



TOPPS - WATER PROTECTION COURSE  
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**Sprayer components and devices able to  
reduce/eliminate point sources contamination  
during sprayer filling and cleaning**

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The operations of:

- Preparation of the spray mixture and filling of the sprayer
- Disposal of the spray mixture remnant at the end of the application
- Internal and external cleaning of the sprayer
- Cleaning of empty PPP cans

**are considered responsible of most of surface water contamination with agrochemicals**

# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

## Possible origins of point sources

Incorrect loading of PPP in the  
main tank of the sprayer



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# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

## Possible origin of point sources

**Uncorrect disposal of empty PPP cans, not  
rinsed, still containing concentrate PPP  
residues**



# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

## Sprayer components and devices available to prevent point sources

Induction hoppers



PPP closed transfer systems



Strainers equipped with nozzles for rinsing PPP cans



# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

## The use of the induction hopper to load PPP in the main tank of the sprayer

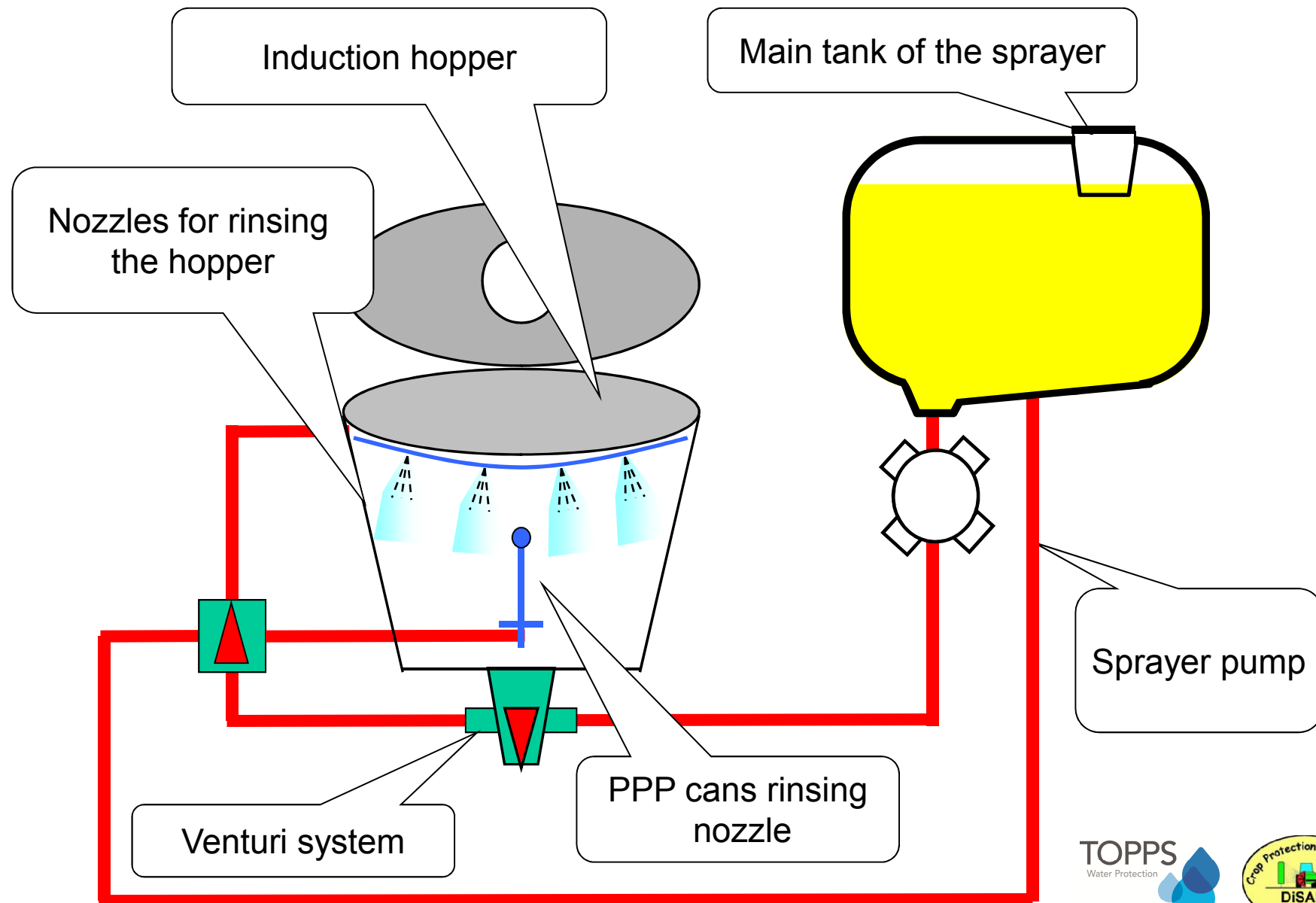
*Independent*



*Mounted on the sprayer*



# SCHEME OF AN INDUCTION HOPPER



# Functions of the INDUCTION HOPPER

(Capacity from 7 to 50 liters)



- Sucking of PPP formulations from cans
- Support correct PPP dosing
- Pre-mixing of PPP formulations
- Introduction of PPP in the sprayer tank
- Rinsing of empty PPP cans



# Use of the induction hopper and manage correctly empty PPP cans

1) Opening of the PPP can



2) Pouring the PPP into the hopper (either liquid or solid formulations)



# Use of the induction hopper and manage correctly empty PPP cans

3) Activating the mixing of PPP in the hopper

4) Transferring the pre-mixed PPP from the hopper to the main tank

5) Rinsing of the hopper



# Use of the induction hopper and manage correctly empty PPP cans

6) Rinsing of the empty PPP can



7) Collection of rinsed PPP cans in special containers for successive disposal and recycling



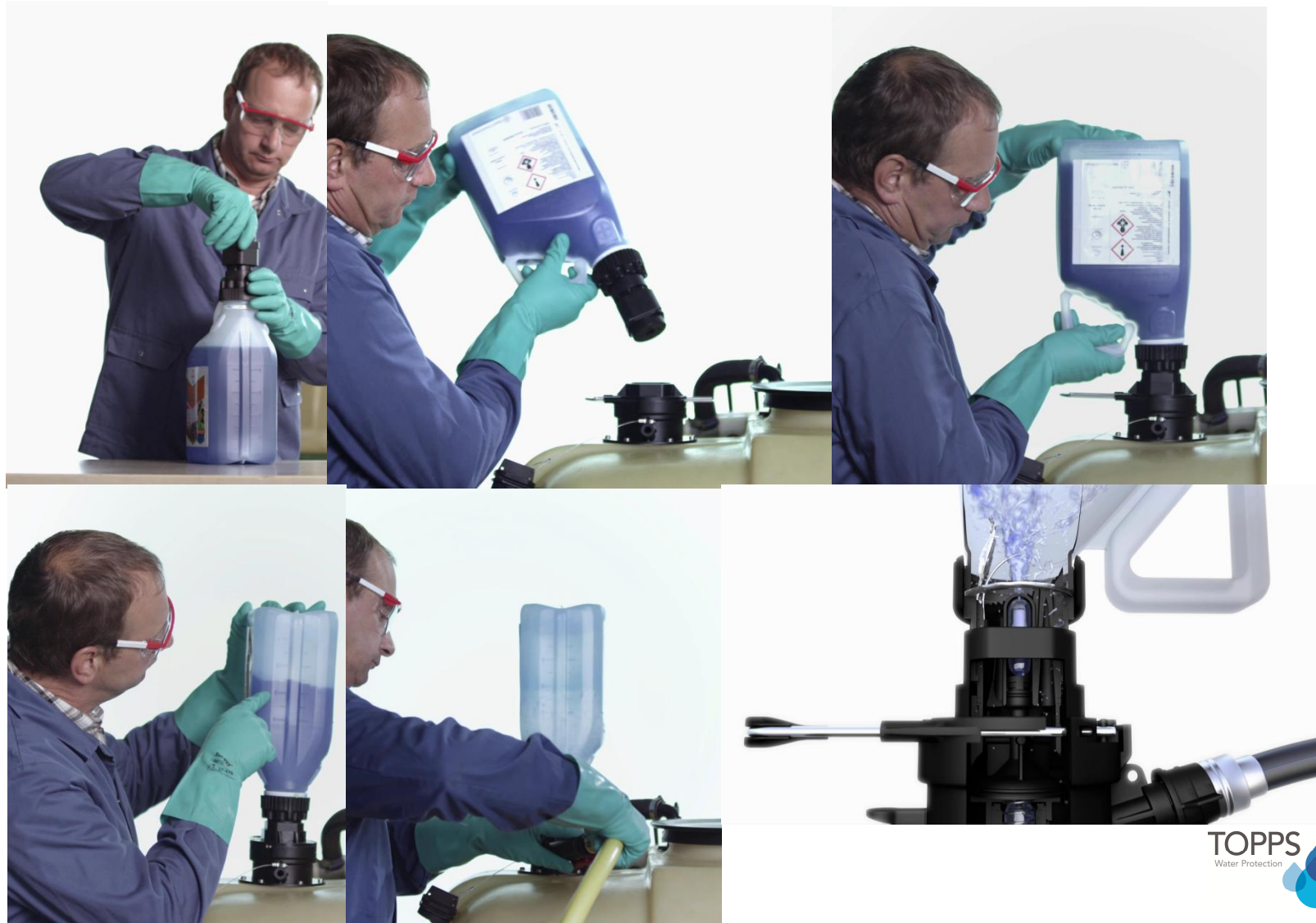
## Use of the induction hopper

Induction hoppers may also suck directly PPP from containers / packs through special devices



# Use of closed transfer systems to introduce PPP in the sprayer tank

The example of Easy-Flow<sup>®</sup> system



# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

## Possible origin of point sources

### Sprayer tank overfilling



# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

Importance of a readable and precise tank content gauge – often not precise (Flow meter recommended)



# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

## Use of a programmable flow meter to fill in the sprayer tank



The flow meter is installed on the water supply hose

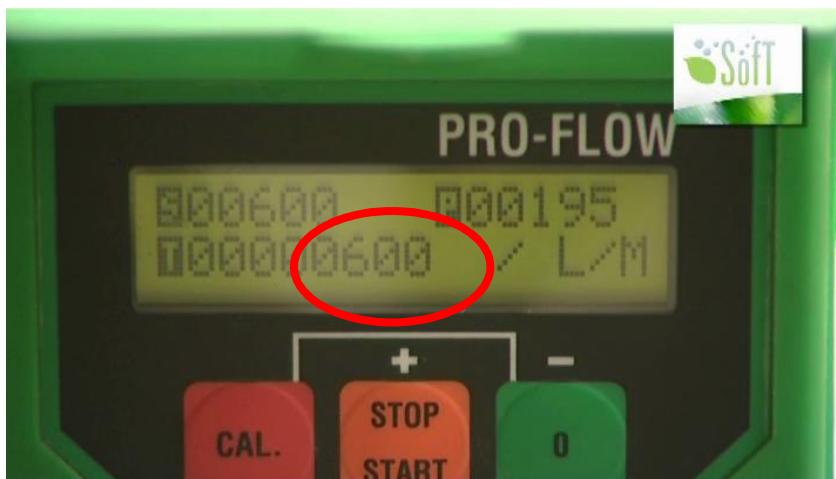


Set up of the intended amount of water to fill in the sprayer



# PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER

## Use of a programmable flow meter to fill in the sprayer tank



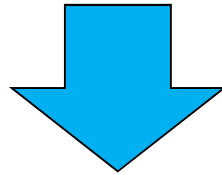
A valve is automatically activated to close the filling hose when the intended amount of water is reached



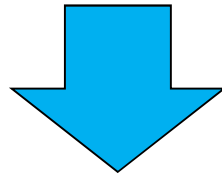
A sensor level positioned in the tank connected to the filling stop valve prevent any accidental overfilling

# **PREPARATION OF THE SPRAY MIXTURE AND FILLING OF THE SPRAYER**

**Be sure to fill the exact amount of spray mixture in  
the main tank**



**Be sure that you spray the correct amount on the  
target surface that only the technical residual  
volume remains at the end of the application.  
(Residual volume not suckable by the sprayer pump)**



**Dilute residual volume with freshwater to its  
minimum. (3 step rinsing / continuous rinsing)**

# AT THE END OF THE SPRAY APPLICATION

## Risk of point sources

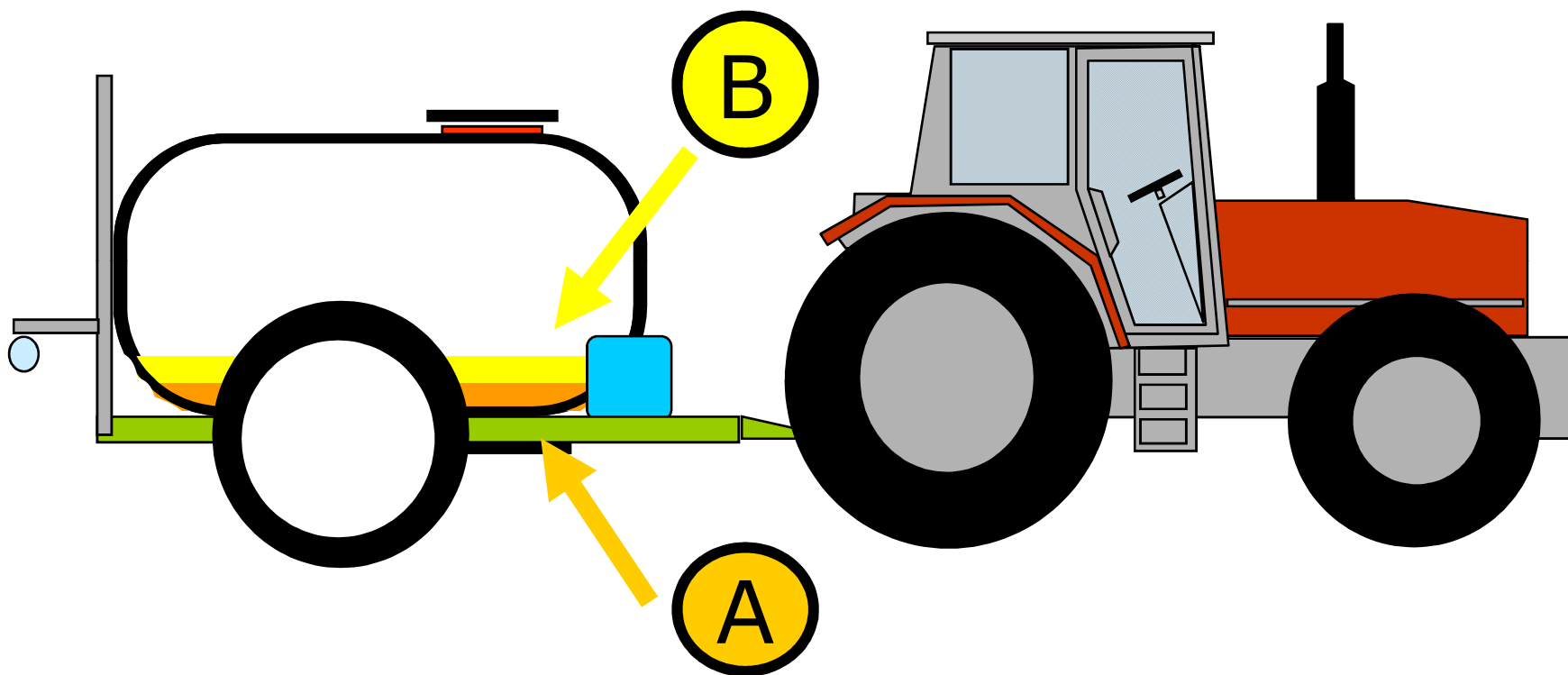
Not correct disposal of considerable amounts of contaminated remnants liquids



The **spray mixture residue** in the tank is composed by two fractions

**B: Overvolume**

**Consequence of a not correct adjustment - must be avoided**



**A: Technical residual volume  
(not suckable by the pump -  
optimize sprayer design)**



# **AT THE END OF THE SPRAY APPLICATION**

## **Cleaning the sprayer in the field**

### **Sprayer components necessary:**

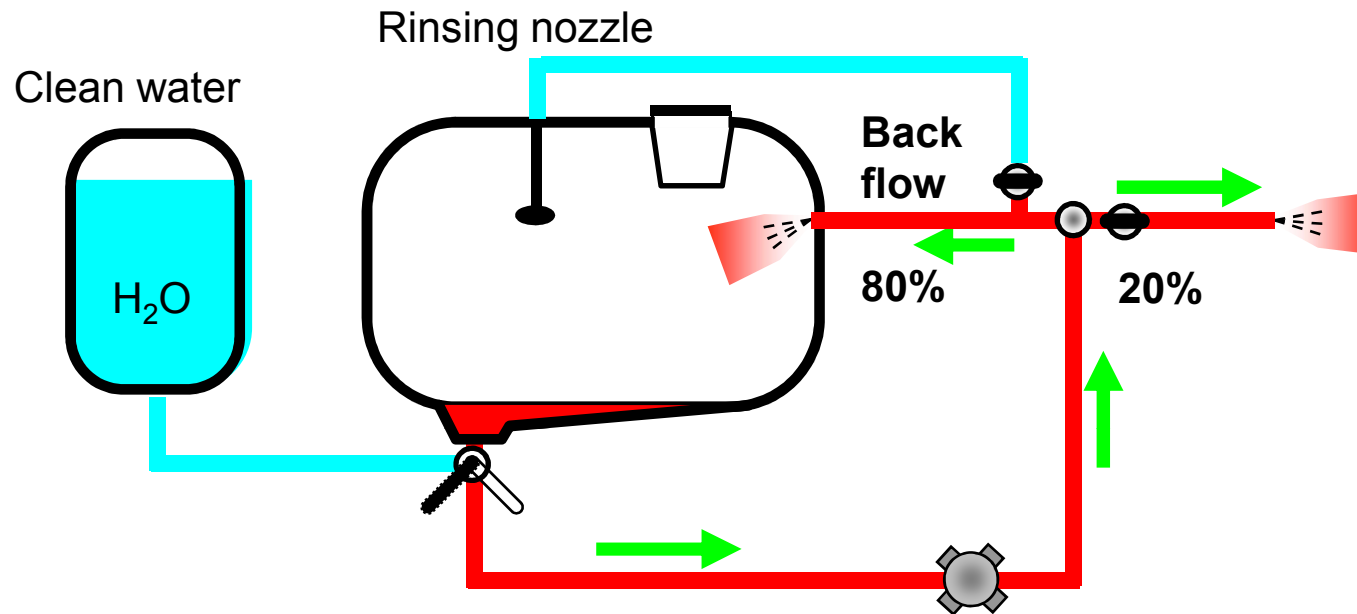
**Clean water tank (10% capacity of the main tank)**

**Tank rinsing device (e.g. nozzle(s))**

**Spray lance for external cleaning**

### 3.Step internal sprayer rinsing:

**NO - by-pass valve!** Spray tank and hydraulic network cannot be rinsed separately – cleaning effect **not optimized**

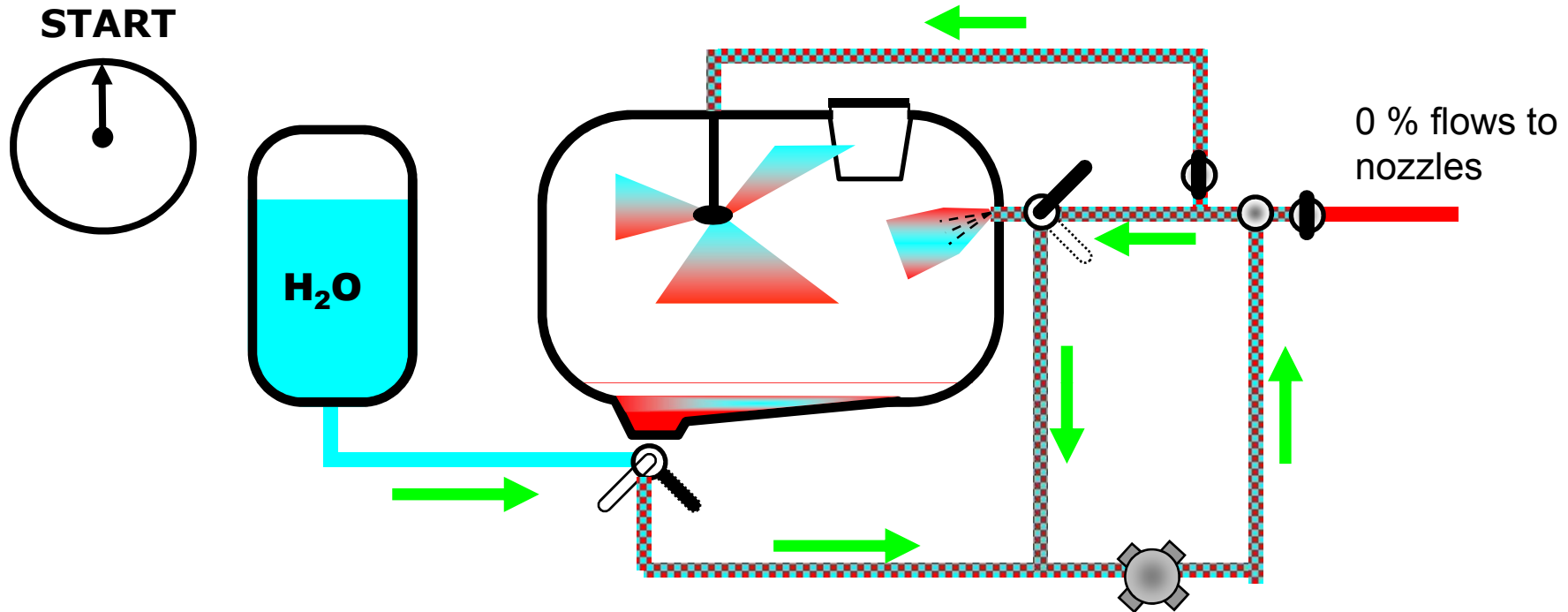


1. Start: 1/3 of clean water dilutes residual volume in tank via the rinse nozzle
2. Remaining spray in the tank is diluted and sprayed out to the nozzles  
(Backflow represents 80% of liquid flow; 20 % are delivered to the nozzles  
80% of the diluted liquid flows back to the tank / this reduces the rinsing effect)

Recommendation: Repeat (1 and 2) three times !!!

### 3.Step internal sprayer rinsing:

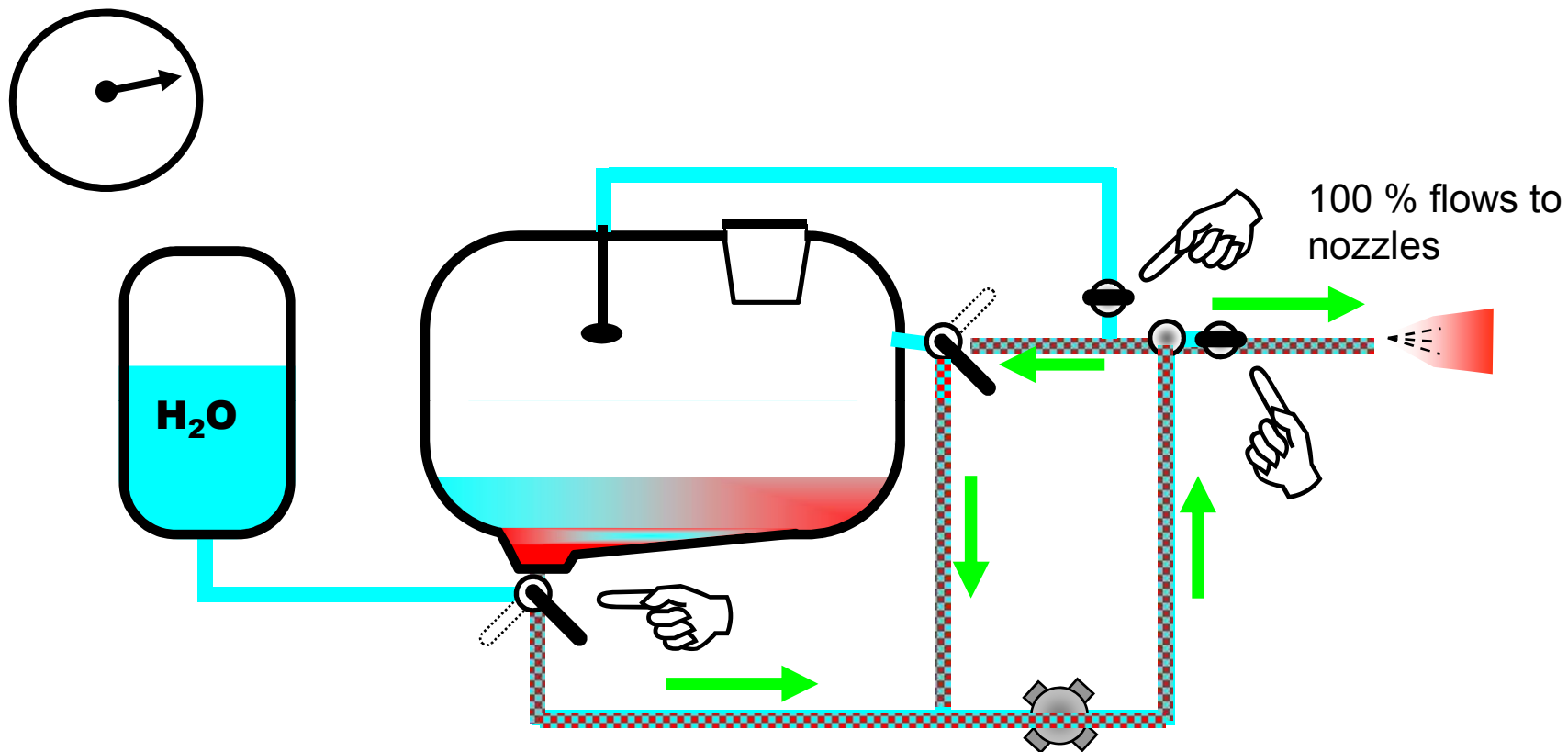
**WITH - by-pass valve!** Spray tank and hydraulic network can be rinsed separately – cleaning effect **optimized** (Slide a)



1. Start: 1/3 of clean water dilutes residual volume in tank via rinse nozzle the pump and backflow circuit.
2. Only rinsing of the tank the pump and backflow system;

### 3.Step internal sprayer rinsing:

**WITH - by-pass valve!** Spray tank and hydraulic network can be rinsed separately – cleaning effect **optimized** (Slide b)



1. Backflow is blocked and diluted liquid flows to the boom / nozzles
2. Pipeline and boom are rinsed

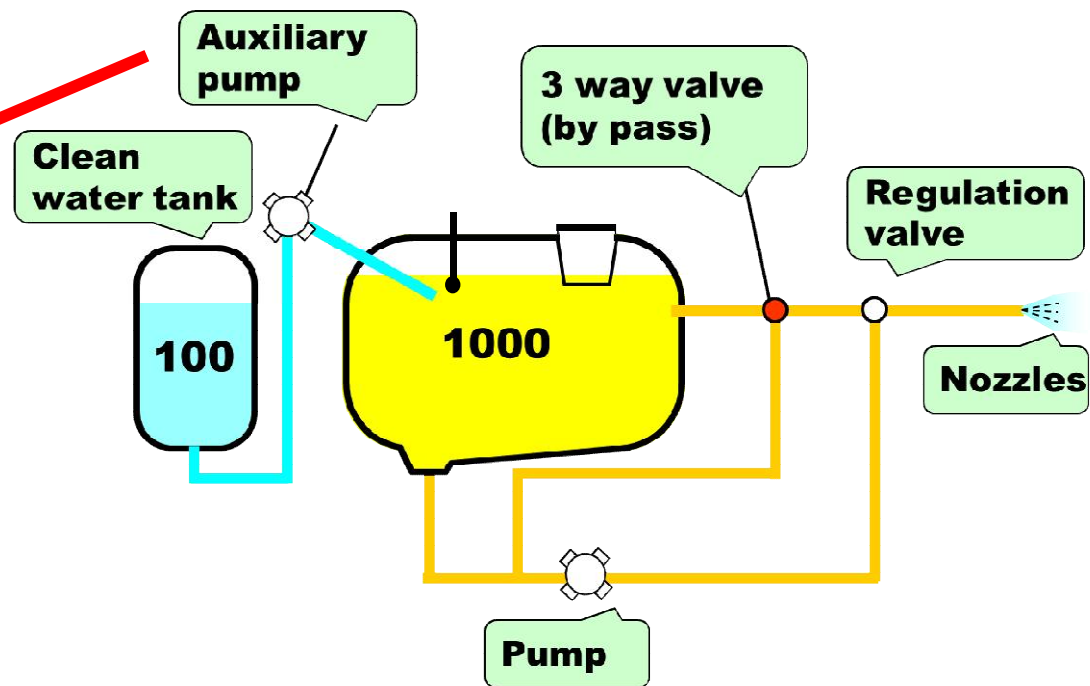
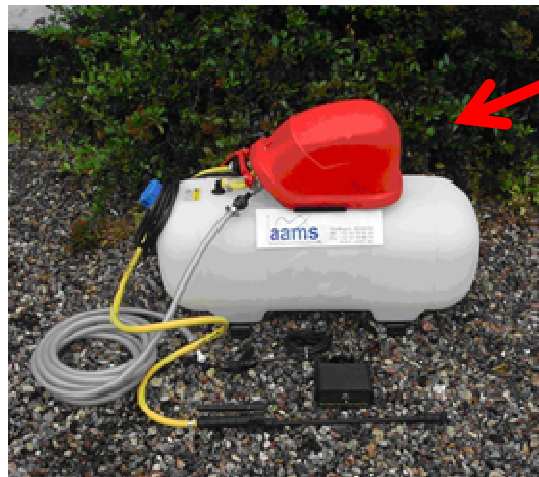
**Recommendation: Procedures (slide a+b) should be repeated 3 times.**



# Continuous cleaning: Additional pump for clean water

*Cleaning faster  
can be done without leaving the tractor*

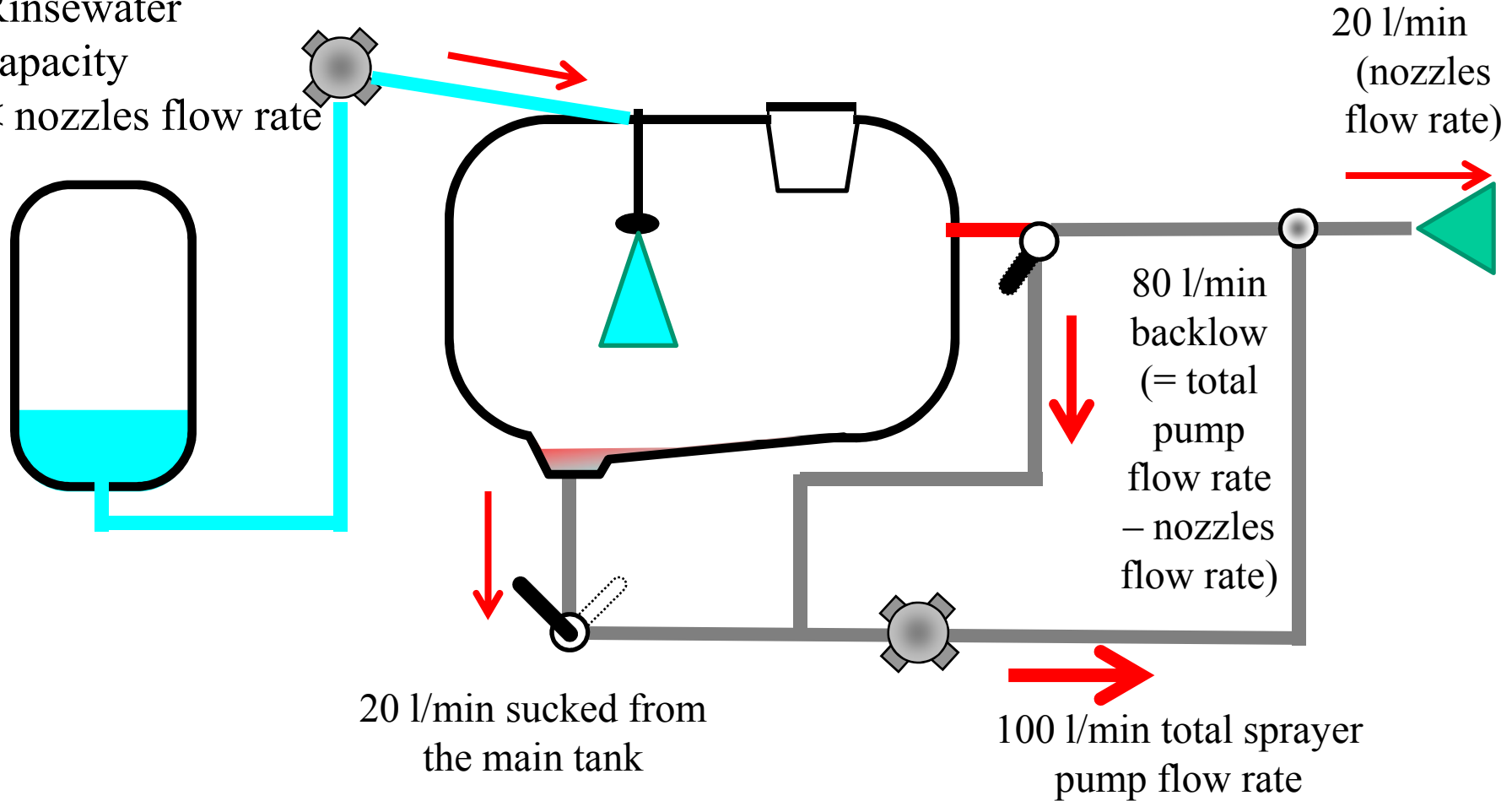
## Layout



(Upgrading kits also from companies  
aams, Agrotop, Herbst)

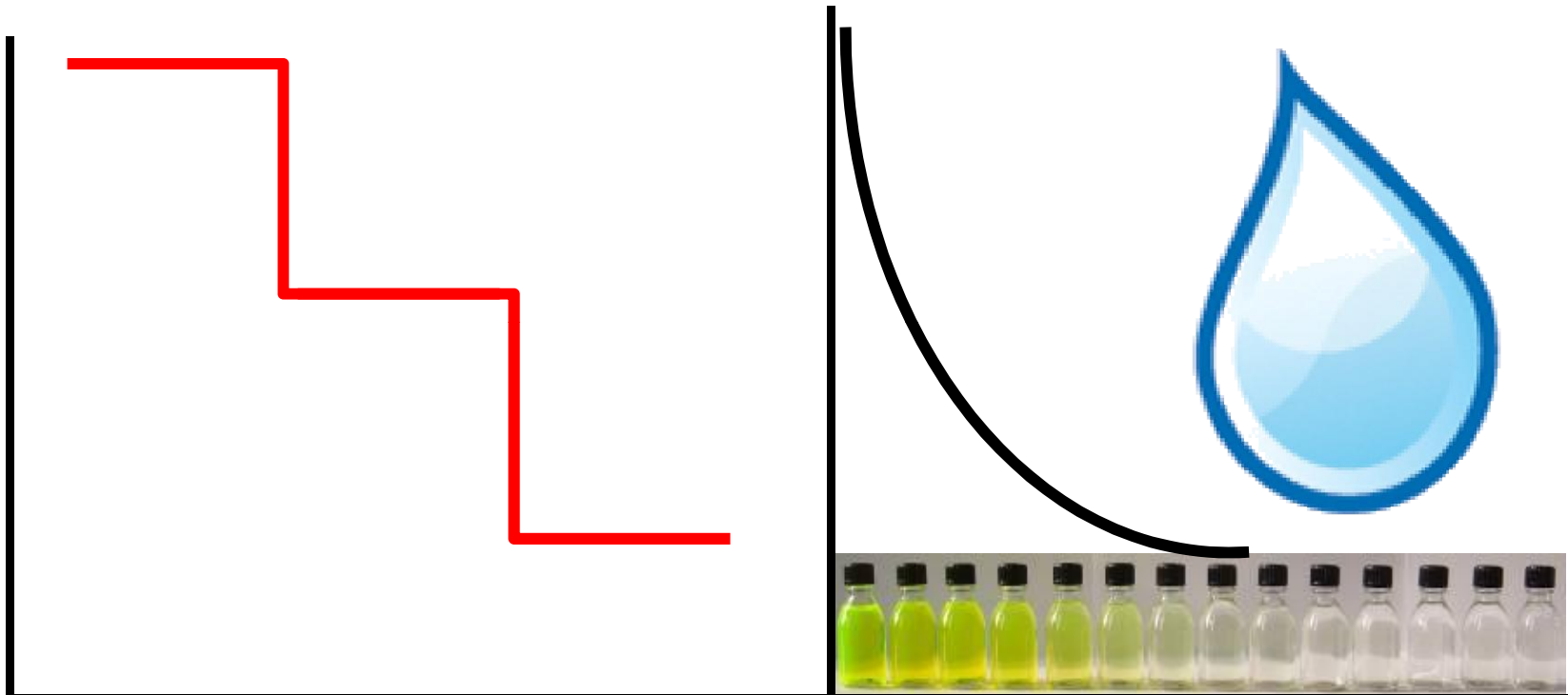
# COUNTINUOUS CLEANING (example: Sprayer with 20l/min flow rate at the nozzles and 100 l in the hydraulic network)

Rinsewater capacity < nozzles flow rate



The method involves **an auxiliary pump** to deliver rinse water to the main tank. The sprayer pump continuously delivers the diluted liquid through the hydraulic system to the nozzles to be sprayer out. **The backflow is closed and only opened at the end of the rinsing process.** – Effective , time saving, can be upgraded

## Internal rinsing of sprayer: 2 options



3 step rinsing  
More time, step down from tractor  
**STEPWISE**

1 step only, faster from tractor  
additional pump necessary  
**CONTINUOUS**

## THE CLEAN WATER TANK



Connected to the sprayer pump

*Even if the sprayer is not originally equipped with a clean water tank it is possible to add it*



Equipped with autonomous electric pump (allowing continuous cleaning)

# EXAMPLES OF TANK RINSING NOZZLES



Tank before rinsing



Tank after rinsing



# AT THE END OF THE SPRAY APPLICATION

## Possible origin of point sources

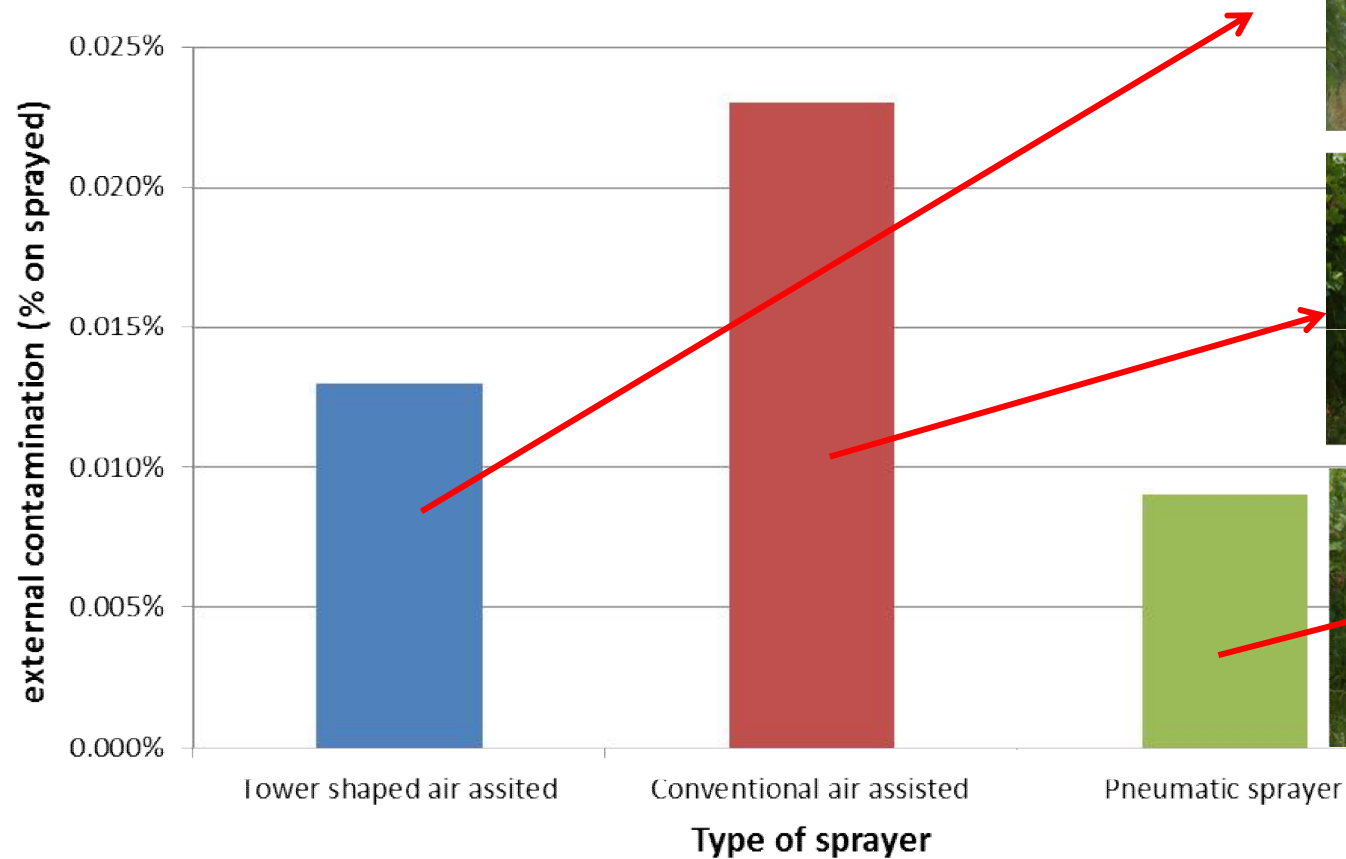
External contamination of the sprayer



# AT THE END OF THE SPRAY APPLICATION

## Possible origin of point sources

### External contamination of the sprayer



# EXAMPLES OF DEVICES FOR SPRAYER EXTERNAL CLEANING

High pressure cleaner

Spray lance

Brush





# RECOMMENDATIONS FOR EXTERNAL CLEANING OF SPRAYERS

- **Clean sprayers external** surfaces in the field with the last application or on a 'Biobed' or an biological active area (grassed area) or on an area where washing water is collected (washing place)
- **Never clean sprayers where there is a risk of polluting** ground or surface water.
- **Minimize external spray deposits.** Prevent long-term accumulation of plant protecting products on any exposed surface of sprayers and their associated equipment. Clean external surfaces immediately after use.