Session 3: Harmonized test methods for PAE not included in ISO EN 16122 series (continue)

The SPISE Advice for functional inspection of wiper applicator.

Paolo Balsari [1], Gianluca Oggero[1], Jaco Kole [2],

[1] DiSAFA , University of Turin, Largo Braccini 1 -Grugliasco (TO) Italy
[2]SKL , Agro Business Park 24, 6708PW Wageningen, The Netherlands

Introduction

The weed wiping technique is widely used in arable crops and grassland to control volunteer crops like weed beet and general weed populations like bracken, rushes, thistles and ragwort in grassland, red rice in rice field (www.monsanto-ag.co.uk) and volunteer potatoes in sugar beets. The working principle of the machine is generally based on the difference in height between the weed plants and the crops. The European Directive 128/2009 provides that also wiper devices are subject to a mandatory functional inspection.

In these type of in Pesticide Application Equipment (PAE), herbicide/chemical mixture concentrated (up to 60%, fig 1 – type A) or herbicide/chemical product not diluted (fig 3 – Type B) is supplied to an absorbent surface (e.g. cotton, sponge roller with carpet for type A, fig 2, and cord for type B). The herbicide/chemical product soaked surface only contacts targets that in same case (e.g. weed control in rice -sugar beets) can be taller than the crop. Chemical is transferred to the surface of the target as the applicator "wipes" over them.

Fig. 1 – Example of weed wiper (distribution of mixture concentrated – Type "A"). Photo: http://www.fwi.co.uk and http://grassworksmanufacturing.com

Fig. 2 - Examples of sponges. Photo: http://www.fwi.co.uk and http://www.forestry-suppliers.com/

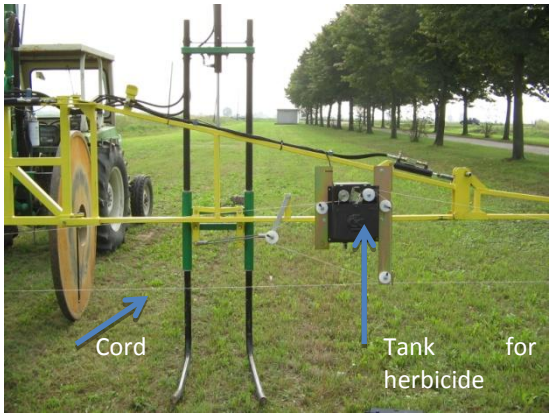

Fig. 3 - Example of weed wiper (distribution of herbicide not diluted using a cord – Type "B" – Photo: MAR snc).

Fig. 4 – Particular of cord (Photo G. Oggero)

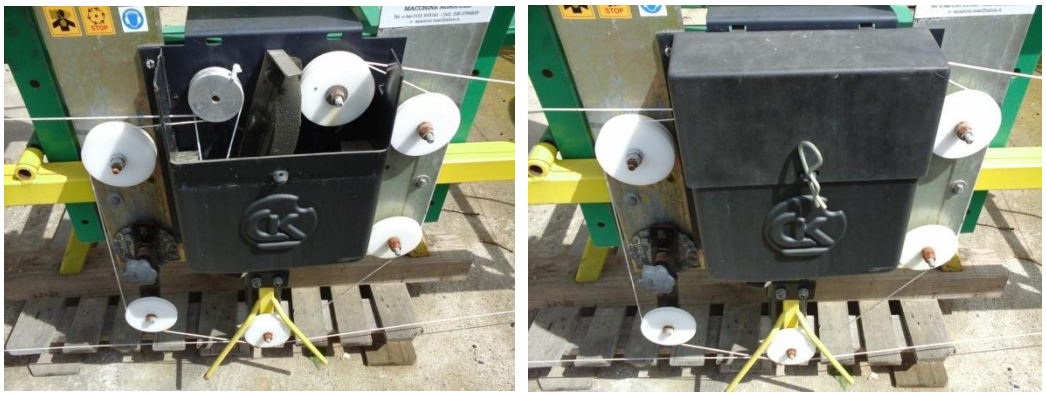

Fig. 5 – Particular of tank for herbicide open and closed whit pulley system (Photo: G. Oggero)

At present no EN or ISO Standards for functional inspections are available. This considered, a **Spice Advice** on how to make their functional inspection, following when possible the harmonized Standard EN ISO 16122 part 1& 2, has been developed inside the SPISE TWG.

1. Pre-inspection

Test suitable for both types of wiper (A&B)

It is important that the inspection can be executed in a way that is safe for the inspector and the environment, and for allowing that a pre-inspection shall be performed. The real inspection can only start when the requirements in the pre-inspection are fulfilled. These last shall be checked following EN ISO 16122-1 (when applicable).

2. Requirements and method of verification

2.1 Leaks

Test suitable for both types of wiper (A&B)

The tank(s) for chemical mixture/herbicide should be filled with water to its nominal capacity.

With the pump, if provided, not running and the machine parked on level horizontal surface, a visual inspection for any leakage shall be carried out.

Method of verification: visual check.

2.2 Dripping

Test suitable for both types of wiper (A&B)

With the pump, if provided, running at a pressure which is equal to the maximum obtainable pressure for the system, with the section valves closed, there shall be no leakage from any part of the machine.

Method of verification: visual check

2.3 Pump

Test suitable for wiper "A"

2.3.1 Pump capacity

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

Method of verification: visual check.

2.3.2 Pulsations (if pressure gauge is provided)

The pulsations shall not exceed 10 % of the working pressure.

Method of verification: visual check, measurement and function test. (see clause 3.1)

2.3.3 Air chamber (if provided)

The membrane shall not be damaged. There shall be no appearance of liquid when operated at the maximum pressure recommended by the manufacturer. The air pressure shall be the pressure recommended by the manufacturer. Normally 1/3 of the spray pressure is used.

Method of verification: measurement and function test

2.4 Agitation

Test suitable for wiper "A"

If the wiper only is used with chemicals which go into a solution (e.g. Glyphosate), no agitation is needed. Often these small wipers only have pump capacity for operating, not for agitation. Agitation systems are usually not installed in this type of machine.

If an agitation system is present it shall be work as is indicated in 2.4.1-2.4.2

2.4.1 Hydraulic

A clearly visible agitation shall be maintained:

— when operating at the maximum working pressure as recommended by the manufacturer;

— with pump rotation speed as recommended by the manufacturer;

— with the tank filled to half its nominal capacity.

Method of verification: visual check

2.4.2 Mechanical

A clearly visible agitation shall be maintained when the agitation system is working as recommended by the manufacturer, with the tank filled to half its nominal capacity.

Method of verification: visual check

2.5 PPP tank

2.5.1 Lid

Test suitable for both types of wiper (A&B)

The tank shall be provided with a lid that shall be well adapted and in good condition.

This lid shall be tightly sealed to avoid unexpected opening.

If a vent is fitted in the lid it shall prevent spillage.

Method of verification: visual check.

2.5.2 Filling hole(s)

Test suitable for wiper "A"

There shall be a strainer in good condition in the filling hole(s).

If the filling hole is smaller than 100 mm (smaller wipers), there shall be a funnel with sieve.

Method of verification: visual check.

2.5.3 Pressure compensation

Test suitable for wiper "A"

There shall be a pressure compensation device to avoid over-pressure and under-pressure in the tank.

Method of verification: visual check.

This is not a requirement for machine that operate at very low pressure

2.5.4 Tank content indicator(s)

Test suitable for wiper "A"

The volume of liquid in the tank shall be clearly readable from the operator's position and/or from where the tank is filled.

Method of verification: visual check.

2.5.5 Tank emptying

Test suitable for both types of wiper (A&B)

It shall be possible to

— empty the tank e.g. using a tap, and

— collect the liquid without contamination of the environment and without potential risk of exposure of the operator.

Method of verification: visual check.

2.5.6 Tank filling

Test suitable for wiper "A"

If there is a water filling device on the machine, water from the machine shall be prevented from returning to the water source, e.g. by means of a non-return valve.

Method of verification: visual check

2.6 Cleaning device for plant protection product container

Test suitable for both types of wiper (A&B)

If provided, the cleaning device for plant protection product container shall work properly.

Method of verification: visual check function test.

2.7 Cleaning equipment

Test suitable for both types of wiper (A&B)

If provided, tank cleaning devices, devices for external cleaning, devices for cleaning of induction hoppers, and devices for the internal cleaning of the complete machine, shall function.

Method of verification: visual check and function test.

2.8 Controls

2.8.1 General

Test suitable for both types of wiper (A&B)

All the devices for measuring and/or adjusting the pressure and/or flow rate shall function. The valves for switching on or off the distribution shall operate properly.

Only if the machine shall be adjusted during operation the controls shall be operable from the operator`s position and the instrument displays shall be readable from this position.

Method of verification: visual check and functioning test.

Note: Turning of the head and the upper body is acceptable to achieve these requirements

Switching on and off individual machine sections, if provided, shall be possible.

Method of verification: visual check and function test.

2.8.2 Pressure indicator (if provided)

Test suitable for wiper "A"

The scale of the digital or analogue pressure indicator shall be clearly readable from the operator's position and suitable for the working pressure range used.

Method of verification: visual check.

The scale of **analogue pressure indicators** shall provide graduations at least every 0,2 bar for working pressures less than 5 bar;

Method of verification: visual check.

The accuracy of the pressure indicator shall be

— ± 0,2 bar for working pressures at 2 bar and below,

— ± 10 % of the real value for pressures at 2 bar and above.

Method of verification: according to clause 3.2

For analogue pressure indicators the minimum diameter shall be 63 mm

Method of verification: measuring

2.8.3 Pressure adjusting devices (if provided)

Test suitable for wiper "A"

All devices for adjusting pressure shall maintain a constant pressure with a tolerance of 10 % at constant setting and shall return within 10 s to the original working pressure ±10 % after the equipment has been switched off and on again.

Method of verification: function test.

2.9 Hoses

Test suitable for both types of wiper (A&B)

Hoses shall not show excessive bending and abrasion through contact with surrounding surfaces. They shall be free from defects such as excessive surface wear, cuts or cracks.

Method of verification: visual check.

2.10 Filters

Test suitable for wiper "A"

2.10.1 Presence

If using Glyphosate only, no filters are required

If pump is provided there shall be at least one filter on the discharge side of the pump and, in case of positive displacement pumps, one filter on the suction side.

The filter(s) shall be in good condition.

Method of verification: examination of filter specification and visual check.

2.10.2 Isolating device

It shall be possible, with the tank filled at 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.

Method of verification: function test.

2.10.3 Filters insert changeability

Filter inserts shall be changeable in accordance with the machine manufacturers' instructions.

Method of verification: visual check and function test.

2.11 Boom

Test suitable for both types of wiper (A&B)

2.11.1 Stability/alignment

Horizontal boom shall be stable in all directions, i.e. no excessive movement caused by wear and /or permanent deformation.

Method of verification: visual check.

2.11.2 Automatic resetting

When provided, the automatic resetting of horizontal boom shall operate to move backwards and/or forwards, in case of contact with "critical" obstacles.

Method of verification: visual check and function test.

2.11.3 Vertical position

When measured with the machine stationary, the difference between maximum and minimum distance from boom and a horizontal reference line (e.g. on a level horizontal surface) shall not vary more than ± 10 mm or ± 0.05 % of the working width, whichever is the highest.

Method of verification: measurement.

2.11.4 Height adjustment

When provided, height adjustment devices shall function.

Method of verification: visual check and function test.

2.11.5 Damping, slope compensation and stabilization

When provided, devices for damping unintended boom movements, slope compensation and stabilization systems shall function.

Method of verification: visual check and function test.

2.12 Weed detection system and other electronic/mechanical devices

When provided, shall work properly.

Method of verification: visual check

2.13 Condition of the cloth/roll/cord

The cloth, the material where the roll is covered with or the cord shall be in good condition and shall have no visible damages.

Method of verification: Visual check

2.14 Humidification of the cloth/roll/cord

All provisions which ensure the correct wetting of the cloth / roll / cord shall function properly.

Method of verification: Functional test

3. Test methods

3.1 Pump pulsations

Pulsations shall be checked:

- with nominal rotation speed of the pump;
- at the location of the machine's pressure indicator (with calibrated test pressure indicator).

3.2 Machine pressure indicator

3.2.1 Specifications of pressure indicators used for verification

Analogue pressure indicators used for testing shall have a minimum diameter of 100 mm and shall be damped. Other minimum requirements on pressure indicators used for testing are given in Tab. 1.

Pressure to measure Δp bar	Scale unit max. bar	Accuracy bar	Class required	Scale end value bar
$0 < \Delta p \leq 6$	0,1	0,1	1,6	6
			1,0	10
			0,6	16
$6 < \Delta p \leq 16$	0,2	0,25	1,6	16
			1,0	25
$\Delta p > 16$	1,0	1,0	2,5	40
			1,6	60
			1,0	100
1 bar = 0,1 MPa = 0,1 N/mm² = 10^5 N/m².				

Tab. 1 – Characterization of pressure gauge used for testing (in accordance with EN 837-1)

3.2.2 Verification method of the machine pressure indicator

The machines' pressure indicator shall be tested mounted on a test bench.

Measurements shall be carried out with both increasing and decreasing pressures in each case as a minimum at 4 equally spaced points within the relevant working pressure range.

The measurements require a stable pressure (no pump pulsations).

Conclusion

Wiper applicator are of different type, with different hydraulic circuit, boom dimension and this made difficult to give a general address about how to made their functional control. Otherwise been detailed standards specification/requirements not available for new wiper applicator equipment, those indicated in this draft SPISE Advice are necessary limited and has been developed in cooperation with users, manufacturers and testing stations of this type of equipment.

The specification/ requirements mentioned in this SPISE Advice could be also taken as guidance in design of new equipment till standard requirements for new equipment will be not available.

References

EN ISO 16122-1 (2015) - Agricultural and forestry machinery - Inspection of sprayers in use - Part 1: General.
EN ISO 16122-2 (2015) - Agricultural and forestry machinery - Inspection of sprayers in use - Part 2: Horizontal boom sprayers.