.
Filters	Filters not blocked. Good condition and works reliably.
Boom	Visual check. Boom is straight. No damages.
Boom-height adjustment and boom-end return works reliably.	Boom-height adjustment and boom-end return works reliably
Nozzles	Nozzles shall be suitable for the task. Identical. Good condition and work reliably. Spray pattern Visual inspection. No Spray pulsation. No dripping after shut off.
Fan	Visual check. Good condition. Guards are safe. Gear works (if applicable). No vibrations.
Chassis, wheels	Visual check of chassis, draw-bar, three-point connection, wheel axles and wheels including bearings. Good condition.

Parts to be checked on portable and handheld sprayers:

Part	Check method and demand
Pump	In good condition, works reliably.
	No leakage.
Tank	No leakage
Hose	No leakage
Handle	In good condition, works reliably.
	Even spray pattern.
	Even flow.
	No dripping.

The control points mentioned above are all possible to check without technical means. As they also are part of the inspection of sprayers in use, the check will ensure that the sprayer is well maintained and works reliably also between inspections and is should result in less remarks during inspections. Check of chassis, wheels etc are proposed to be a part of regular checks as it is relevant to prevent accident that may result in large-scale leakages of spray-liquid causing major contamination of environment and also human injuries.

A simple protocol with checkpoints is needed for the checks and for the controlling authority. The protocol should be realistic for the user to use and for the authority to audit. Examples of protocols with control points and check-methods are given in annex B.

Training

Training courses already exist in Member States with various levels of content. In most cases calibration and technical checks are already included in courses, so far at a level of best management practise and also reflecting recommendations given by manufacturers. As examples Denmark has a basic course to receive a “Spraying Certificate” on 74 hrs. The courses give a general certificate for use in agriculture, horticulture and forestry. Knowledge on sprayer’s construction, functions and adjustments is a part of the course. From 2009, a 1-day refresher course is demanded every 4 year, without exams. Another example, Sweden has a basic course on four days of which 4 hours are practical in calibration of knap sack sprayers and boom sprayers. Calibration and dosage calculations are important parts of the courses. A one-day refresher course is demanded every 5 years. Written exams are demanded on the courses. The participants need to give correct answers on calibration- and calculation questions to receive the certificate. The course gives a certificate for professional use of all plant protection products except seed-treatment that has a special course.

The FWD will cause Member States revision of the courses and development of new training courses. Concerning application equipment there will be obligations to deal with proper use of equipment subject to exemption from inspection as well as calibration and technical checks on equipment in a way that the performed measures can be recorded and controlled.

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Annex A

Example of Report for calibration

Equipment identity.

Type ……..

Owner ……

Date …… Calibration performed by: ……..

Signature: ……

Speed

Time for 100 m	Speed	Optional: gear, rpm, wheel size	Optional: Shown on display	Notes

Output

Nozzle type/output type and size	Number of nozzles	Measured l/min	speed	l/ha

Examples on calibration methods

For the user of the equipment it is necessary to measure output per nozzle and travel speed. Knowing this, the liquid-rate per hectare can be calculated.

For boom sprayers, knappsack and handheld sprayers, the wanted output per nozzle is calculated with the formula:

$$L/min = \frac{\text{liquide rate (l/ha) x speed (km/h) x nozzle distance (m)}}{600}$$

The driving- or walking speed can easily be calculated by measuring the time for driving 100 m. This is also useful for checking the functioning of sprayer computers:

$$\text{Speed (km/h)} = \frac{360}{\text{Time to drive 100 m /sec)}}$$

Knowing the output per nozzle and speed the liquid-rate can be calculated.

The flowrate should be measured representative for sprayer sections and for all present nozzle types or sizes.

$$\text{Liquid rate (l/ha)} = \frac{\text{nozzle flow (l/min) x 600}}{\text{Speed (km/h) x nozzle distance (m) (working width)}}$$

Hand-operated sprayer (lance)

$$\text{Nozzle flow (l/min)} = \frac{\text{Sprayed area (m2) x liquide rate (l/1000 m2)}}{\text{Time (sec) x 16,7}}$$

Mistblowers

Mistblowers for orchards, winery etc can be calibrated and checked by calculating the needed total flow for all nozzle and thereafter the wanted nozzle flow (l/min). It should be considered that different nozzle sizes can be used at the same time. Measurement of single nozzle flow should be made for each size on both sides of the sprayer.

Liquid flow for all nozzles

$$\text{Sum flow (l/min)} = \frac{\text{Liquid rate (l/ha) x speed (km/h) x row distance}}{600}$$

Single nozzle flow

$$\text{Nozzle flow (l/min)} = \frac{\text{Nozzle flow for all nozzles (l/min)}}{\text{Number of nozzles}}$$

Granule spreaders

Turn driving wheel 100 turns. Collect and measure the output amount from one or more outlets.

Calculate the output per hectar by

A = row distance

B = weight of collected output from 1 output after 100 turns

C = diameter of driving wheel

D = number of turns on driving wheel

E = number of spreaders/outputs

$$\text{Output rate (kg/ha)} = \frac{10 \times B}{A \times C \times D \times E \times 3{,}14}$$

Annex B

Example of report, Self certification Scheme Regular technical check of sprayer (boom-sprayer, mistblower, band-sprayer, handheld sprayer with engine….)

Date: ……..

Sprayer identity: Brand, type: Owner:

……. …….. …….

Check performed by: Signature:

…….. ……..

Checkpoint		Demands, check method	OK	To be repaired	Note
1	PTO-shaft	No damages			
2-3	Pump-flow/agitation	Tank half-full with water. Spray with biggest nozzle on highest pressure. Visual check of agitation in tank. No leakage from pump.			
4	Tank	No leakage Lid in place			
5	Armature	On/off- adjustments and measuring works reliably. Manometer shows pressure stabile. No leakage			
6	Pipes and hoses	No leakage. Not disturbing spray pattern.			
7	Filters	Not blocked. Good condition, works reliably.			
8	Boom	Straight. No damages. Boom-height adjustment and boom-end return works.			
9	Nozzles	Nozzles shall be suitable for task. Identical. Note nozzles. Good condition, work reliably. Spray pattern: visual inspection. No pulsation. No dripping after shut off			
10	Fan	Good condition, work reliably. Guards are safe. Gear works (if applicable). No vibrations.			
11	Chassis, wheels	Good condition No damages Visual check of chassis, draw-bar, three-point connection, wheel axles and wheels including bearings.			

Example of report: Self certification scheme regular technical check of sprayer (portable and handheld sprayers; knappsack sprayers, handheld sprayers….)

Date: ……..

Sprayer identity: Brand, type: Owner:

……. …….. …….

Check performed by: Signature:

…….. ……..

Checkpoint		Demands, check method.	OK	To be repaired	Note
1	Pump	Good condition, work reliably. No leakage.			
2	Tank	No leakage.			
3	Hose	No leakage.			
4	Handle	Good condition, work reliably. No leakage.			
5	Nozzle	Good condition, work reliably. Even spray pattern. Even flow. No dripping.			

Calibration of sprayers

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Summary

The origin of the word “calibration” is the matching of the bullet size to the size of the canon barrel - in other words a preparation that is necessary to ensure a desired well defined result.

For spraying, calibration is necessary to ensure targeted, optimal use of plant protection products, minimum risk to the crop, consumer, and environment and to avoid excess spray liquid at the end of the spray job.

This paper describes a practical method for calibration of field crop sprayers orchard sprayers and hand held sprayers as well as some aspects of calibration that may need further discussion and clarification: So far there are no well documented general answers telling at what wear rate nozzles should be changed, how chemical injection systems can be calibrated efficiently and safely.

Introduction.

In practice sprayer calibration is a method to check end ensure that:

1. The volume of spray liquid mixed in the spray tank will fit exactly with the area to be treated - leaving no left over volume to be disposed. Calibration will prove if:
   - The nozzles are worn a little and the pressure needs to be readjusted.
   - The nozzles are worn out and need to be changed.
   - The speed is correct. The tractor speedometer may be incorrect (dependent on e.g. tyre size).
   - The pressure gauge is incorrect or there is a pressure drop from gauge to nozzles that needs to be accounted for.
2. The nozzles are performing well (no damaged nor blocked nozzles).
3. The boom is adjusted correctly – correct height and in level.
4. the sprayer is in good shape and with no leakages.
5. Precise dose rates of plant protection products can be calculated and applied.

There is so far no standard for sprayer calibration, what parameters must be included in the calibration, how it should be carried out or what tools and accuracy is recommended.

The following describes a basic, low tech method aiming to check the sprayer regarding the above mentioned aspects.

However there is also a more holistic point of view from which a full calibration preparing the sprayer for the desired well defined result would include choice of droplet energy (a result of nozzle size, type and air assistance) adapted to target and weather conditions like wind speed, temperature and humidity. Traditionally the nozzle selection is dealt with separately from what is normally included in the calibration procedure. This paper suggests that future calibration encounters the total spray account as an aim to optimise on-target deposit and hereby minimising any off-target deposit, as described in figure 1 (Jørgensen and Witt 1997).

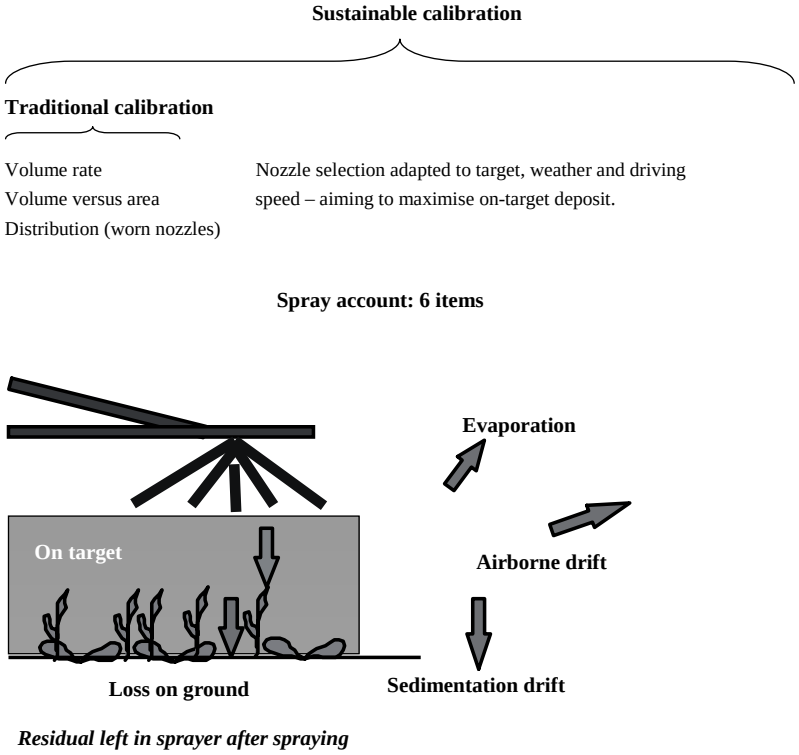


Fig. 1 The 6 items in a spray account describing where the spray liquid may end up. After Jørgensen and Witt 1997

Most sprayer manufacturers have described a calibration method in order to control the spray volume (l/ha). As many European countries require that sprayer operators pass an exam to be licensed to apply plant protection products there are also several books and leaflets giving the relevant instruction in how to check that a sprayer is operating safely and efficiently – in Denmark the official publication is called "Handbook for sprayer operators" (Spliid et al. 2008).

The following description of calibration is based on Hardi International's booklet "Spray Technique" available from the internet in 10 languages (Hardi International 2002). Any description of a calibration procedure will reflect decisions regarding "how often should calibration take place" and "how much nozzle wear can be tolerated", however reasoning and test results that may lie behind are rarely presented.

Field sprayer calibration – checking volume rate

Always start with a clean sprayer with clean water in the tank. For safety reasons nozzle checking should take place over an area covered with grass or other vegetation in the field. Always use gloves when touching the sprayer even though it has been cleaned. Personal Protective Equipment [such as gloves, coverall, boots] is intended for precautionary use only. Remember to take off gloves and any other Personal Protective Equipment – especially if contaminated - every time you enter the tractor.

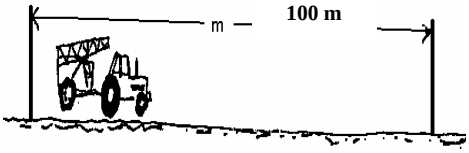
Every time a sprayer is calibrated make records of: tractor, tyre size, speed, gear, RPM, nozzle type and size, calibration pressure, theoretical and measured nozzle flow (l/min) and volume rate (l/ha).

A. Choice of spraying parameters:

The agrochemical label often suggests an all round efficient volume rate – l/ha. However own experience, special weather conditions and local research or need for high capacity may often lead to choosing an alternative - often lower - volume rate. Also driving speed can be very individual – some farmers look for high capacity through higher driving sped -others use a low speed to minimise drift and increase crop penetration. For uneven ground or simple boom suspensions lower forward speed is recommended. Often volume rate and driving speed are decided first – then the nozzle choice is limited to the possibilities within the accepted pressure range (normally 2 to 2.5 bar for conventional nozzles).

B. Check driving speed:

- Measure 100 meters. It may be useful to have some 'permanent' markers that are located in a convenient place (in a field or field like conditions).
- From the table in the tractor you find the gear to achieve the speed you want at a given rpm.



- Drive the measured distance (with a ½ filled tank) and measure the time.
- Calculate the speed:

$$\frac{\text{Distance driven (m) x 3.6}}{\text{Time (sec)}} = \text{km/h}$$

- If the speed check does not lead to the desired speed either choose another gear and check speed again or change the rpm to reach the required speed:

$$\frac{\text{RPM from speed check x required speed (km/h)}}{\text{(km/h) from speed check}} = \text{New RPM to get the required speed*}$$

*The pto-RPM should not exceed 540. If agitation is still acceptable the pto, RPM can be reduced down to about 400 as a minimum (that is – 25%). Some tractors and sprayer pumps run at around 1000 rpm at the PTO in stead of 540 rpm.

C. Calculate the required nozzle flow and choose nozzle size:

$$\frac{\text{Checked speed (km/h) x Water rate (l/ha) x nozzle spacing (m)}}{600} = \text{Flow for each nozzle (l/min)}$$

Find a suitable nozzle size in a nozzle catalogue

D. Check liquid system

- Always use clean water for calibration.
- Mount the chosen nozzles on the boom.
- Turn on the sprayer and spray at minimum 8 bar whilst you check the liquid system for any leakages.
- Check the agitation
- Nozzle performance. Always take a good look at the whole boom performing – try to have the sun behind the nozzles – and see if any nozzles are damaged or maybe partly blocked. "Stripes" in the spraying pattern is a sign of wear, and all nozzles should be changed.

E. Check nozzle output

- Set the pressure.
- Adjust even pressure valves on all boom sections.
- Measure the nozzle output for one minute.
- Repeat - measuring at least 2 nozzles for every boom section.
- Calculate average nozzle output.

If the nozzle output is not that required (and the nozzles are not worn more than 10 %)

pressure can be readjusted:

$$\left\langle \frac{\text{New output (l/min) 2}}{\text{Measured output (l/min)}} \right\rangle \text{ X Measured pressure = New pressure}$$

$$\frac{\text{600 x measured nozzle output (l/min)}}{\text{Nozzle spacing (m) x speed (km/h)}} = \text{l/ha}$$

F. Based on the size of area to be treated the volume of the total spray mix and how much plant protection product to add can now be calculated.

Field sprayer calibration – checking nozzle wear and uniformity

Wear test – all nozzles:

1 Fix a new nozzle on the boom (same brand, type and size as the ones you want to check). This is your reference nozzle

2 Check the flow of this nozzle at your spray pressure.

3 Calculate the maximum tolerated average flow
= flow for new nozzle + 10 % = l/min for new nozzle x 1.10

4 Check all nozzles at 3 bar

5 Calculate average. Sum of nozzle flows / number of nozzles

Uniformity

1. Calculate the maximum and minimum accepted limits for individual nozzle flows: +/- 5 % of the average measured above.
2. Check that all measured flows for the individual nozzles are within the limits. If one or more nozzles have higher deviations than + or – 5 % all nozzles must be changed.

Wear test – quick-test during the season:

A quick check-up during the season can be useful (but it still remains very important to carry out the full nozzle test for both wear and uniformity as specified at least at the beginning af a season). Measure the flow rate for a sample of nozzles – could be 2 nozzles per boom section - and check that individual flow for the measured nozzles does not exceed the worst case situation of more than 10% average wear plus a further 5 % deviation allowed for individual nozzles. Maximum wear (10 %) + maximum deviation (5 %) = 15 % meaning that 15 % increase in single nozzle output can be tolerated in the quick-test.

When to change to new nozzles:

When the average nozzle flow has increased by more than 10 % compared to the flow from a new nozzle – all nozzles must be changed to new ones. Does one or more nozzles deviate more than +/- 5 % compared to the average flow, it is sufficient to shift these nozzles if the average nozzle flow is increased less that 5 % compared to new nozzles. If the average flow has increased by more than 5 % and one or more single nozzle flows deviate more than +/- 5 % ALL nozzles on the boom must be changed.

How often must a sprayer be calibrated?

Before spraying with a new set of nozzles, new volume rate, new speed, new tyres, new pressure or any new field or equipment conditions:

- Check driving speed.
- Check nozzle flow and pressure.

Once a year (and before inspections) Hardi recommends a thorough check:

- Check driving speed.
- Check all nozzles.
  - if average output has increased more than 10% compared to new nozzles: change all nozzles.
  - if there is more than +/- 5 % deviation in nozzle output, change all nozzles.

During the season frequent quick-checks are recommended:

- Check 2 nozzles per boom section if one nozzle has more than 15 % increase in flow, change all nozzles.

The basic calibration as described above is based on following assumptions:

- Average nozzle flow (l/min) may not exceed output from new nozzles + 10 %.
- Single nozzle flow may not exceed output from new nozzles + 15 %.

Tools for quick calibration and boom distribution measurement

Many sprayer manufacturers are aware that the formula for calculation of total nozzle flow based on nozzle spacing, driving speed and the wanted volume rate (l/ha) is not very handy in practise. Therefore different aids have been made, like calibration wheels and rulers where the most used formulas are integrated. Also little programmes for PC and PDA are available for free download from some sprayer manufacturers. One of the more advanced examples is Calipilot from Hardi International. The Calipilot offers all necessary calculations for calibration and adding of plant protection product. Also nozzle wear is dealt with. The programme is available from the Hardi homepage.

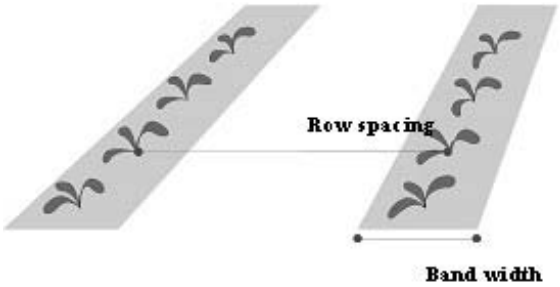
Also more advanced tools that take calibration beyond the crude measuring jug are available: from handheld units for measuring, saving and processing the nozzle flow rates to more or less advanced spray tables, some for simultaneous measurement of nozzles from a boom section and for visualising the distribution to advanced models that automatically read and process data for each 10 cm of a whole boom offering data like coefficience of variation as a description of boom distribution.

Electric control of valves and sprayer computers are making life more easy for sprayer operators – however speed monitors may be faulty either do to errors when setting or if not calibrated to specific tyres. Increase in flow rate due to nozzle wear may be encountered for automatically when setting a wanted volume rate – however the individual nozzles still need to be checked for wear and performance.

Bandspraying - Calibration method

Water volume rates [l/ha] in the treated band:

Label recommendations usually state total water volume rates l/ha, also called broadcast rates. When band spraying, we only want, to apply this broadcast rate in the bands, so instead we call it: l/ha in band.



Check forward speed (as in field sprayer calibration):

Find required nozzle capacity:

$$\frac{\text{l/ha in band x band width (m) x km/h}}{600} = \text{volume of water [l/min] for the band}$$

Total required water volume:

$$\frac{\text{area of field (ha) x l/ha in band x band width (m)}}{\text{row spacing (m)}} = \text{total volume required (l/field)}$$

Amount of agrochemical for a tank:

$$\frac{\text{Litres of water in tank x chemical dose (l/ha)*}}{\text{l/ha in band}} = \text{chemical per tank (l/ha)*}$$

*or [kg/ha] or [gram/ha]

Chemical injection systems - Calibration method

When spraying with chemical injection there are 2 or more pumps and a main water tank as well as chemical tanks contributing to the total flow. The injection pump can either be a higher pressure or a low pressure pump system (http://www.freepatentsonline.com/EP1289668.html):

- High pressure injection pump: can inject chemical close to the spray nozzle as it has sufficiently high pressure to overcome the pressure of the pumped water. Unfortunately, however, this makes calibration of the injection system difficult: any change in the back pressure of the system affects the output of the injection pump.
- Low pressure injection pumps: injects chemical before the sprayer's main pump. This allows accurate calibration of the amount of chemical mixed with the water but is slower acting than the high pressure injection since the chemical is injected a significant distance from the spray nozzle. PRACTICAL CALIBRATION: measured as l/min of pure chemical flow from the calibration nozzle.

Orchard sprayer calibration – different methods

Some chemical labels indicate what liquid volume per area either the traditional l/ha or Vertical canopy surface (Laubwandfläche) to use – others make de volume rate dependent on crown height. More and more the liquid volume is adapted to a canopy volume (Tree Row volume or Unit Crop Row). Common for all methods is that calibration of liquid flow can be measures as l/min – as illustrated in table 1.

Method "what do we relate chemical dose and water rate to?"	**Name of method**	**Calculate calibration unit: total l/min**
Surface area (litres/ha)	(traditional)	$\frac{\text{l/ha x spray width (m) x (km/h)}}{600} = \text{l/min}$
m crown height (litres/ha/m crown height)	"Crown height rate"	$\frac{\text{l/ha/m crown height x crown height (m) x spray width (m) x (km/h)}}{600} = \text{l/min}$
Vertical canopy surface (litres/vt.ha)	Laubwandfläche	$\frac{\text{l/vt.ha x 2 x crown height (m) x (km/h)}}{600} = \text{l/min}$
Canopy volume (litres/m3 or l/1000m3)	Tree Row Volume TRV	l/1000 m3 x crown height (m) x crown width(m) x (km/h) x 16.67 = l/min
Canopy volume (litres/UCR = litres/(1mx1mx100m) = "litres/100m3"	Unit Crop Row UCR	l/100 m3 x crown height(m) x crown width(m) x (km/h) x 16.67 = l/min
l/100 m row	Distance based	L/100 m x km/h/6 = l/min

Tab. 1 Different calibration factors for orcahrd sprayer calibration.

The following calibration guidance is a summary from Hardi's Mistblowing technique (Hardi Internationnal 1993)

Adjusting speed and air volume to orchard canopy volume.

Because forward speed is an influencing factor on the air volume presented to the crop, calibration starts by choosing a combination of air volume (where adjustable) and driving speed.

The theoretical air flow needed (m,3/h) for a given application can be calculated as follows:

$$Q\ (m^3/h) = \frac{1000}{k} * \text{speed (km/h)} * \text{tree height (m)} * \text{spray width (m)}$$

The k value is depending on crop density, for very dense canopies k is 2,5 and if the canopy is very open k is 3,5. Once the required air flow is established, the fan can be adjusted by increasing/decreasing the rotation speed or for some orchard sprayers by changing fan gear or blade angling.

Rule of thumb: At the optimum combination of air volume and speed the spray will only occasionally penetrate through the row.

After establishing the desired driving speed, the speed must be checked by driving in the orchard with the spray tank half filled with water – follow procedure as described for field sprayers.

Orchard sprayer calibration – checking l/min

For orchard sprayers all nozzles must be checked at the desired spray pressure and the total flow (l/min) calculated – or check nozzles on one side of the sprayer and multiply by 2. Then the actual l/ha can be calculated with the formula below – or other calibration units can be deducted from the formulas in table 1.

Normally it is necessary to use a flexible hose to lead calibration water form nozzle to measuring jug.

$$\text{Actual l/ha} \quad \frac{\text{Total actual l/min} \bullet 600}{\text{Km/h} \bullet \text{Row spacing (m)}} = \text{l/ha}$$

Pressure adjustment if not reaching the aimed flow:

$$\text{New Pressure} = \frac{(\text{New flow})^2}{\text{measured flow}} = \text{bar}$$

Tools for quick Orchard sprayer calibration

Over the years orchard sprayer manufacturers have made different efforts to make calibration easier. Good examples are the calibration wheel and small nozzle selection programme from Hardi International. The latter can be down loaded form the Spanish Hardi homepage.

Using water sensitive paper [WSP] to optimise orchard sprayer spray deposits

The goal in spraying is an even coverage of all target surfaces within the canopy and as little as possible waste above and below the target area. Optimally positioned Water Sensitive Paper within and around the canopy can help assess whether this is achieved and can be used to indicate how best to make improvements to the set up of the sprayer – to maximise on-target and minimise off target deposit.

If there are very few drop impacts on the WSP in the canopy area then try driving slower; a goal that may be best achieved by using a lower tractor gear at the same rpm. Recalibrate speed and recalculate l/ha.

Totally blue papers suggest a too high volume is applied and that run off would be likely on the leaves. If this overdosing occurs then try the use of a smaller nozzle size. Remember to recalibrate flow if changing nozzle sizes and/or pressures.

Totally blue papers can also suggest that too much spray is being lost through the row and is not being retained within the target canopy. Again try smaller nozzles or - when ground conditions allow - a higher driving speed. When spray is not reaching the top of the canopy try:

- a slower forward speed
- replacing the nozzle that is directed at this area with a higher output nozzle
- fitting a double or triple nozzle holder at this point to increase the locally emitted volume

Remember:

Recalibrate speed or l/ha when changing speed or nozzles.

Re-do the WSP check.

Write the exact spraying data on all your records with the relevant WSP.

Keep your calibration sheets ready for the next time you go spraying.

Remember to re-adjust nozzle setting and calibrate when changing from one orchard to another.

Calibration of hand held sprayers – 2 basic methods.

There are many techniques for calibration but only two are described in these notes (Hardi 2001). One method has assumed that there is guidance from the supplier of pesticide on nozzle type, water volumes and also nozzle pressure. The second method assumes very little guidance is available and few instruments to help the operator. Other labels may give dose and water volume rates for small areas

whilst others – only that for a hectare. Some products offer a concentration of solution with general guidance on what sort of target surface coverage should be gained whilst spraying.

General for both types of calibration:

- Fill the clean sprayer with water.
- Check that the sprayer is operating correctly and safely with no leakages.
- Practise spraying at comfortable nozzle height and find your personal walking speed, that you can maintain all though a spray job.
- Spray water on a dry, flat surface at the chosen nozzle height and operating pressure. Measure the width of the spray pattern – do not include tapered edges.

Tools: Stop watch, measuring tape (20 m +), 2 litre measuring jug, and preferably a pocket calculator.

Method 1 – "Spray 1 minute".

1. Mark out a line at least 100 m.
2. With comfortable walking speed and while spraying correctly, measure distance walked in 1 minute.
3. Spray into container and measure volume of spray emitted for one minute.
4. Calculate l/m2, and l/ha:

$$\frac{\text{Volume (l/min)}}{\text{swath (m)} * \text{speed (m/min)}} = \text{l/m}^2$$

$$\text{l/m2} * 10.000 = \text{l/ha}$$

Method 2 – "Spray 100m^2".

1. Make sure the sprayer is full – place on a horizontal surface and make a mark on the spray tank showing how much water is in the tank.
2. Based on the spray width (see table below) find out how far to walk in order to spray 100m^2.

100 m^2	
Spray width (m)	Spraying distance (m)
0,5	200
0,7	143
1	100
1,2	83
1,5	67

3. Spray 100 m at the practised nozzle height and walking speed.
4. Measure how much water is necessary to refill sprayer to the marking on the tank.
5. To find the volume rate (l/ha) multiply the measured quantity of water (l/100m2) with 10.000 m2/ha.

Handheld sprayers - Tools for quick calibration

Kalibottle

Need: Measuring tape, Kalibottle (instructions on bottle) – No calculator needed!

1. Measure width of spray swath.
2. Mark out 25 m2 using a convenient lay-out for this width. For example; if swath width is 0.5 m, a spraying distance of 50 m would be appropriate.

Table: Some useful dimensions for Kalibottle calibration

25 m2	
Swath width	Spraying distance
0.5 m	50.0 m
0.7 m	35.7 m
1.0 m	25.0 m
1.2 m	20.8 m
1.5 m	16.7 m

3. Fit Kalibottle to lance and with bottle hanging vertically from lance, “spray” this marked out area.
4. Application rate is read off the bottle.

Conclusion

The simple method for a traditional field sprayer calibration described above leads to some questions that may need clarification in the process of making a general guideline for calibration:

- How much nozzle wear can be tolerated? Is an average of the nozzle manufacturers statements of maximum acceptable wear rate acceptable in an official recommendation?
- Is it enough to make a visual check of liquid distribution or should the nozzles or the actual boom distribution be tested over a spray table?
- How often should a sprayer be calibrated – and what parameters at what intervals?
- For chemical injections systems a double calibration is needed – one for the grand sprayer liquid system and one for the injection system. For both high and low pressure injection pumps it is a challenge to deal with the cleaning of the measuring jug for measuring concentrated chemical.

The fact that more and more sprayer manufacturers offer manual or IT tools for easier calculation of calibration values indicates that there is a need for simplifying the process.

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Conclusions of Session 4

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Topics discussed

- Calibration methods are subject to many discussions and the best methods for bush- and tree crops are not agreed on.
- Recommended calibration methods vary between Member States.
- Factors that should cause new calibration or technical checks.
- Sprayer manufacturers already give recommendations on calibration and technical checks in operator handbooks. Should the demanded checks be different from theses?

Conclusions and draft proposal supplementations

- Calibrations should be km/h, l/min and airflow (if required).
- Calibration should be don annually, after repairs and after technical changes which also may be caused by changes of e.g weather, crop or development stage. At minimum equipment should be calibrated and checked every year before the treatment-season start.
- Technical checks should be done annually and after repairs and technical changes.
- Proposal for checklists/protocols are presented in Annex A and B.

List of subjects to be dealt with by SWG into account

- To develop training-courses it would useful with uniform recommendation for calibration.
- To develop training-courses it would useful with uniform recommendation for technical checks of equipment.
- The expression “regular” needs to be defined and recommendations to be given given at European level. There is a need for recommendations about intervals between calibrations and checks: if it should be in a timely base e.g. each year, every week, after specified hours use or if it should be related to treated area or quantity. Mixtures of definitions or other definitions may be relevant. The opinions and needs may vary between Member States.
- Equipment used very much e.g. many thousands of hectares per season, operating 24 hrs/day during high season or equipment used by contractors where the use also include road transports, may require other time tables. Another example requiring checks and calibration more often could be equipment for seed treatment treating very large quantities.
- There is a need for recommendations on protocols and checklist for regular calibrations and regular technical checks. The examples presented at SPISE 3 workshop and in Annex A and B can be used as basis.

Session 5: Member States shall establish certificate systems for mutual recognition of the certificates (according article 8/6)

Introduction paper

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Abstract

With the Frame Work Directive (FWD) each Member State (MS) is obliged to appoint a responsible body for implementing and running an inspection scheme for all PAE and shall inform the Commission thereof. This responsible bodies issues (or let grant on behalf of) the certificates for the inspected and approved sprayers. This certificate should exist of a (if possible) harmonised official test report and a label on the sprayer. This label shall be placed on a clearly visible place on the machine to make an easy check on the validity of the certificate possible. Both the test report and the label shall be unique and make clearly visible when the inspection expires.

In the FWD the mutual recognition of inspections between MS is organised. For realising a proper system of mutual recognition it is very important that the sprayer-inspection schemes in the different MS have an equal quality. Important is this case is a uniform execution of the inspections, within a MS but also in the different MS. Therefore a EU wide quality assurance system would be preferable.

Mutual recognition between the MS will only be possible if the expiring date of the last issued certificate of a sprayer is equal of shorter than the time period of the inspection interval applicable in its own territory and when each MS can be sure that the inspected sprayer fully fore fill the requirements in article 4 of paragraph 8 of the FWD. In paragraph 6 of the Framework Directive Sustainable use of Pesticides (FWD) is explained how the inspections should be organised in each Member State (MS) and are MS endeavoured to recognise certificates of inspected sprayers issued in other MS.

Responsible bodies.

To implement and execute the inspections of all application equipment for pesticides each MS have to establish a body which is in this MS responsible for implementing and running the testing scheme. It is the responsibility of each MS how to organise the testing scheme. It can be done by means of a State inspection service or the inspections can be done by private companies. The MS have also the freedom how to organise the responsible body and can set their own demands to such a body in terms of organisation and management. As stated in the FWD, the MS has to inform the Commission about this body.

- The main task of such a body is to organise that in a MS the inspections of all equipment is done in a uniform way in line with the article 8/4 in which are the requirements of the PAE. It is very important that all tests are done according to a high level of quality and that all tests are done in a uniform way. To organise this uniform inspections some things have to be done:
- There has to be clear standards how to test the equipment. For all different kinds of equipment there has to be uniform and clear standards. The base for performing the tests are the harmonised EN standards but for the test personnel there have a be a clear explanation of the interpretation of this standards to all types of equipment adopted to the specific needs in the MS. This is important to be sure that all tests are done in a uniform way.
- Important for a good quality and uniformity of the performed tests is well trained test personnel. This can both be personnel of a State inspection service or from private companies. There has to be a good basic training in which a proper education about the testing standard, the testing equipment and spraying technique. But in order to keep the level high, periodical refreshing courses are needed to keep the knowledge of the testers actual for new developments in spraying technique, testing equipment and development of the standards.

- There must be uniform guidelines for the requirements of test equipment and test conditions for the workshops or test teams. On base of the harmonised standards uniform guidelines for the equipment has to be made.
- The responsible body has to organise the issuing of certificated for equipment what is approved. The body can issue this certificates themselves or grant the workshops to issue this certificates on behalf of the responsible body. To have a good overview of all performed test in a MS and the results of the tests, it is needed the responsible body gather the results of all tests in a national database.
- To guarantee the quality and uniformity of all performed tests, a system of Quality Assurance in needed. This system should include all elements needed for control on the uniformity of the tests and shall contain elements like the organisation of the supervision on the workshops or test teams, control and calibration of test equipment, education of the test personnel, review on already inspected sprayers, etc.

Certificate systems

Each MS shall design and establish a system for issuing certificates for approved PAE. With this certificates the validity of the inspection can be verificated. In line with the harmonised standards, the results and conclusions of an inspection has to summarized on a test report. But for an easy verification a label should be placed on the tested sprayer. The relation between the test-report and the label can be made by a unique identification number both on the report and the label. In order to endeavour mutual recognition between the member states it is important that there is a uniformity in both test reports and labels.

Test report

The official test report shall give a clear and unique overview of the result of the performed test. It shall be clear that it is an official document, that is issued by or on behalf of the responsible body, what workshop, test operator or test team has performed the inspection, give a clear identification of the owner and the machine, have a unique identification (number) and show both the test date and date of expiring. In figure 1 is the header of an example of a test report shown.

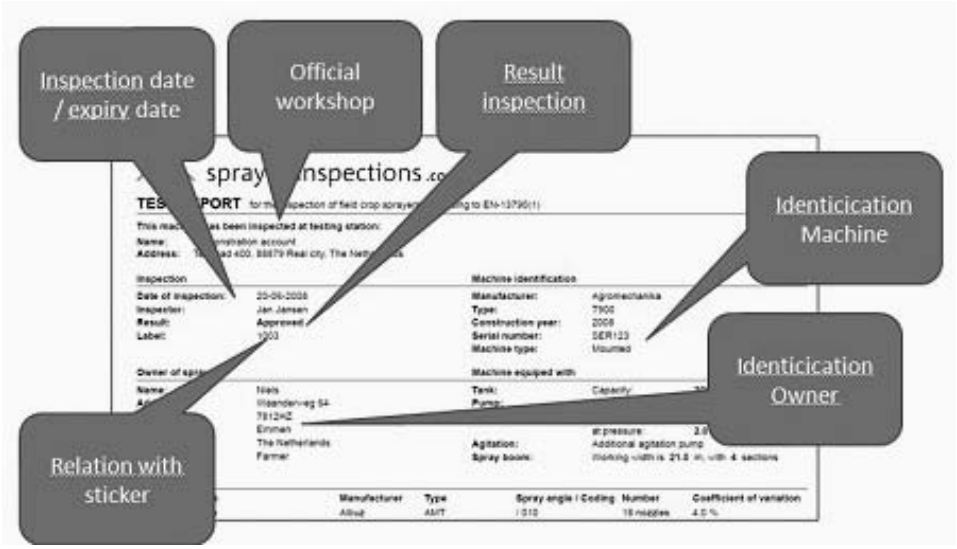

Fig. 1 Example of the header of a test report

The report shall also contain information about the results of the different parts of the test.

Label

For an easy validation of the validity of the inspection of a sprayer a label should be placed on a clearly visible place on the machine. By design of the label, it shall be clear that it is an official label. When the machine is tested with good results, the test operator will place the label on the machine. To have a relation with the test report, the label shall have a unique identification number. On the label shall also be clear what the expiring date of the certificate is. In figure 2 is an example of a label what is in use in the Netherlands.

Fig. 2 Example of a label for placing on approved machines

Mutual recognition

In the FWD Member States shall recognise certificates what are granted in other Member States. This is both important for owners, manufacturers and dealers of sprayers. This will prevent double inspections. This mutual recognition is most actual in border regions where farmers are working in different member states and in situations where new or used sprayers are being im- and exported to other MS. With this mutual recognition the farmer has the choice in which MS his sprayer will be inspected.

Important for the mutual recognition is that the MS have to sure that the certificated is issued by or on behalf of the responsible body of another MS and that the inspection is fully done in line with paragraph 4. The validity of the certificate must fit in the interval of the MS, the time period since the last inspection carried out in the other MS is equal to or shorter than the time period of the inspection interval applicable in its own territory.

Conclusion

The FWD provides MS to designate a body responsible for implementing a inspection scheme for all PAE. Important elements in implementing such a scheme are all cases what endeavour the uniformity and quality of the performed tests. The main tasks of this responsible body is to organise the inspection scheme in a uniform way and to grant certificates to approved PAE. This certificate exists of both an official test report and a label on the machine. With this elements a clear check on the validity of the certificate is possible. Mutual recognition of certificates between MS is forced by the FWD. For a proper mutual recognition a system of quality assurance of the performed inspections in needed.

An overview of the defects on tested field sprayers in Belgium

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Summary

In Belgium, the inspection of sprayers is performed by official and mobile teams ruled by two regional inspection authorities. The management of the inspection is done by the federal Ministry for Consumer Protection, Public Health and the Environment. Regional authorities need to have an ISO 17020 certification, so as a consequence the Belgian inspection is completely independent and objective. In this way inspection results are centralized and can be easily consulted. The inspection results are a very useful tool to have an overview of the general condition of the Belgian sprayers. Those results can be helpful when advising on changes in legislation. They can also be used as an instrument to advise farmers on how to improve their spraying machines, or what points they have to pay attention to when buying a new or second-hand machine. Therefore, a detailed overview is made of the inspection results of the year 2008.

Fig. 1 Measuring pressure in different boom sections

Introduction

Since 1995 sprayer inspection is mandatory in Belgium which makes it one of the forerunners in this field in Europe. At that time, the bad technical state of the sprayers, the excessive supplementary costs for the farmer consequent upon the waste of pesticides, the negative impact on the environment and the necessary restructuring of the European Agriculture to keep it competitive after the CAP reform and GATT negotiations were the main reasons for the implementation of the sprayer inspection (Huyghebaert et al). Now, the Framework Directive for a sustainable use of pesticides introduces the inspection for all pesticide application equipment in Europe.

In many ways, the mandatory inspection of sprayers in Belgium differs from inspections in other European countries (Braekman et al.). The inspection is carried out by two official governmental bodies: ILVO (Flemish region) and CRA-W (Walloon region). Those two official bodies are also accredited according to ISO 17020 (BELAC) which guarantees a maximum quality of the performed inspections. The inspection teams (3 in the Flemish region and 2 in the Walloon part) are equipped with a test van that contains all necessary equipment to perform testing according to Belgian legislation. The inspections are carried out at a neutral location and farmers/contractors are invited by letter at an exact date and time,

to present their sprayer for testing at this place. All over the country test locations are hired in a way that farmers/contractors don't need to travel great distances with their sprayers (maximum 15 km). At this moment about 21.200 machines are tested every 3 years, mainly boom and orchard sprayers. The inspection procedure is based on the analytical principle which means that all parts of the machine are tested separately. On average, one inspection team carries out about 12 inspections a day. After the inspection the farmer/contractor receives a clear certificate that confirms the approval of the sprayer for the next three years or that specifies all the items that need to be repaired in case of a rejection. No repairs are made to the sprayer during the inspection, so the farmer/contractor needs to repair the defects himself or leave the repairs up to a workshop. Consequently, the repaired sprayer has to be represented for a second passage. It is also worthwhile to mention that the inspections can be performed at a very competitive price!

Fig. 2 Inspection van with equipment

The diagnosis principle and rejection procedure

The protocol of inspection developed in Belgium fits EN 13790 for 95 % in terms of inspected criteria. However, the inspection methodology is based on the analytical principle which consists in measuring separately and independently the performances of the different parts of the sprayer so the defect(s) can be determined and a precise diagnosis can be made.

To illustrate the analytical principle, the check of the pressure stability can be mentioned. The pressure stability is described for a boom sprayer in EN 13790-1, paragraph 4.2.2. it specifies that "There shall be no visible pulsations caused by the pump". If one follows a simple inspection protocol, the inspection can be stopped after observing pressure pulsations on the working manometer for example.

Now, if one applies the analytical principle, further measurements, observations and analysis are carried out so as to determine the exact cause of the pressure pulsations. Indeed, pressure stability depends on several factors such as the pressure in the air-bell, the state of the diaphragm of the air-bell, the state of the induction and exhaust valves and the membranes of the pump, the air-tightness at the induction side of the pump, etc. With the analytical principle all these factors are measured or observed to determine the precise cause of the pressure pulsations and to advise the user properly on the repair(s) that need to be made.

Up to 58 criteria are verified on the sprayer, some are checked visually, some are subject to measurements (pressure, nozzle flow rate, nozzle spacing, volume/hectare, etc.). All checks and measurements are encoded and stored in a computer with tailor-written software. The analysis is done automatically and the report is printed on site.

The dysfunctions are listed in this report and classified according to their seriousness to disturb sprayer performances, together with advice on repairs. The combined analysis of the nature of the dysfunction and its cause allow determining the weight of this dysfunction in the inspection results. The dysfunction leads to a rejection of the sprayer if it significantly disturbs spraying or safety and if its origin is imputable to the user (lack of maintenance). Moreover, for objectivity reasons, the dysfunction leading to a rejection of the sprayer has to be determined in an indisputable and objective way (measurements). Thus, not all checked criteria lead to a rejection of the sprayer. Depending on the weighted analysis, the defect criterion will lead to a rejection. Moreover, the same defect criterion could lead to different consequences (rejection or not). From the 58 checked criteria, only 13 lead potentially to a rejection of the sprayer.

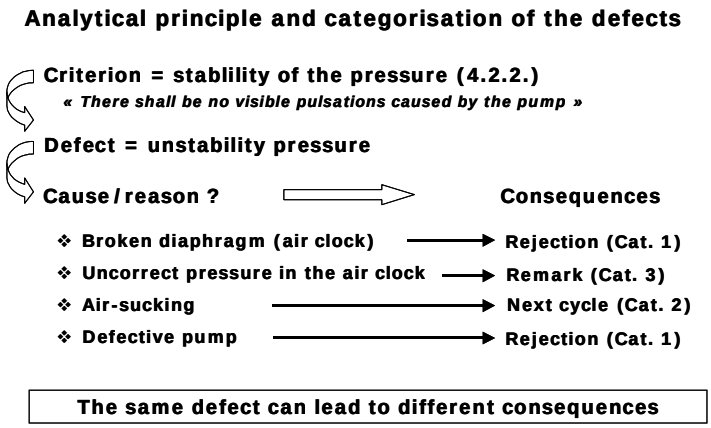

Fig. 3 Analytical principle and categorisation of the defects

The defects observed during the diagnosis are divided into three different categories:

Category I defects are defects that automatically entail a rejection. Faults within this category must be repaired within four months and the sprayer must be submitted for retesting.

Category II defects do not result in rejection, but should be repaired by the next inspection during the inspection interval. This means that the user has three years time (= one inspection cycle) to repair these defects.

Defects of **category III** are only added for information reasons and are aimed at improving the general operation of the sprayer. The user is completely free to follow these comments.

Overview of the defects of field crop sprayers

This overview is based on the inspection results obtained in 2008. Approximately 4900 sprayers were inspected, 580 (11,8 %) of which were rejected during the first passage. A sprayer can display several defects from different categories, or from one category (e.g. 2 defects cat. I). Also sprayers that received a pass can display defects from category II or category III.

Defects of category I

Defects of category I lead to rejection of the sprayer requiring repair and resubmission within 4 months after the first inspection. Between the first and the second inspection it is allowed to use the sprayer.

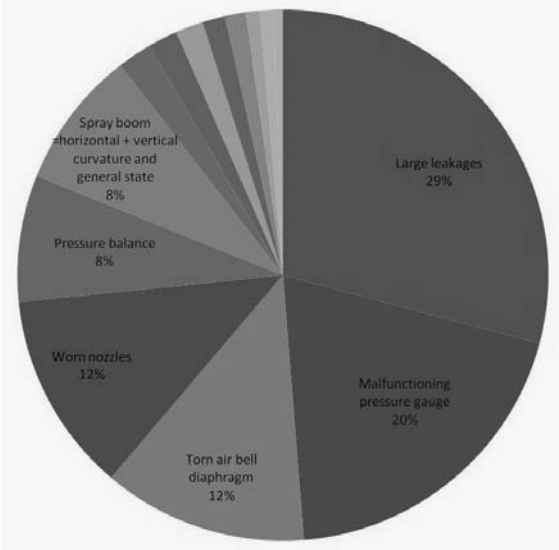

Fig. 4 An overview of Cat. I defects during 2008

Within category I defects, the largest number of rejections was caused by leakages (29 %). Although the user is asked to pay attention to leakages, this criterion often poses problems. Possible leakages are observed for spraying pressures from 2 to 5 bar and are measured by using a measuring cylinder and a chronometer when there is doubt about the size of the leaks. Leakages in excess of 30ml/min are considered as major leakages (Cat. I), leaks below 30ml/min are classified as minor (Cat. II). Major leakages (pump, tank, pipes, etc.) are considered as critical and automatically lead to a rejection of the sprayer.

Malfunctioning pressure gauges cause the second highest number of rejections (20 %). The sprayer pressure gauge is checked by comparison with a reference manometer. The whole measuring range is explored, generally from 2 to 5 bar. The pressure gauge on the sprayer is tested and the pressure is compared with that measured with a reference manometer placed on the sprayer boom. When the deviation exceeds 10 % the pressure gauge is dismantled from the sprayer and tested on a pressure test bench. When the deviation is also higher than 10 % on the test bench, the pressure gauge and the sprayer are rejected.

Fig. 5 Testing the work manometer

A torn air bell diaphragm is responsible for 12 % of the rejections. A torn diaphragm is one of the main causes of pressure instability. The pressure pulsations are detected on the working manometer as a rapid oscillation of the needle. Additionally, the inflating pressure of the air-bell is checked (1/3 to 1/2 of the spraying pressure). A broken diaphragm is detected when water squirts from the inflating valve. Another cause can be a defective pump. But this defect occurs much less frequently (1,5 %).

On the fourth place we find worn nozzles responsible for about 12 % of the rejections. The nozzles are removed from the boom and placed on a specific test bench where their flow rates are measured individually. The variation in flow rate compared with that of a new nozzle (the reference) is checked. When the deviation between the average flow rate of the inspected nozzles and the nominal flow rate exceeds the threshold, the complete nozzle set and sprayer are rejected.

The pressure balance between the different spray boom sections is certainly a major parameter that ensures equal feeding of all nozzles. The pressure deviation between the working manometer and the boom, but also between the different boom sections should be as small as possible. A manometer is placed on each boom section to check the pressures. The mean pressure is calculated from the results of all section manometers, and if the pressure deviation of one or more sections exceeds 10 % the sprayer is rejected. There can be different reasons for pressure heterogeneity: sections and/or feeding pipes of different length, clogged filters in the boom sections, blocked or strangled feeding pipes, and defective distribution block. According to the weighted analysis, only the last two defects lead to a rejection of the sprayer. About 8 % of the sprayers are rejected as a result of an unequal pressure between the different sections.

Fig. 6 Testing the spray computer

Also the state of the boom poses a lot of problems (8 %). About 3 % of the rejected sprayers display a major problem of horizontal curvature of the boom and 2 % have a problem with the vertical curvature. Spray boom slanting causes an uneven distribution and has to be avoided. Finally 3 % of the spray booms are also in a very bad general condition (torn weldings, completely rusted, asymmetric, etc.)

A number of Cat I problems also appear less frequently. Heterogeneity of the nozzle sets (type, size, angle) with an occurrence of 2 % of the rejected sprayers is nowadays lesser encountered. User awareness on the importance of this parameter is higher than in the past. Also defects involving sprayer regulation system are less frequent. Only a few of the rejected sprayers are affected by a defective pressure valve (1,8 %), a defective distribution block (1,7 %), malfunctioning sensors, flow meter or computer (0,8 %), and a maladjusted mechanical regulated pump (0,6 %). Finally defective pumps are responsible for about 1,6% of the rejections.

Defects of category II

Category II defects do not lead to a rejection of the sprayer. The user is encouraged to repair as soon as possible the determined defects of this category. Anyway, these defects have to be repaired by the next inspection (3 years later). If not repaired, these defects will result in a rejection.

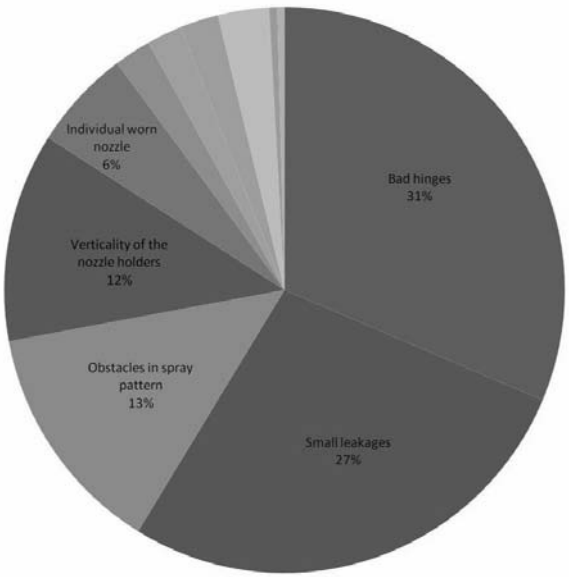

Fig. 7 An overview of CAT II defects

Category II defects refer mainly to spray boom problems (60 %).

Major problems involve bad hinges and loose connections (31 %). This causes irregular movements of the spray boom especially at the start and finish of spraying. Another frequently encountered problem are obstacles in the spray pattern (13 %), mostly tubes that are not sealed properly. There are also still many nozzle holders that are not positioned vertically (12 %) . Furthermore there are problems with the suspension system and balance of the boom (3 %), and the distance between the nozzle holders (1 %).

Also small leakages (<30ml/min) are quite frequent with an occurrence of 27 %.

In 6 % of the cases, only some nozzles of the set are worn and need to be replaced. Filtering causes fewer problems (2 %).

A rejected sprayer can also display defects from this second category.

Defects of category III

Defects of category III never lead to a rejection. The user is simply encouraged to repair the determined defects of this category. Those defects are of less importance, but their repair will improve spraying quality or user comfort.

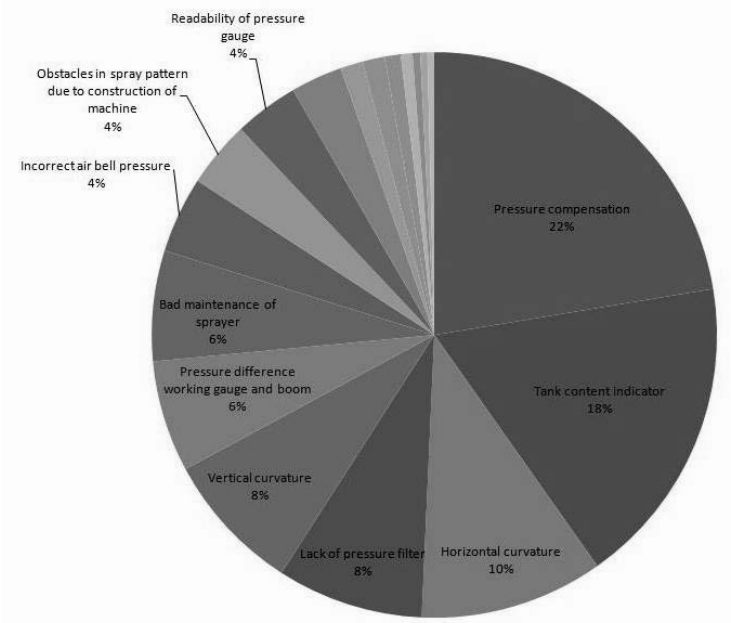

Fig. 8 An overview of CAT III defects

Many old sprayers don't have the pressure compensation (22 %). The user has to adjust the working pressure when he closes a boom section. Also a large number of problems concern the readability of the tank content indicator (unreadable or defect 18 %). Minor horizontal (10%) and vertical (8 %) curvatures are classified as category III defects. Some (older) sprayers lack a central pressure filter (8 %) and many sprayers also show a pressure drop between the working pressure gauge and the spray boom (6 %). Furthermore an incorrect air bell pressure (4 %), obstacles in the spray pattern as a result of bad machine construction (4 %) and poor readability of the pressure gauge (4 %) are also noted. There are also a large number of smaller faults that do not occur that often.

Conclusions

The farmers are as much as possible involved in the actual inspection and advice is given to the farmers about possible effects. All test results are registered in an official test report. Since the start of the inspection in Belgium, farmers became far more aware of the negative effects of a badly maintained sprayer resulting in a significant decrease in the number of rejections. Continuous information and training of farmers is still necessary to maintain or even improve the current maintenance level of the sprayers.

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Conclusions of Session 5

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Topic discussed:

- Is there a need for the creation of a EU-wide platform of the responsible bodies of all MS and can the SWG play a role in this? And what are the demands of such a platform?
- How can the uniformity of the inspection schemes in the different MS be promoted or guaranteed?
- Is there a need for a European database so that MS can easily check the validity of granted certificates of tested sprayers?
- How to define and deal with minor defects?
- How can the uniformity of test reports be better?
- What are the elements what have to stated on a label (shape, content, colour, etc.)?
- Can SPISE or the SWG play a role in endeavouring MS in mutual recognition of inspections between MS?

Some conclusions:

- At the moment there is no need for a central European database of issued certificated. Not all MS heave an inspection scheme running, not all MS have a central database and there will be problems with the misuse of data, place, management, admission and content of the database.
- Approved PAE should be issued with a certificated which exist of both a official test report and a label fixed on a clearly visible place on the machine
- The base for good and uniform inspections are harmonised EN standards. Therefore it is important that the standards EN-13790 are harmonised and official published. So that they can be implemented by the different MS. The priority will be the standards for both field crop and air-assisted sprayers, but there is also a need for harmonised standards for the other types of equipment.
- Mutual recognition between MS and easy validation of approved sprayers will be promoted by a uniform label. Uniformity in the content of the label and the colour of the label. For the colour is the colour coding of spray nozzles an idea (ISO 10625).
- At the moment there is no uniformity between MS how they deal with minor defects.
- Point of attention in the revision and harmonisation traject of CEN TC144 WG3 of the standards EN-13790:
  - A correct definition of minor defects.
  - Uniform test report.
  - Development of standards for other PAE as field-crop and air-assisted sprayers.

Listing of subjects to be dealt with by the SPISE Working Group:

- The SPISE workshops, the SWG and the SPISE website have already a role in giving information to MS with the implementation of sprayer inspection schemes. But the SWG can play a role in giving information to MS for implementing a sprayer testing scheme. This can be done in cooperation with the Commission.
- To make the communication between the responsible bodies and expert between MS more easier, the SWG can play a role in assembling a list of this body in the different MS.
- SWG can play a role in promoting a uniform label (content, colour, size, etc).
- In cooperation with the Commission the SWG can play a role in the development and execution of an auditing system for the inspection schemes in the MS.

Session 6: Defining criteria for rejecting pesticide application equipment, authorization and monitoring of workshop

Introduction paper

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Introduction to the session

In the Frame Work Directive (FWD) it is mentioned that "The inspection shall verify that pesticide application equipment (PAE) satisfies the relevant requirements listed in Annex II in order to achieve a high level of protection for human health and the environment" and that "Pesticide application equipment complying with harmonised standards developed shall be presumed to comply with the essential health and safety and environmental requirements" but nothing is clearly mentioned concerning the **criteria to be adopted to reject the PAE**. Should the PAE completely fulfil all the requirements listed in Annex II and /or in EN 13790 and future amendments to be able to pass the inspection? Could a PAE with minor defects be not rejected? For all these questions, at present, there are not harmonized answers and the situation is variable from Country to Country as it results from a specific questionnaire spread around Europe just before SPISE 3 Workshop (see Annex 1). For example, minor defects are not managed in the same way in the different Countries, therefore it actually happens that in about 57 % of EU countries the presence of minor defects can result in the rejection of the PAE, while in the other 43 % of countries it is necessary to detect a major defect on the sprayer to reject it after the inspection (Figure 1).

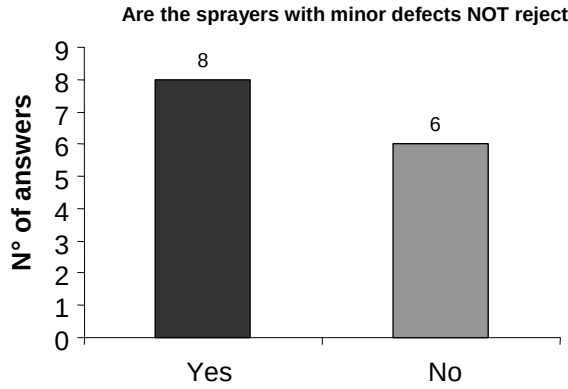


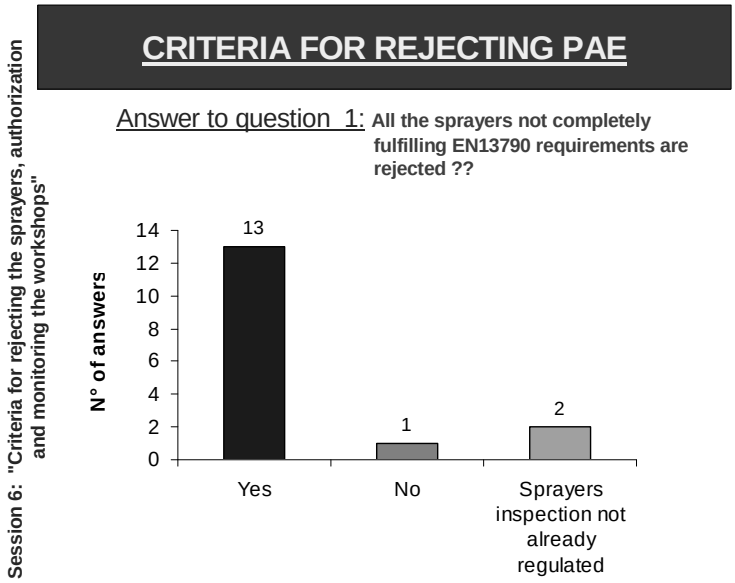
Fig. 1 Example of result of the survey carried out in EU countries concerning the criteria adopted to reject the inspected PAE.

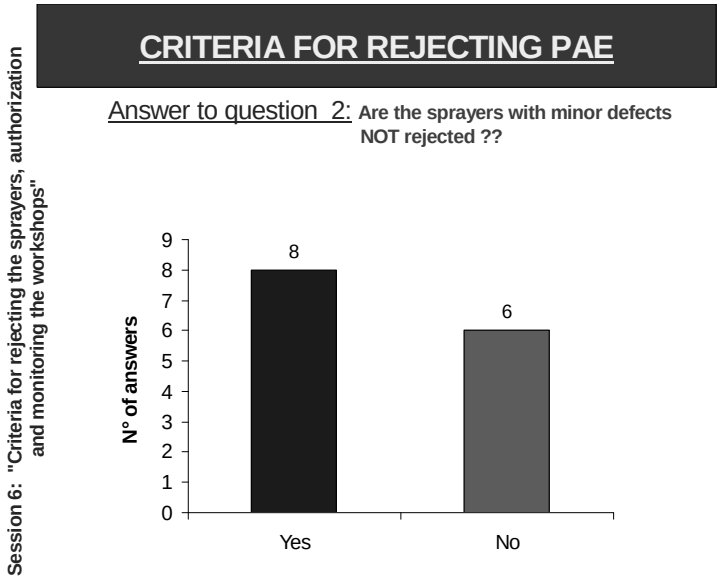
For what concerns the criteria for authorizing the inspection workshop in article 8 - paragraph 6 of the FWD it is mentioned that "Member States shall designate bodies responsible for implementing the inspections systems and inform the Commission therefore" but the criteria to be adopted for authorizing the bodies responsible for making the inspections are not defined. Should they have an internal certification like ISO 17020? Is this ISO certification too much restrictive and does it not allow to have the inspection implementation as required by the FMD? The Framework Directive also did not mention anything concerning the **monitoring of workshop activities**.

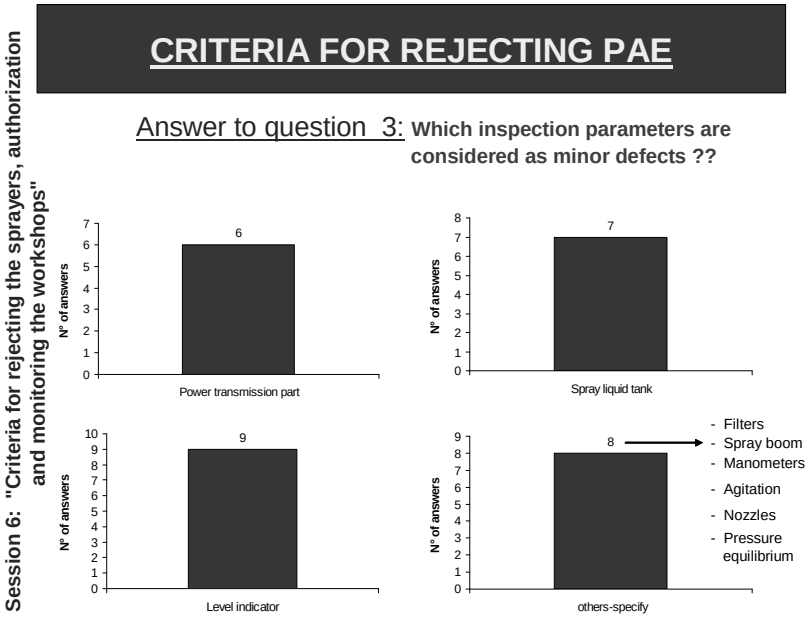
Member States previous experiences have very well underlined the importance of this activity that is also essential for having mutual recognitions possible. Which criteria should be considered for the monitoring? Which should be the background of the supervising Authority: ISO 17020, ISO9001? Others?

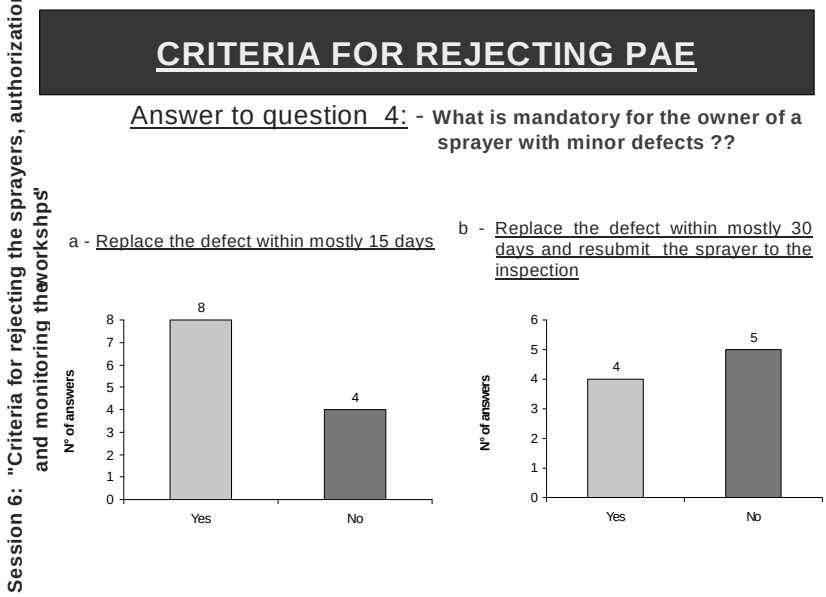
All these aspects have been mentioned during the introduction of session 6.

Annex 1





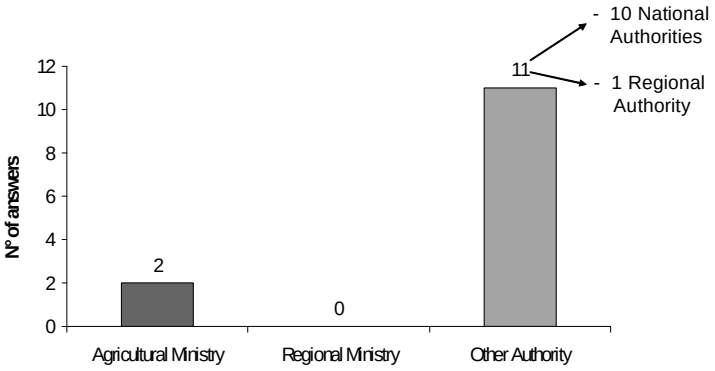

Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"
CRITERIA FOR REJECTING PAE
Answer to question 3: Which inspection parameters are considered as minor defects ??
Nº of answers
6
Power transmission part
7
Spray liquid tank
9
Level indicator
8
others-specify
- Filters
- Spray boom
- Manometers
- Agitation
- Nozzles
- Pressure equilibrium


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshps"
CRITERIA FOR REJECTING PAE
Answer to question 4: - What is mandatory for the owner of a sprayer with minor defects ??
a - Replace the defect within mostly 15 days
Nº of answers
8
4
Yes
No
b - Replace the defect within mostly 30 days and resubmit the sprayer to the inspection
4
5
Yes
No

Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 5: **Which Authority gave the Workshop Authorization ??**

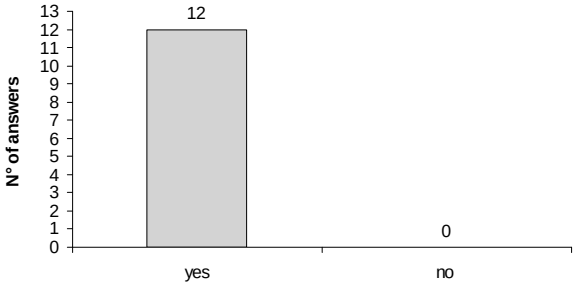


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization ??**

a – Inspector trained background

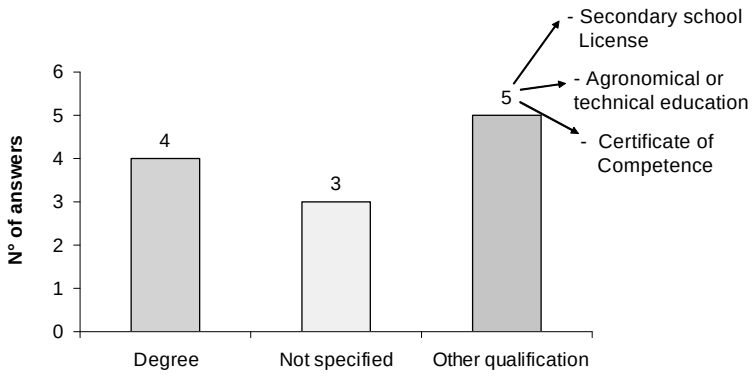


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization ??**

b – Inspector trained background required

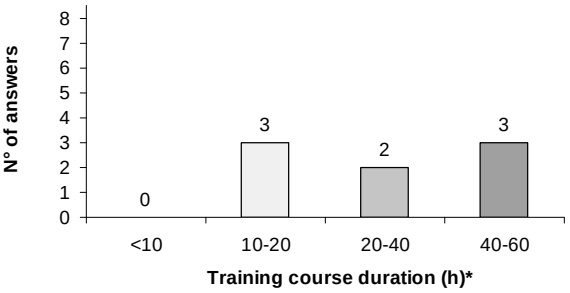


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization ??**

c – Inspector trained background required: **training course duration**



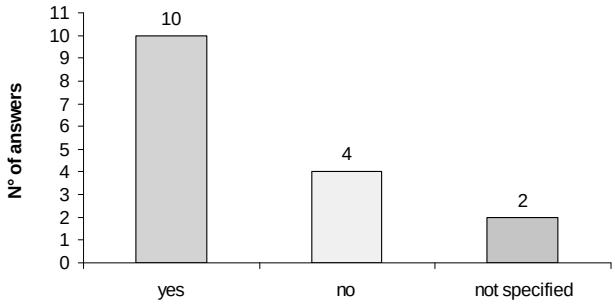
* Assuming 1 days = 8 h

Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization ??**

d – Workshop should have a suitable structure ??

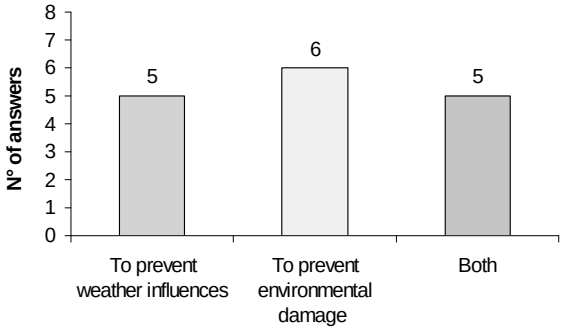


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization??**

e – Type of Workshop structure required

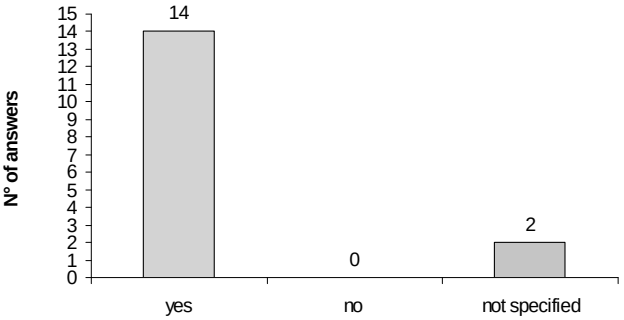


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization ??**

f – Workshop should have suitable instruments ??

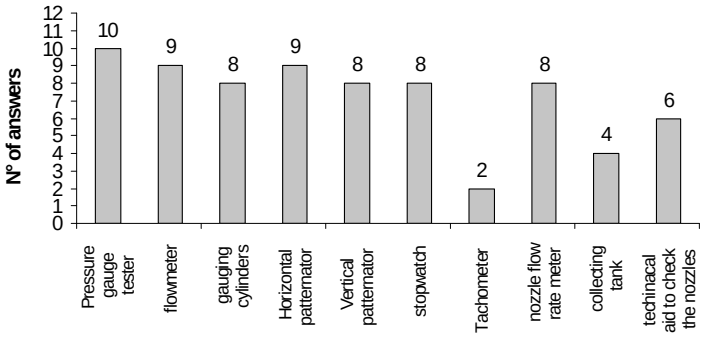


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization ??**

g – Workshop suitable instruments necessary

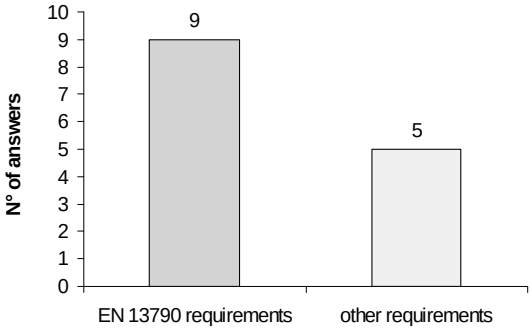


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

Answer to question 6: **Which are the requirements to obtain the authorization ??**

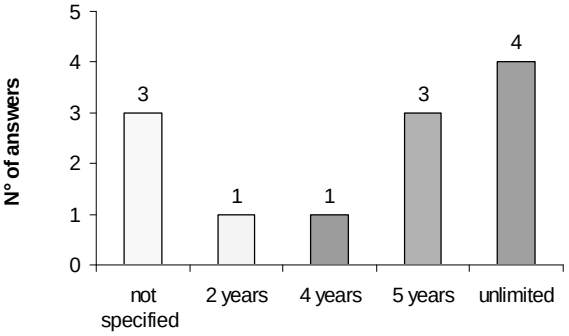
h – Which requirements has the patternator to fulfill??



Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

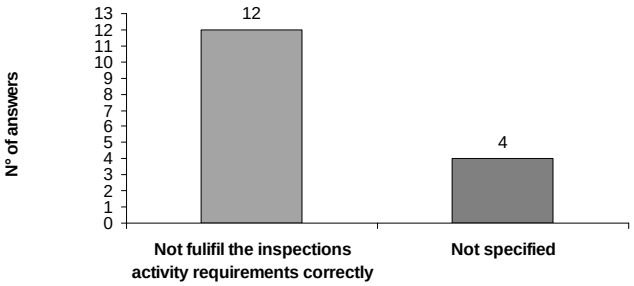
Answer to question 7: **How long the Workshop authorization is in force ??**



Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR AUTHORISING THE WORKSHOP

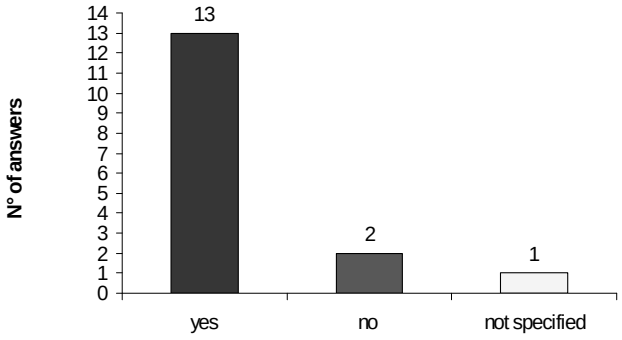
Answer to question 8: **Which criteria are adopted to cancel the workshop authorization** ??



Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR MONITORING THE WORKSHOP ACTIVITIES

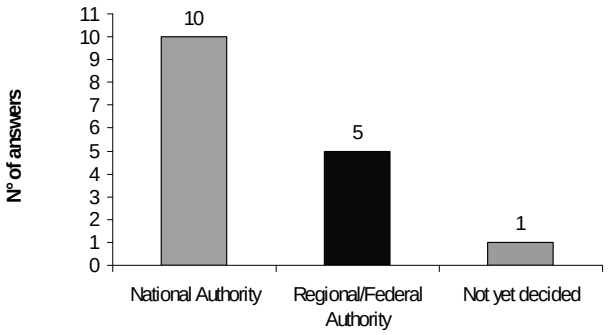
Answer to question 9: **Is it at present in force the workshop monitoring in your Country ??**



Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR MONITORING THE WORKSHOP ACTIVITIES

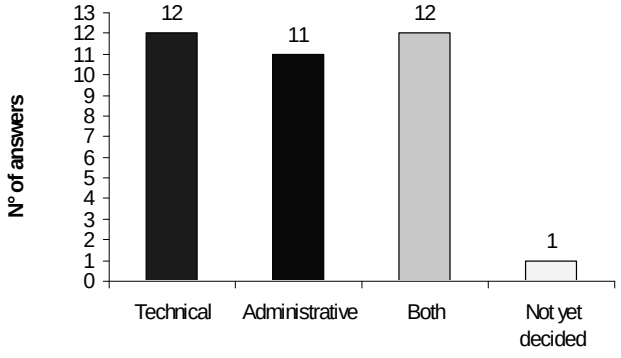
Answer to question 10: **Who (will) make the workshop monitoring ??**



Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR MONITORING THE WORKSHOP ACTIVITIES

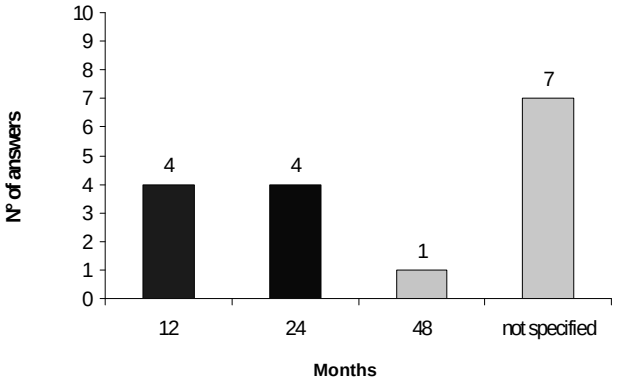
Answer to question 11: **Main aspects analyzed for the workshop monitoring**



Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR MONITORING THE WORKSHOP ACTIVITIES

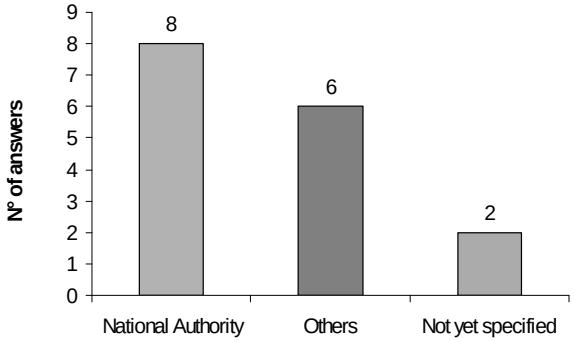
Answer to question 12: **With which frequency is made the workshop monitoring ??**



Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR MONITORING THE WORKSHOP ACTIVITIES

Answer to question 13: **Who (will) collect the national results of the inspections ??**

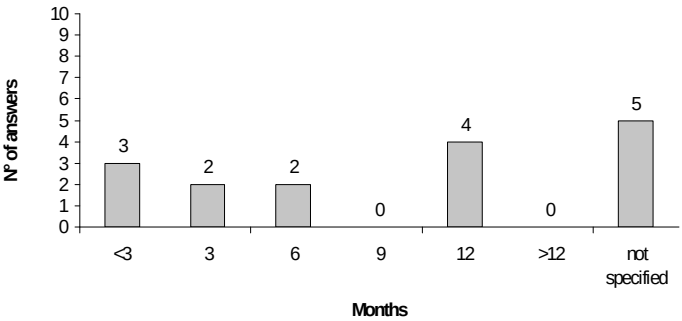


Session 6: "Criteria for rejecting the sprayers, authorization and monitoring the workshops"

CRITERIA FOR MONITORING THE WORKSHOP ACTIVITIES

Answer to question 13: **Who (will) collect the national results of the inspections??**

- With which frequency are collected the results of the inspections at National level ??



The evaluation of sprayers inspection procedure in Italy

Balsari, P.; Marucco, M.; Oggero, G.
DEIAFA Sez. Meccanica – Università di TorinoVia L. Da Vinci 44, Grugliasco (TO), Italy

Summary

In these last years the activity of inspection of sprayers in use in Italy improved with an increased number of authorised workshops and licensed technicians in most of the Italian Regions.

With the approval of the new European Directive on the sustainable use of pesticides, the exigency to be aligned with all the other EU countries concerning the management of the inspections of sprayers in use has become a priority for Italy. The first step is to harmonise the methodology for sprayers inspections tests at national level.

To reach this objective, the National Board for Agricultural Mechanisation (ENAMA), charged by the Ministry of Agriculture, is carrying out a specific program, which started in 2005, through a technical working group leaded by DEIAFA – University of Turin and involving most of Italian Regional Administrations. After the definition of the test methodology to inspect sprayers in use and of the requirements for workshops, in the last two years the technical working group focussed the attention on the monitoring of the inspections activity and on the compliance of workshops with more severe requirements in order to guarantee a good quality level of inspections.

Introduction

In the four years of activity of the ENAMA Working Group (2005-2009) 12 documents which contain the guidelines and the indications for applying a common and standardised test methodology to inspect the sprayers in use in Italy were produced. In the guidelines all information are reported in order to activate and to manage the sprayer inspection service, to train the licensed technicians charged of making the inspections and concerning the minimum requirements that the equipment used by testing stations (workshops) must fulfil.

Between 2008 and 2009 three new documents have been prepared to integrate the guidelines reported in the previous documents. More in details, two of these documents (identified as ENAMA Document n° 13 and n° 14 respectively) concern the test methods and monitoring of the inspection activity, including the equipment used by the testing stations to carry out the inspections, the assessment of the activity made by the licensed technicians and a further certification issued by ENAMA to the authorised workshops. The third document (ENAMA Document n° 15) is actually still at a draft stage and is aimed at defining the guidelines for an ad hoc program about the adjustment of sprayers.

Periodical inspection of the activity carried out by the workshops and by the licensed technicians – ENAMA Document n° 13

How the inspection is made

The need of making periodical checks on the activity of inspection of sprayers in use, on the equipment used to carry out these inspections (test benches, flow meters, manometers, etc.) led to the issue of a specific ENAMA document (n° 13) that provides common and precise guidelines in order to verify the efficiency and the correctness of the service made by the workshops and by the licensed technicians.

ENAMA Document n° 13 therefore states a common procedure for monitoring the activity of workshops and licensed technicians, indicating the frequency of the checks and the disciplinary actions or the fines that are foreseen in case any irregularity is verified.

The periodical checks for workshops and licensed technicians concern:

- The control of the validity of the official license for sprayers inspections and its registration in the national database.
- The correct application of the test methods for sprayers inspections reported in the ENAMA documents.
- The management of data collected during the sprayers inspection using the appropriate official forms.
- The correct storage of the documents on informatics support.
- The efficiency of the equipment used to make the sprayers inspections.

Both workshops and licensed technicians are checked either during the inspections or afterwards on the already inspected sprayers; in this latter case it is checked the exactness of the inspection results reported in the official documentation.

All checks of workshops and of licensed technicians are carried out according to defined checklists that are included in ENAMA Document n°13.

Disciplinary actions in case of irregularities verified during the check

In case any irregularity is verified concerning the activities of workshops or technicians, as it is reported in the document, disciplinary actions are foreseen, consisting in the suspension or in the withdrawal of the authorisation/license.

The decision about the type and terms of the disciplinary action is taken by the Regional Administration where the workshop/technician operates.

The suspension of the authorisation for the workshops is foreseen in the following cases:

- Refusal or discrimination in providing the sprayers inspection service without any valid technical or operative reason.
- Missed execution of the prescriptions given by the responsible of check within the stated terms.
- Application of fees for the sprayer inspections higher than those established by the Regional Administration.

The authorisation withdrawal procedure is foreseen in case that the workshop refuses to be checked by the competent authorities or when one irregularity in the workshop activities is repeated more times.

For what concerns licensed technicians, the suspension of the license can be due to a proved irregularity during the sprayers inspection activity or even to the not justified and repeated absence at the periodical refreshment courses organised by the Regional Administration where the technician operates.

The withdrawal of the license is applied when, over a period stated by the Regional Administration, the technician has been suspended two times.

When the workshops and/or the technicians are subjected to the authorisation/license withdrawal, at the end of the penalty period, they must repeat the procedure to get the authorisation/license for sprayers inspection.

ENAMA certificate of workshops compliance (ENAMA Document n°14)

The ENAMA certificate of workshops compliance was created in order to guarantee the adequate quality and operative level for workshops activities and their equipment through more frequent and more severe checks with respect to the ordinary program. This kind of voluntary certification is therefore an added value for workshops that already have the official authorisation to make sprayers inspection. To realise the ENAMA Document n° 14 the International Standard ISO/IEC 17020 was taken as reference. It contains “the general criteria for the functioning of the organisations that look after inspection activities”. In details, the parts of the ISO/IEC 17020 Standard concerning the administrative requirements, the data and inspection results management (privacy policies), the quality of inspection activity, the equipment used, the inspection methods and the recording of inspection results (test reports and inspection certificates) related to workshops were taken into account.

Requirements that workshops must fulfil to obtain the certificate of compliance

Workshops officially authorised to make sprayers inspections that ask for the ENAMA certificate of compliance must provide ENAMA with a set of documents concerning their activity, structures, technical personnel and equipment used to inspect sprayers.

The following documents have to be attached to the request form for the ENAMA certificate of compliance:

- Names and licenses of the technicians who make sprayers inspections in the workshop.
- Declaration in which the workshop agrees to transfer the results of sprayers inspections to the reference board or regional office at regular intervals, by internet and ad hoc software.
- Declaration in which the workshop agrees to allow his licensed technicians to attend the periodical refreshment courses organised by the Regional Administration.
- Declaration in which the workshop confirms that the inspection activity carried out is complying with the impartiality principles and privacy policies.

In order to obtain the ENAMA certificate of compliance it is also necessary that the workshops, besides the requiremens stated in the ENAMA Documents n° 1, 3, 4 and 8b, are equipped with:

a) An adequate protection from weather influence (rain and wind) in the place where sprayers inspection tests are made.
b) Instruments to register weather conditions which may influence the inspection test results.
c) A flat area provided with a collecting and disposal system for the liquid sprayed during the inspection tests.
d) A system to properly send away the gas emissions from the tractors or self-propelled sprayers if tests are conducted indoor.
e) A set of 12 V power supplies to feed the eventual sprayer instruments or the test benches.

Workshop equipment provided with the ENAMA certificate of compliance

Workshop equipment used for sprayers inspections which have the ENAMA certificate of compliance, besides the minimum technical requirements stated in ENAMA documents n° 3, 4 and 8b, must be provided (when this is possible) with an official documentation issued by a recognised organisation, proving their correct functionality and calibration. Instruments which need calibration or adjustment procedures have to be checked periodically by certification boards previously stated. Eventual not correct functioning, repairs, or changes of instruments must be reported by the workshop to the organisation responsible of the sprayers inspections (ENAMA or delegated organisation).

Monitoring of workshops provided with the ENAMA certificate of compliance

Workshops that have the ENAMA certificate of compliance are subjected to checks that are carried out systematically every two years by an organisation nominated by ENAMA. Control procedures are the same as those adopted for the ordinary monitoring of authorised workshops. More attention however will be focussed on equipment and instruments used for the inspections, examining the documents related to their calibration and functionality.

Transfer of data and results of sprayers inspections

Certified workshops shall transmit directly to ENAMA the results of sprayers inspections every 15 days using an ad hoc software supplied by ENAMA. Any miss or delay in transferring the data shall be justified and reported to ENAMA.

Validity and withdrawal or the ENAMA certificate of compliance

The certificate of compliance is valid for 4 years; within three months before its expiration, the workshop can ask for its renewal provided that it still fulfils all the necessary requirements. When the workshop is not more suited ENAMA can withdraw the certificate of compliance or can reject the request for renewal. The withdrawal of the ENAMA certificate of compliance is automatic if the workshop official authorisation to make sprayers inspections is suspended or withdrawn for any reason.

Conclusions

The monitoring of the sprayers inspection activity carried out by the authorised workshops is one of the main aspects reported in the new EU Directives and therefore it is very important for the EU countries that joined SPISE. One of the objectives to be reached is to define common guidelines to make the checks of workshops in all EU countries where the sprayer inspection service is in force and regulated by law. In particular, these guidelines should report a standard procedure to certify the equipment and instruments used by the workshops, defining their minimum technical requirements and the periodical checks to be made on them.

This would allow to establish a specific ENTAM certification not only for the inspection equipment but for the whole workshops.

A further step could be the realisation of a European database of the authorised workshops so to have updated information available about the evolution of sprayers inspection activity in the different countries.

Conclusions of Session 6

Balsari, P.

DEIAFA Sez. Meccanica, Università di Torino, Via L. Da Vinci 44, Grugliasco (TO), Italy

Topics discussed

During Session 6 of 3rd SPISE Workshop, it was presented the actual state of the art in the EU Member States concerning the criteria to reject the sprayers after the inspections and the procedures adopted for authorising the workshops delegated to carry out the inspection of sprayers in use on the territory and then to monitor their activity.

For what concerns the criteria for authorizing the inspection workshop, during Session 6 it was presented the experience of Italy, where the National Board for Agricultural Mechanisation (ENAMA) establishes the minimum technical requirements that an inspection workshop must have, while the formal authorisation to operate the inspections is provided by the Regional Administrations.

Concerning monitoring of workshop activities, during Session 6 it was presented more in details the Italian situation, where the monitoring of the inspection workshops is carried out by the Regional Administrations responsible to organise the sprayers inspection service on their territory or by ENAMA, following a specific protocol which allow to obtain a specific Workshop Certification. The monitoring of workshops, in Italy, is carried out every 12 or every 24 months in function of the number of sprayers inspected per year (less or more than 200) and concerns the evaluation of documents, inspection devices and personnel.

For what concerns the criteria to reject the PAE, it is very important that the MS agree each other on the regulations which concern other MS, because otherwise the mutual recognition of the inspections is not possible and this can arise several problems (e.g. in border areas). Taking into account the results of the inquiry and the experience of MS that started several years ago the PAE inspection activity (like Germany, Belgium, the Netherlands), it is suggested to consider as harmonized criteria for rejecting sprayers that they do not fulfil the requirements of the EN 13790 and future amendments with the exception of the minor defects as defined during Session 5 of 3rd SPISE Workshop.

Some conclusions

Due to the positive experience gathered by some MS and considering the results acquired from the inquiry it is suggested to have the following harmonized criteria for Workshop Authorization:

a) Inspector with an appropriate background;
b) A suitable structure to prevent weather interference during the inspection and environmental damage;
c) Suitable workshop instruments (following EN 13790 requirements or certified by ENTAM – European Network for Testing of Agricultural Machines).

Finally, regarding the **monitoring of workshops activities**, the harmonized proposal that takes into account also the results carried out from the specific inquiry made is to:

a) Monitor the workshop activity in terms of technical and administrative requirements with a frequency of not more that 24 months;
b) When possible, make the workshop monitoring carried out by certified Authorities (EN 1270 - ISO 9001- ISO 17025);
c) Promote the creation of an EU database of the authorized workshops.

Closing Session

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Concluding remarks of the workshop

The aim of the Workshop was to discuss article 8 of the Framework Directive (the inspection of plant protection equipment already in use) and to reach conclusions for implementing equipment inspections in the Member States.

The participants came from testing and research institutes, administration departments and companies and the majority possessed technical expertise so that in particular practical implementation was the focal point of the Workshop.

The results of the workshop can be summarised as follows:

1. Mrs. van Tongelen asked the participants to take part in the 2nd meeting of experts (in accordance with article 18) which is planned for June 2010.
2. Mr Fraser explained why the certification of new equipment is organised by the Machine Directive and the inspection of plant protection equipment already in use by the Framework Directive.
3. Mr Hagenvall (ECPA) emphasised that equipment which works well is an important prerequisite for the complete efficacy of plant protection products and for avoiding negative effects.
4. Mr Oldenkamp (CEMA) welcomed the harmonisation of equipment inspections because this means that national regulations will be phased out. He supports the inspection of new equipment by the manufacturers at their factory and before delivery to the customers. (This approach is already used successfully for some neighbouring Member States based on bilateral agreements).
5. Mr. Rademacher (COPA) would welcome a similar inspection for plant protection equipment already in use in the Member States and called for the harmonisation of the inspection procedure and inspection intervals.
6. Mr. Wehmann reported on the results of a survey in the Member States on the present situation of the inspection procedure for plant protection equipment already in use. He established the fact that the compulsory inspection has now been introduced to all participating countries or that this is definitely intended in the next few years.
7. It was considered practical and equivalent for the inspection of plant protection equipment to be carried out both by officially certified inspection workshops and offices of the official service (as is the case, for example, in Belgium, Germany and the Netherlands).
8. Most Member States which have not yet had as much experience with plant protection equipment inspections will keep to inspection intervals of 5 years; other Member States considered a shorter interval to be more practical.
9. Inspections of new equipment after 5 years at the latest following their first use, as provided for in article 8 § 2, is not seen as being particularly practical. An inspection which takes place immediately at the manufacturer's is considered as being practical and is supported.
10. The question also arose as to whether an operator can have his plant protection equipment inspected in a neighbouring Member State where the inspection is easier and cheaper.
11. It remained open as to whether Member States have to offer inspections for all plant protection equipment or whether plant protection equipment owners can also be referred to offers from other Member States (e.g. for aircraft).
12. It has to be clarified for which types of construction the Member States may use different schedules and inspection intervals and which types of construction may be exempt from inspections.

13. It has to be clarified how the assessment of risks for human health and the environment, including an assessment of the scope of use of the equipment, should be carried out in order to be able to examine certain types of construction independently of the regular inspection intervals or to exclude them entirely from the inspection. The question arose as to whether EN/ISO 12100 - Safety of machinery - General principles for design, risk assessment and risk reduction (ISO/DIS 12100:2009) can be used as a basis for the required risk assessment.
14. When introducing equipment inspections to the Member States it is considered suitable and practicable to limit these first of all to the type of construction, for which the corresponding EN standards have already been published in the Official Journal (EU).
15. In conjunction with the inspection of handheld plant protection equipment and knapsack sprayers, training operating personnel is considered very important. Studies have shown that the 'human' factor is just as important as the factor 'equipment'.
16. The Commission has assigned the CEN the task of drawing up standards for the inspection of plant protection equipment. A first meeting of the CEN/TC 144/WG 3 which has been assigned the task took place on 20 and 21 October 2009 in Paris.
17. The participants expected that this standardisation work by the WG 3 would be promoted and be high up on the list of priority.
18. Alternatives for inspecting plant protection equipment without having mandated standards available were discussed and demonstrated by the JKI/AT using examples.
19. In accordance with article 8 § 5 operators are obliged to carry out regular calibrations and technical checks. To this end interesting case studies were shown and explained.
20. The required certification regulations for the mutual recognition of inspections can be limited to the submission of a valid inspection report and a valid inspection sticker on the plant protection equipment. A separate and more detailed certificate is not deemed necessary. The inspection report is stipulated by EN 13790. The inspection sticker itself (shape, print design) was not discussed in any greater detail.
21. It was suggested to orientate the colour of the inspection sticker around ISO 10625 (colour coding for nozzles).
22. Furthermore, the criteria for not issuing inspection stickers and for recognition and monitoring officially recognised inspection workshops were addressed. In this context, reference was made to exemplary regulations from the Netherlands, Belgium and Germany which can be found on the SPISE website.
23. Monitoring recognised inspection workshops was seen as essential, harmonisation was considered necessary. Accreditation according to ISO 9000/ISO 17020 was seen as too complicated and costly.
24. The draft prepared and presented by the SPISE Working Group, 'Proposal for uniform enforcement of inspection in the Member States', can be seen as a contribution on how equipment inspections according to article 8 of the Framework Directive can be implemented in national legislation. Particularly technical and administrative aspects are taken into consideration.
25. A concluding recommendation/comment was compiled on the basis of the previous SPISE Workshops:

Recommendations of the Workshop "Standardised Procedure for the Inspection of Sprayers in Europe – SPISE 3"

The participants welcomed the initiative of the SPISE Working Group and expressed their expectations to continue efforts towards harmonising sprayer inspections with the following conclusions and recommendations:

The participants took into consideration that:

- plant protection is an essential instrument for ensuring sufficient amounts of high-quality and healthy food and other agricultural products,
- justified demands of consumer and environmental protection and nature conservation are to be implemented in the interests of society and politics,
- properly maintained and checked technical equipment is important in complementing the use of authorised plant protection products according to good plant protection practice,
- properly maintained and checked technical equipment plays a crucial role in risk reduction,
- the European Parliament adopted the Pesticide Framework Directive at the second reading on 13th January 2009,
- the vote of the Council is expected in September 2009,
- pesticide application equipment (PAE) is a key element of the Framework Directive and will have to be regularly inspected,
- the CEN accepts the mandate to revise EN 13790 and to develop a series of additional European standards for the inspection of all types of equipment used by professionals,
- the Directive 2006/42/EC will become amended according to essential environmental requirements for the PAE,
- the European Commission offers the Member states support within the TAIEX (Technical Assistance Information Exchange Instrument – DG Enlargement) when introducing equipment inspections.

The participants welcomed that:

- The Framework Directive aims to achieve a more sustainable use of pesticides by introducing an obligatory inspection of equipment already in use in the Member states,
- provisions for mutual recognition of inspections are foreseen.

The participants recommend that:

- the European Commission and Member states should take the proposal for the harmonised (uniform) enforcement of the inspection of PAE already in use into account in order to ensure comparable and high quality inspections,
- the certification systems proposed for mutual recognition of inspections among the Member States are recognised by the Member States and considered for future recognitions,
- the inspection procedure of brand new PAE is adapted to current needs and makes use of positive experience by inspecting PAE before it is used for the first time,
- the recommendations of Session 4 regarding regular calibrations and technical checks should be considered as part of good plant protection practice. It should be reflected in the good plant protection practice,
- the recommendations of Session 6 concerning criteria for rejecting the sprayers, authorisation and monitoring of workshops should be considered by the Member States to develop further regulations/protocols,
- the information packages of Belgium, Germany and the Netherlands on PAE available on the Internet (JKI website) are maintained and adapted to their current developments,
- the SPISE working group should continue its work on advising on technical aspects of inspections in the Member States, and that it may serve as a pool of experts for questions on PAE, in particular plant protection equipment, and prepare a 4th SPISE workshop in collaboration with the European Commission in the near future.

Excursion for visiting inspection centres

This excursion took place on the 23 September 2009. With this it should achieved an understanding for the work of some inspection centres in the Czech Republic and also in Slovakia. The lengths of the circuit amounted to about 300 km.

The summarized programme:

08.00	Departure by bus from meeting point in front of the Hotel Continental Brno, Kounicova 6
08.45 – 09.40	Hustopeče – AGROTEC a.s. – Czech inspection site
11.30 – 13.00	Rovinka – SKTC 106 – Slovak inspection site(lunch with sandwiches and coffee)
14.30 – 15.15	Hodonín – Josef Imrich + AKP s.r.o. – Czech inspection sites
15.45 – 17.30	Lednice – visit to Lednice Castle – castle gardens
18.00 – 22.00	Prušánky – workshop dinner at tavern „U Jeňoura“

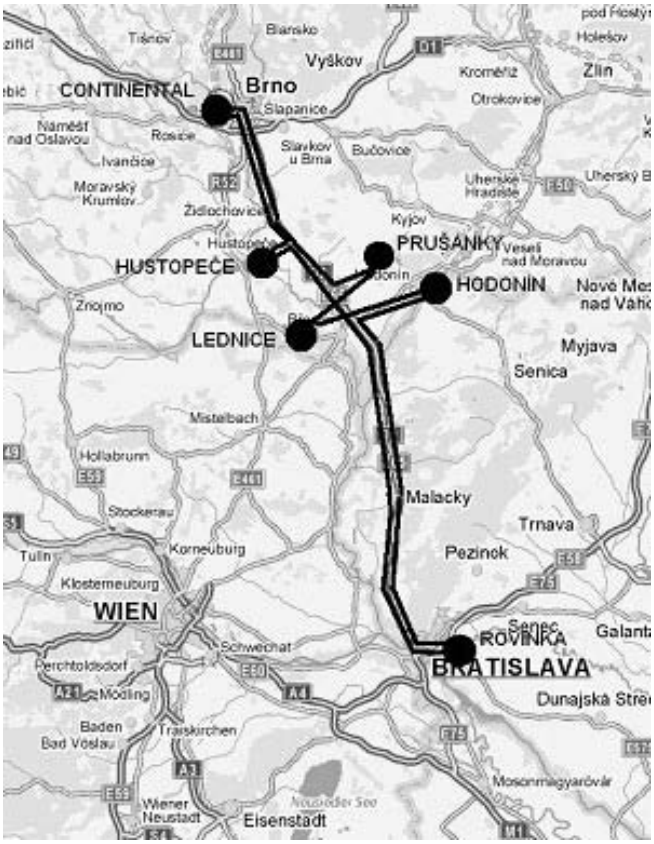

Fig. 1 The course of the bus tour

The first visit was planned for the company AGROTEC a.s at Hustopeče situated about 30 kilometres in the south of Brno. Here an inspection of a self propelled field sprayer was demonstrated (Figure 2).

Fig. 2 Determination of the cross distribution by mobile spray scanner at Hustopeče

About 120 kilometres in south direction from here and very close to Bratislava situated is the Slovakian State Agricultural Testing Institute SKTC-106. Among others the task of this institute is the testing and evaluation of plant protection product application technique before its placing on the market and inspection activities. Here in detail it was simulated a complete inspection of a trailed field sprayer including the evaluation of detected defects.

Fig. 3 Measuring of the pump capacity at Rovinka

After that at the Institute Josef Imrich + AKP s.r.o. at Hodonin (Czech Republic) an inspection of an air-assisted sprayer was visited.

Fig. 4 Determination of the nozzle output of a vineyard sprayer at Hodonin

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Third European Workshop on Standardised Procedure for the Inspection of Sprayers in Europe – SPISE 3 -

Der SPISE 3-Workshop hat am 22. bis 24. September 2009 in Brno (CZ) stattgefunden. Der Workshop wurde organisiert von der SPISE Working Group (SWG), der Vertreter aus Belgien, Frankreich, Italien, Niederlande und Deutschland (Chairman: Dr.-Ing. H. Ganzelmeier) angehören. Die Teilnehmer kamen aus Prüfungs- oder Forschungsinstituten, Verwaltungen oder Firmen und brachten die nötige technische Expertise mit. Deswegen stand beim aktuellen Workshop in Brno vor allem die praktische Umsetzung der europäischen Regelungen für die Gerätekontrollen im Vordergrund. Von der Europäischen Kommission haben Vertreter der DG-Environment and der DG-Enterprise sowie Repräsentanten Europäischer Organisationen (ECPA, CEMA, COPA) teilgenommen. Mit einer Beteiligung von ca. 100 Experten aus 27 europäischen Ländern ist dieser SPISE3-Workshop wiederum auf große Resonanz gestoßen.

Die neue Rahmenrichtlinie verpflichtet die Mitgliedstaaten bis spätestens 2016 für Pflanzenschutzgeräte eine turnusmäßige technische Überprüfung einzuführen. Der von der SPISE Working Group vorbereitete und eingebrachte Entwurf „Proposal for uniform enforcement of inspection in the Member States“ kann als Beitrag angesehen werden, wie eine Umsetzung der Gerätekontrolle gemäß Artikel 8 der Rahmenrichtlinie in nationales Recht erfolgen kann. In Anlehnung an die vorhergehenden SPISE-Workshops haben abschließend die Teilnehmer ihre weiteren Empfehlungen und Erwartungen in einer Resolution zum Ausdruck gebracht.

Third European Workshop on Standardised Procedure for the Inspection of Sprayers in Europe – SPISE 3-

The SPISE 3-Workshop took place from 22 to 24 September 2009 in Brno (CZ). The Workshop was organised by the SPISE Working Group (SWG), to which representatives from Belgium, France, Italy, the Netherlands and Germany belong (Chairman: Dr.-Ing. H. Ganzelmeier).The participants came from inspection and research institutes, administration and private companies and brought with them the necessary technical expertise. This is why the emphasis at the Workshop in Brno was above all on the practical implementation of the European regulations for equipment inspections. The European Commission‘s representatives were from DG-Environment and DG-Enterprise. The European organisations ECPA, CEMA and COPA also took part. The SPISE3-Workshop met with a very positive response, demonstrated by the 100 experts who took part from 27 European countries.

The new Framework Directive binds the Member States to introduce a technical inspection for plant protection equipment which takes place on a rotational basis by the year 2016. The draft prepared and presented by the SPISE Working Group, ‚Proposal for uniform enforcement of inspection in the Member States‘, can be seen as a contribution on how equipment inspections according to article 8 of the Framework Directive can be implemented in national legislation. As in the past SPISE-Workshops, the participants then expressed further recommendations and hopes in a resolution.

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