Belgian trial inspection protocol for the inspection of cold atomizers

Johan Declercq, David Nuyttens, Guillaume Defays, Bruno Huyghebaert
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Actual Belgian situation

Legislation (Royal Decree 7/11/2011):
- NOT exempted from inspection
- Mandatory notification to inspection services
- Owner receives a notification certificate (+/- 30)

Reality:
- NOT yet inspected because no protocol
- Initial idea was waiting for ISO16122 series ➔ Deadline?
- New protocol developed within SIRA-APESTICON

TRIAL PROTOCOL READY FOR VALIDATION
Actual Belgian situation

- Cold atomizers protocol:

  ➔ First stage:
  - Inventory off all available standards and inspection protocols
  - No specific standard but German, Dutch and British protocols

  ➔ Second stage:
  - Draft Belgian “trial” protocol based on existing protocols and general standards and adapted to Belgian format

  ➔ Third stage:
  - Feedback from manufacturers and dealers
  - Validation of the protocol for different types of cold atomizers

  ➔ Last stage (to be done):
  - Trial inspections and minor changes to the protocol
  - Finetuning inspection method, choosing measuring equipment
Technical description cold atomizers

- Used in closed environments (greenhouses, storage, ...)
- Droplet size = ultra fine – very fine (1 – 50 µm)
- **Pneumatic method** of droplet generation

- Nozzle body creates venturi effect @ nozzle orifice.
  - Low underpressure.
  - Very low flowrates (2 to 8 L/h )
  - Venturi effect mixes air with liquid solution → small droplets.

- Liquid end nozzle with large orifice (prevents blockage)
Technical description

Two main types based on the air supply:
- Using a blower or similar
- Using a compressor

Three types to adjust the flow:
- Liquid metering valve
- Adjusting the air supply
- Changing the nozzle
CHECK THE ADMITTANCE RULES:

- Working and clean state
- Filled with clean water
- No major leakages
- All moving parts and or electrical components are properly protected
- Flowrate table must be supplied!

OK

REFUSED!
Inspection part 1: Inspection before starting up

Inspections performed before starting up the machine:
- **A**: General condition
- **B**: Pesticide tank
- **C**: Filtering
- **D**: Fan(s)
- **E**: Measuring instruments
- **F**: Compressor/blower
Inspection part 1: Inspection before starting up

A1: Maintenance condition: Visual check
Limit Cl3: Rust, very dirty, warning stickers damaged, ....

A2: Electrical: Visual + measurement
Limit Cl2:
- Damaged cables, plugs, connectors, ...
- Bad and/or unsafe reparations
- Grounding not connected to metal parts
- Damaged control panel, switches, warning lights, ....

A3: State of the liquid lines: Visual check
Limit Cl2: Bended, twisted, worn, bad connections, ....
Inspection part 1: Inspection before starting up

**B1+B2: Tank contents indicator:** Visual check
Limit Cl3: B1 not present and B2 not visible

**B3: Tank cleaning:** Visual check
Limit Cl3: Difficult to clean, impossible to demount, no emptying tap, ...

**B4: Tank lid:** Visual check
Limit Cl2: Damaged, not fitting, ...

**C: Filters presence and state:** Visual check
C1+C2: Filling funnel with strainer (or tank strainer)
C3+C4: Filter in liquid line
Limits: Presence Cl3 (C1+C3) and state Cl2 (C2+C4)
Inspection part 1: Inspection before starting up

D: General condition from the fan:

D1: **Protection**: Visual check  
*Limit Cl2: The fan is not adequately protected.*  
*Protection broken, not present, grid to wide, ...*

D2: **State of the fan**: Visual check  
*Limit Cl2: Dirty fan blades, damaged fan blades, abnormal noises (bearings, out of balance, ...)*
Inspection part 1: Inspection before starting up

**E1: Presence from a measuring instrument:** Visual

- Limit Cl3: Not present, no pressure gauge and/or flow meter.

**E2: Visability from the measuring instrument:** Visual

- Limit Cl3: Unreadable from operator position.

**E3: Pressure gauge:** Measurement

- Limit Cl2: Bad working pressure gauge. Difference >10% when measured on a teststand

**E4: Flow meter test:** Measurement (checked part3)

- Limit Cl2: Measured flow differs by more than 10% from flow shown on flow meter.
Inspection part 1: Inspection before starting up

F: General functioning
- Compressor or
- Blower or
- Vacuüm pump

F1 General condition: Visual check

Limit Cl3: The compressor/blower/vacuum pump is bad maintained: Oil leakages, worn power belts, ...
Inspection part 1: Inspection before starting up

**F2: Air pressure circuit:** Visual check

Limit Cl2:
- The pressure hoses are worn, torn, or show leakages.
- Bad hose couplings
- Dirty air suction filter
- The air-swirl element is dirty, misses swirl plates, ....
Inspection part 2: Inspection during operation

**Evaluation from the atomization:**
- During actual operation evaluation of:
  - G: Pressure stability
  - H: Atomizing pattern
  - I: Controls
  - J: Agitation
  - K: Leakages
I: Controls:

I1: Liquid flow valve functioning: Measurement
Limit Cl2: Liquid flow valve not functioning or damaged. Not possible to set the desired flow.

I2: Pressure setting: Measurement
Limit Cl2: Impossible to set the pressure at the desired operating pressure.
Bad working pressure gauge, insufficient air capacity, ....

I3: On/Off controls: Visual check
Limit Cl2: All controls are functioning. No dripping after switching off the equipment. (>5sec)
**G: Pressure stability:** Measurement

*Limit Cl2*: The pressure in the air circuit at the swirl-nozzle varies >10%. Bad working pressure gauge, compressor problems, ...

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**H: Atomization:**

**H1: Irregular atomization pattern:** Visual check

*Limit Cl2*: The atomization pattern is irregular, big droplets falling out of the pattern, ....

*(Dirty nozzles, air supply problems, ...)*

**H1: Obstacles:** Visual check

*Limit Cl2*: Hoses or other obstacles in the spray pattern.
Inspection part 2: Inspection during operation

**K: Leakages:** Measurement
- **K1:** Limit Cl1: *major leakage* > 30ml/min
- **K2:** Limit Cl2: *minor leakage* < 30ml/min

**J: Agitation (if present):** Visual check
- **Limit Cl3:** No or insufficient agitation.
Inspection part 3: Flow measurement

Dose setting: For equipment with liquid flow valve the dose setting shall be adjusted as stated in the supplied flow rate table.

Nozzle: For equipment with changeable restrictor/nozzle the dose shall be changed by using another restrictor/nozzle. The dose table shows the dose related to the used nozzle-machine combination.

Pressure regulation: For machines using a compressor, the air pressure shall be set according to the table supplied by the manufacturer. This table also states the flow rate at the desired pressure.
Inspection part 3: Flow measurement

**L: Flow**: Measurement

*Limit Cl1: Flow difference >15% from flow values stated in manufacturer table*

**Possible method:**
- fill the pesticide container for +/- ¾
- operate the equipment at the desired settings during a few minutes.
- switch off the equipment
- put a level mark on the pesticide container
- add a fixed volume to the container with a measuring cup (eg 500 mL)
- switch on the equipment again and actuate the stopwatch
- when level reaches the level mark stop the stopwatch
- calculate the flow

**Possible alternatives:**
- Use a tank contents mark as a reference
- Weigh the tank
- Flow sensor ?? (small volumes?)
Thank you

johan.declercq@ilvo.vlaanderen.be

Sprayer inspection: http://www.ilvo.vlaanderen.be/keuringspuittoestellen
Spraytech lab: http://www.ilvo.vlaanderen.be/spraytechlab