# Čiščenje naprav za nanos FFS - kako tehnično in organizacijsko izboljšati obstoječe stanje v Sloveniji ?

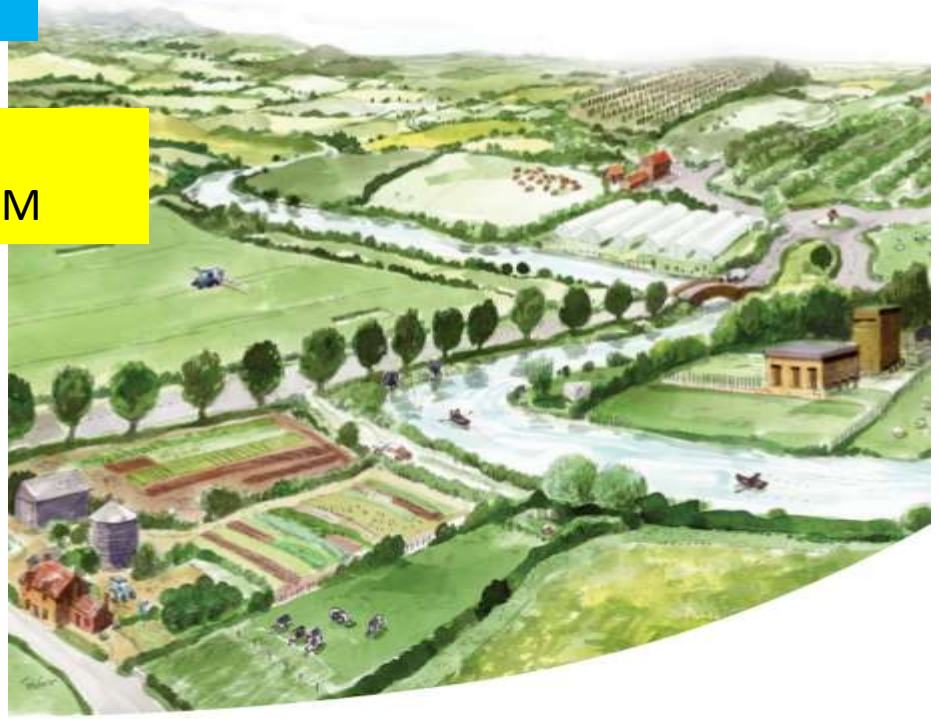
Mario Lešnik
Fakulteta za kmetijstvo in biosistemske vede UM

Crop Protection Association

H2OK? Think Water

Every drop counts

Advice on pesticides and water protection for farmers and sprayer operators



GIZ fitofarmacije

TOPPS Water Protection

A clear solution for farmers

Environment Agency

SEPA

The Voluntary Initiative
Promoting responsible pesticide use

# PROJEKT TOPPS SLOVENIJA

TOPPS Water Protection

## NAMEN

- POVEČATI USPOSOBLJENOST UPORABNIKOV FFS ZA PRAVILNO UPORABO FFS

## SODELUJOČI

European Crop Protection

VARSTVO RASTLIN VARNA UPORABA

GIZ fitofarmacije

Kmetijsko gozdarska zbornica Slovenije

Univerza v Mariboru

Fakulteta za kmetijstvo in biosistemske vede

# STEWARDSHIP PROGRAMI ECPA - DELEŽNIŠKI ODNOSI

- REALNOST – VEDNO VEČJI KONFLIKTEN RAZKORAK MED PROIZVAJALCI FFS IN ŠIRŠO NEKMETIJSKO JAVNOSTJO
- REALNOST – VEDNO VEČJI KONFLIKTEN RAZKORAK MED PROIZVAJALCI ŽIVEŽA IN ŠIRŠO NEKMETIJSKO JAVNOSTJO

- OBDOBJE PRESEŽKOV HRANE GENERIRA IDEJE DA JE PRODUKCIJA PODREJENA ZAGOTAVLJANJU VAROVANJA OKOLJA (EKOSISTEMSKIH STORITEV) IN ZDRAVJA

- ZELO VELIKA STOPNJA ZAVRAČANJA RABE FFS S STRANI NEKMETIJSKE JAVNOSTI
- PRAKTIČNO NEREALNA PRIČAKOVANJA JAVNOSTI GLEDE PRENEHANJA UPORABE FFS ČEZ NOČ
- HITRO POVEČEVANJE FINANČNIH TEŽAV KMETOV
- NEZMOŽNOT PREHODA V ALTERNATIVNE TEHNIKE PRIDELAVE ČEZ NOČ
- A JE ZAVRAČANJE JAVNOSTI GLEDE UPORABE FFS REZULTAT NAJDB FFS V HRANI, VODI IN V OKLJU, ALI PA GRE TUDI ZA DRUGE SOCIOLOŠKE PROCESE ????
- POTREBNO JE NENEHNO IZBOLJŠEVANJE USPOSOBLJENOSTI UPORABNIKOV, DA SE IZBOLJŠAJO VSI KAZALCI STANJA OSTANOV FFS V HRANI, VODI IN OKOLJU
- ALI JE TA PROCES DOVOLJ, DA BO JAVNOST RAZUMELA POTREBO PO UPORABI FFS, ALI PA SE BO TRENUTNI SOCIOLOŠKI PROCES NADALJEVAL DO ZLOMA PONUDBE HRANE PO SPREJEMLJIVH CENAH ??????????????

# Po zaključku aplikacije FFS v napravah za nanos ostane še veliko ostankov FFS

- TUDI PRI NAJNOVEJŠIH NAPRAVAH PO ZAKLJUČKU APLIKACIJE V NAPRAVAH OSTANE NEKAJ OSTANKOV (TEHNIČNI MINIMUM)
- KAM SPROSTIMO OSTANKE TEHNIČNEGA MINIMUMA????????
- ALI IMAMO DOVOLJ STROKOVNIH NAVODIL GLEDE NAČINA IN MESTA SPROSTITVE OSTANKOV ???
- ALI IMAJO NAPAKE PRI PRANJU NAPRAV POMEMBEN VPLIV NA DOLOČENE NAJDBE FFS V VODAH RAZLIČNIH KATEGORIJ ??????????




ODTEKANJE OSTANKOV FFS OSTALIH V ŠKROPILNICI PO NANOSU FFS V TEKOČINI OD PRANJA NAPRAVE V ODTOK KI JE POVEZAN S POVRŠINSKIMI VODAMI




ODTEKANJE OSTANKOV FFS OSTALIH V PRŠILNIKU PO NANOSU FFS V TEKOČINI OD PRANJA NAPRAVE V ODTOK IN SPROŠČANJE KAPLJIC V ATMOSFERO

## SODOBEN KONCEPT ČIŠČENJA NAPRAV ZA NANOS FITOFARMACEVTSKIH SREDSTEV (FFS)

- VSAJ **99 %** OSTANKOV FFS JE POTREBNO IZ NAPRAVE ODSTRANITI NA LOKACIJI NANOSA FFS

- VEČJI DEL SE ODSTRANI S PONOVNIM NANOSOM RAZREDČENE ŠKROPILNE BROZGE NA TRETIRANO POVRŠINO S POVRATNO VOŽNJO PO TRETIRANI POVRŠINI

- MANJŠI DEL SE ODSTRANI V POSTOPKU ZUNANJEGA PRANJA ZNOTRAJ TRETIRANE POVRŠINE ALI PRANJA NA BIOLOŠKO AKTIVNEM ROBU TRETIRANE POVRŠINE KI NI V BLIŽINI VODA ALI DRUGIH OBČUTLJIVIH OBMOČIJ

LETNO V SLOVENIJI PORABIMO PRIBLIŽNO 1000 TON AKTIVNIH SNOVI FFS

**SCENARIJ 1** - PROFESIONALNO DELO S SODOBNO TEHNIKO (OSTANKI V IN NA NAPRAVI 0,01 %)

NA KMETIJAH OB PRANJU NA DVORIŠU SPROSTIMO **0,1 TONE** AKTIVNIH SNOVI FFS

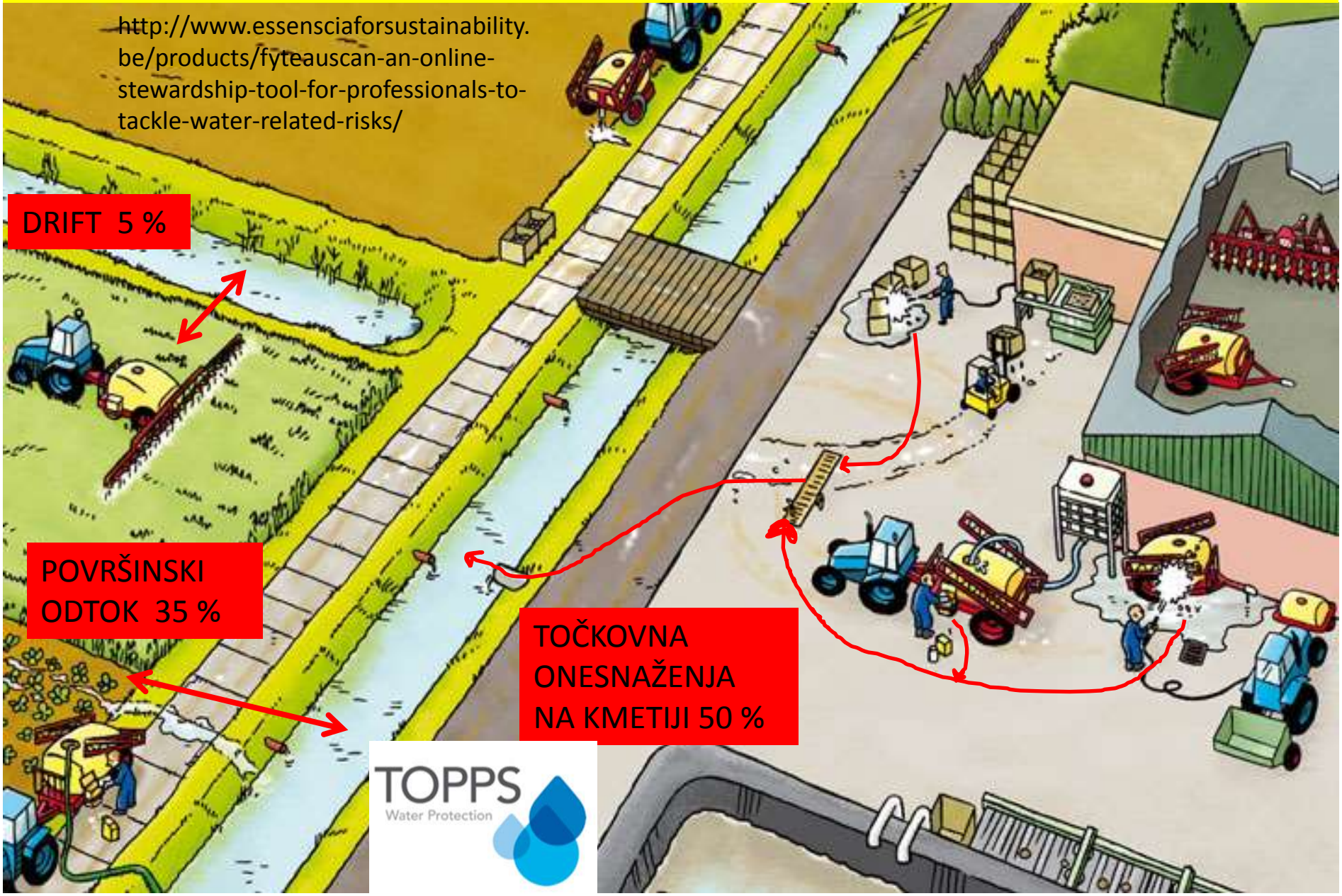
**SCENARIJ 2** - NEPROFESIONALNO DELO S SODOBNO TEHNIKO (OSTANKI V IN NA NAPRAVI 0,05 %)

NA KMETIJAH OB PRANJU NA DVORIŠU SPROSTIMO **0,5 TONE** AKTIVNIH SNOVI FFS

**SCENARIJ 3** - NEPROFESIONALNO DELO Z ZASTARELO TEHNIKO (OSTANKI V IN NA NAPRAVI 2,0 %)

NA KMETIJAH OB PRANJU NA DVORIŠU SPROSTIMO **20 TON** AKTIVNIH SNOVI FFS

# RAZMERJE MED VIRI ONESNAŽEVANJA POVRŠINSKIH VODA S FITOFARMACEVTSKIMI SREDSTVI (FFS)



STEKANJE TEKOČIN IZ NAPRAVE ZA NANOS FFS V ODTOČNI JAŠEK POVEZAN S KANALIZACIJSKIM SISTEMOM - VSTOP FFS V OMERŽEJE POVRŠINSKIH VOD




https://sprayers101.com/articles/specialty-sprayers/hort-maintenance/feed/

Ekosistemsko najbolj smotrno je če napravo očistimo takoj po zaključku dela na biološko aktivni površini, kjer smo izvedeli nanos FFS.  Tako domov na dvorišče kmetije ne prinesemo ostankov FFS in ni potrebe po pranju na dvorišču kmetije.



Ekosistemsko najbolj smotrno je če napravo očistimo takoj po zaključku dela na biološko aktivni površini, kjer smo izvedeli nanos FFS. Tako domov na dvorišče kmetije ne prinesemo ostankov FFS in ni potrebe po pranju na dvorišču kmetije.



# EN-Standardi glede tehničnega rezidualnega volumna v napravi po zaključku nanosa FFS

TRENUTNI STANDARD ZA ŠKROPILNICE
IZRAČUN: 0,5 % VOLUMNA REZERVOARJA
+ 2 l/m ŠIRINE ŠKROPILNE ARMATURE

Manj vode porabimo na hektar več FFS prinesemo domov !!!!!!!!!!!!!!

| Residualni volumen v litrih (EN 12761-2) | | | | |
|---|---|---|---|---|
| Rezervoar | | Škropilna armatura | | Skupaj |
| Volumen | 0,5 % | Dolžina m | 2 l /m | Litri |
| 800 | 4 | 15 | 30 | 34 |
| 3 000 | 15 | 21 | 42 | 57 |
| 4 200 | 21 | 36 | 72 | 93 |

2 DO 4,5 % VOLUMNA SODA

| Residualni volumen v litrih (EN 12761-3) | | |
|---|---|---|
| Rezervoar | % | Skupaj - litri |
| 400 | 4 | 16 |
| 800 | 3 | 24 |
| 1 500 | 2 | 30 |

TRENUTNI STANDARD
ZA PRŠILNIKE
IZRAČUN: 0,5 % VOLUMNA REZERVOARJA

TOPPS
Water Protection

# Primer izračunov rezidualnih volumnov vezanih na tehnični minimalni rezidulani volumen po EN 12761 (*kumulativno 10 nanosov*)

| Primer: poraba vode 250 l/ha in 1 000 g aktivne snovi na hektar | | | |
|---|---|---|---|
| Škropilnica | Tehnični ostanek v l | Grami aktivne snovi v tehničnem ostanku | Grami aktivne snovi po 10 uporabah naprave |
| 800 l | 34 | 136 | 1 360 |
| 3 000 l | 57 | 228 | 2 280 |
| 4 000 l | 93 | 372 | 3 720 |

Škropilnica

| Primer: poraba vode 250 l/ha in 2 000 g aktivne snovi na hektar | | | |
|---|---|---|---|
| Pršilnik | Tehnični ostanek v l | Grami aktivne snovi v tehničnem ostanku | Grami aktivne snovi po 10 uporabah naprave |
| 400 l | 16 | 128 | 1 280 |
| 800 l | 24 | 192 | 1 920 |
| 1 500 l | 30 | 240 | 2 400 |

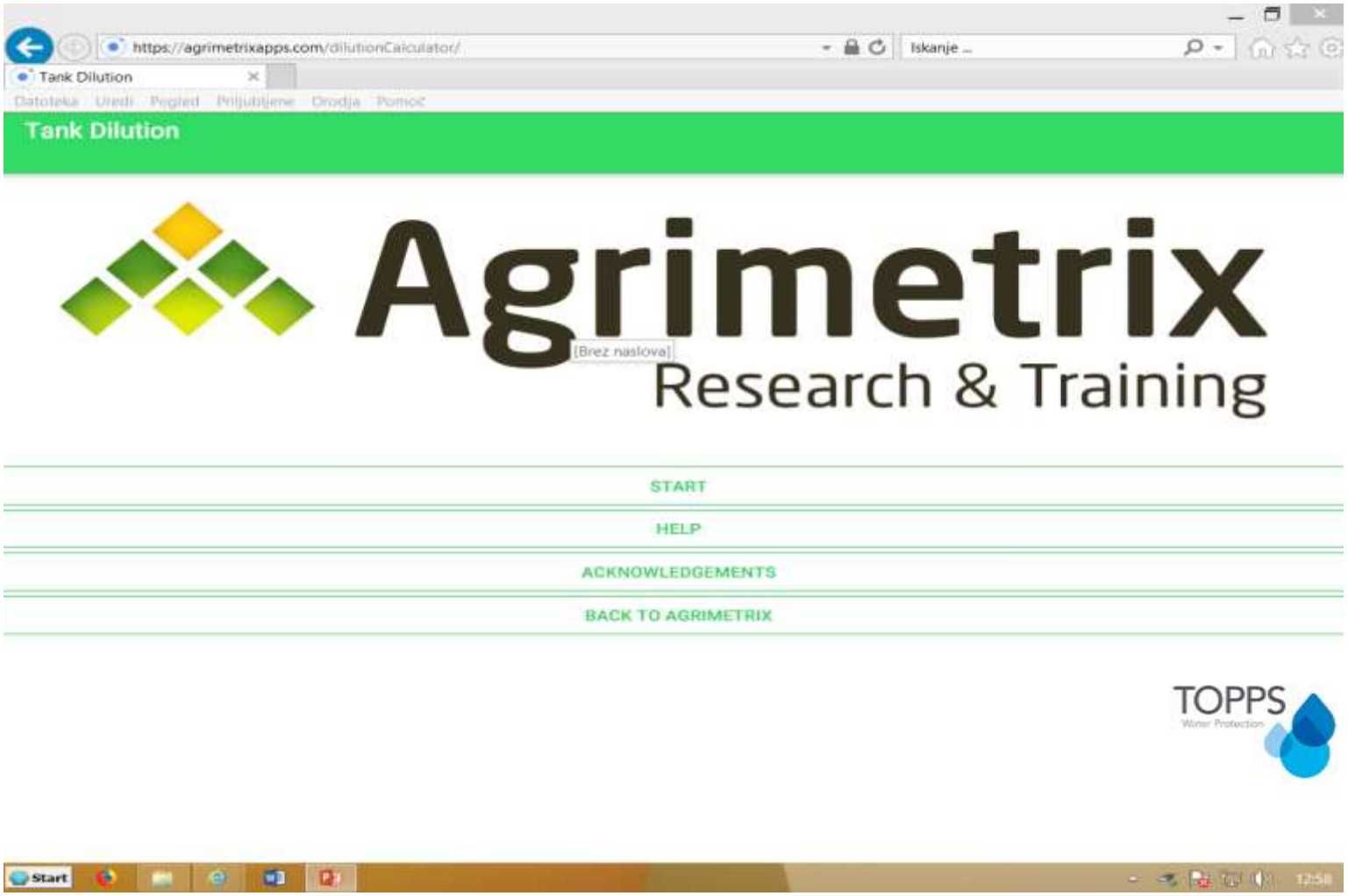
Pršilnik

VELIKOKRAT ŠKROPIMO MEŠANICO ŠKROPIV IN PORABA ZNESE TUDI DVA DO TRIKRAT VEČ

# OB ČIŠČENJU MORAMO DOBRO RAZREDČITI OSTANKE TEHNIČNEGA MINIMUMA

Obstajajo spletne strani za izračun faktorja razredčenja koncentracije FFS ob čiščenju

https://agrimetrixapps.com/dilutionCalculator/



PODATKI O KOLIČINI FFS KI PO APLIKACIJI OSTANEJO NA POVRŠINI ŠKROPILNICE
Primeri iz Nemčije



# Outside cleaning device and cleaning in the field

## Boom sprayers

- Outside contamination is about 0,01 to 0,1 % of the applied amount measured on boom sprayers. Boom sprayers with air support showed concetrations of 0,47 % (*Wehmann 2006).
- Modell calculation:
  Assumption: if 1,5 kg active ingredient/ha is sprayed per year
  Outside contamination: about 0,15 to 1,5 g active incredient / ha (100 ha: 15 g to 150 g active incredient/year; Field sprayers with air support about 10 x more)





* Quelle: JKI

PRIMER RAZISKAVE O KOLIČINI FFS NA ZUNANJIH POVRŠINAH PRŠILNIKA

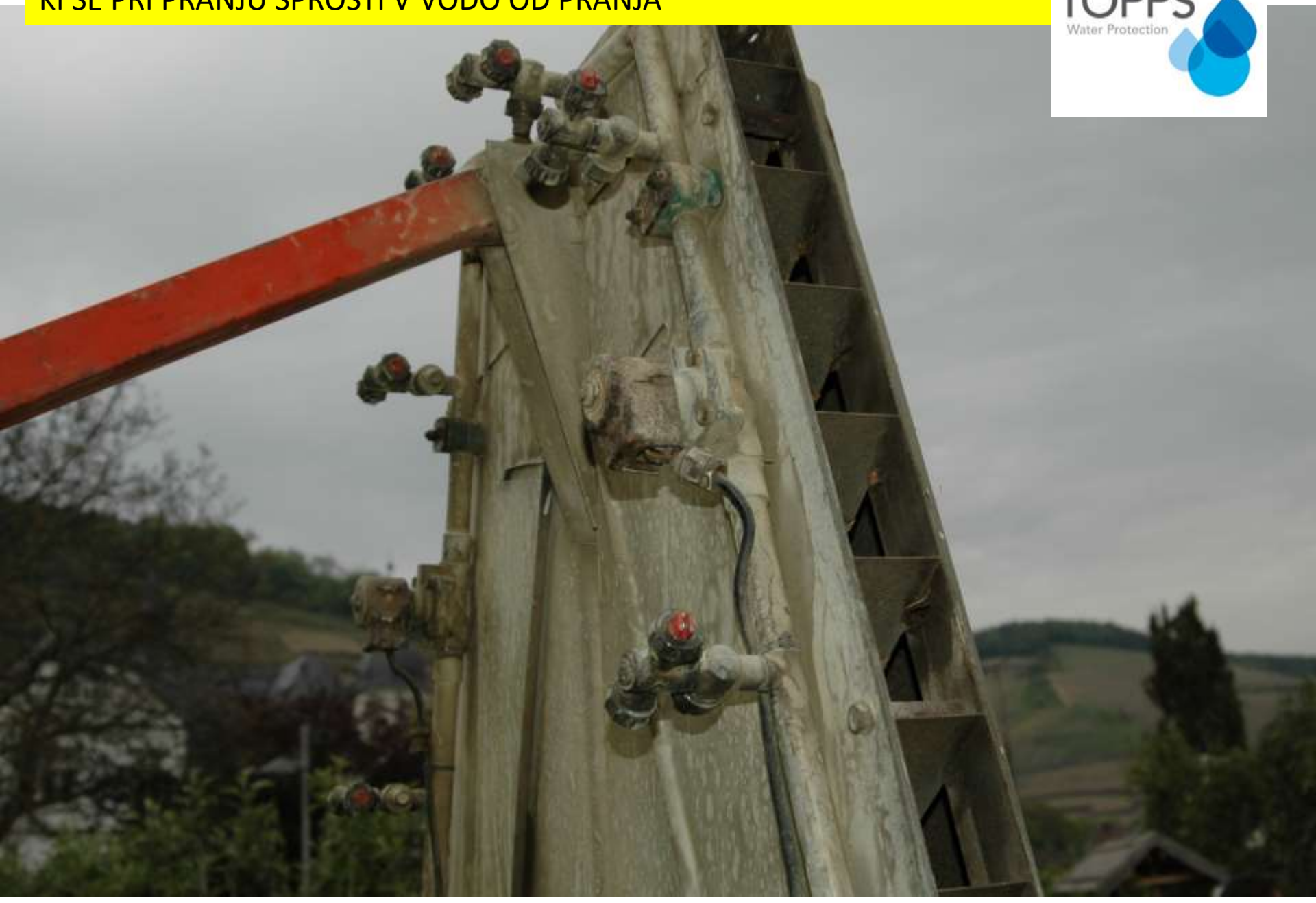
*Aspects of Applied Biology* ***114***, *2012*
*International Advances in Pesticide Application*

# External loading of an orchard sprayer with agrochemicals during application

By J M G P MICHIELSEN[1], J C VAN DE ZANDE[1], M WENNEKER[2], H STALLINGA[1] and P VAN VELDE[1]

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Pršilniki so vedno precej obloženi z oblogo pesticidov
KI SE PRI PRANJU SPROSTI V VODO OD PRANJA



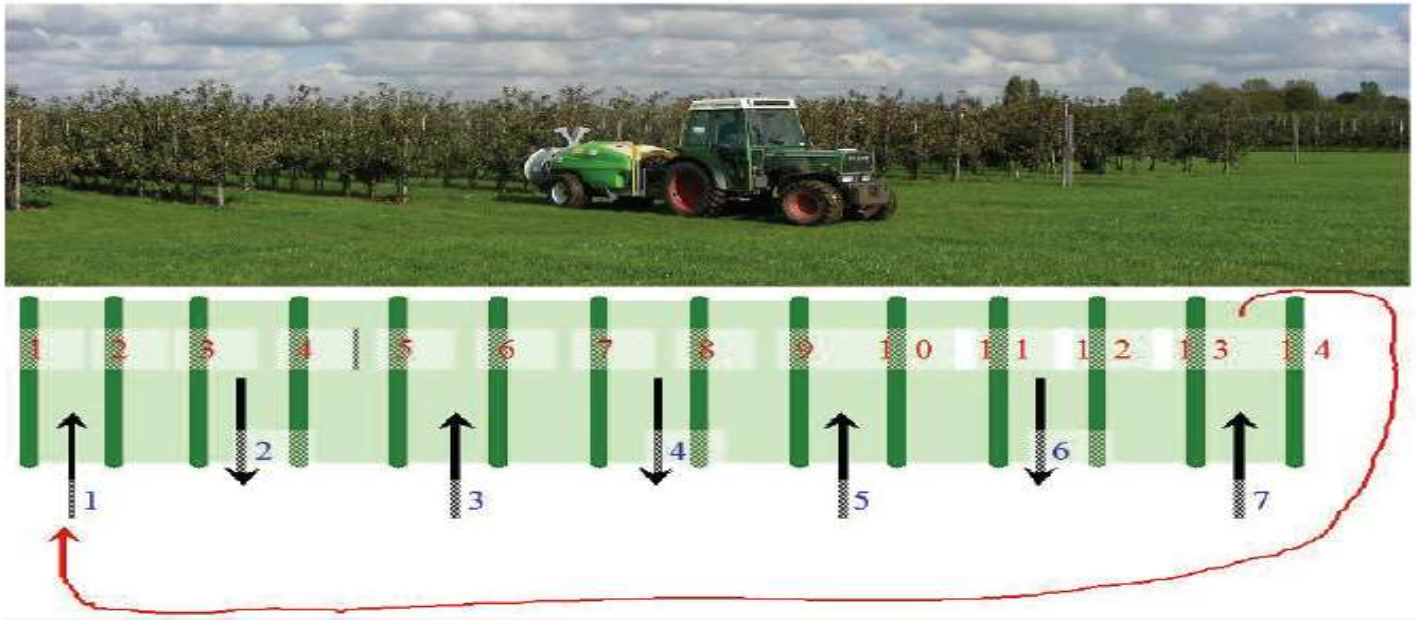



Fig. 1. Overview test area with a Munckhof axial fan sprayer and routing scheme of the sprayer through the orchard.




Fig. 2. Schematic overview sampling places and representative surface area on tractor (T1–T4) and sprayer (1–10). Collectors and marked areas (10 cm × 10 cm) on fan house (right; one area wiped) and wiping on tank (centre).

# REZULTATI – DELEŽ ŠKROPIVA, KI JE OSTAL NA ZUNANJIH POVRŠINAH

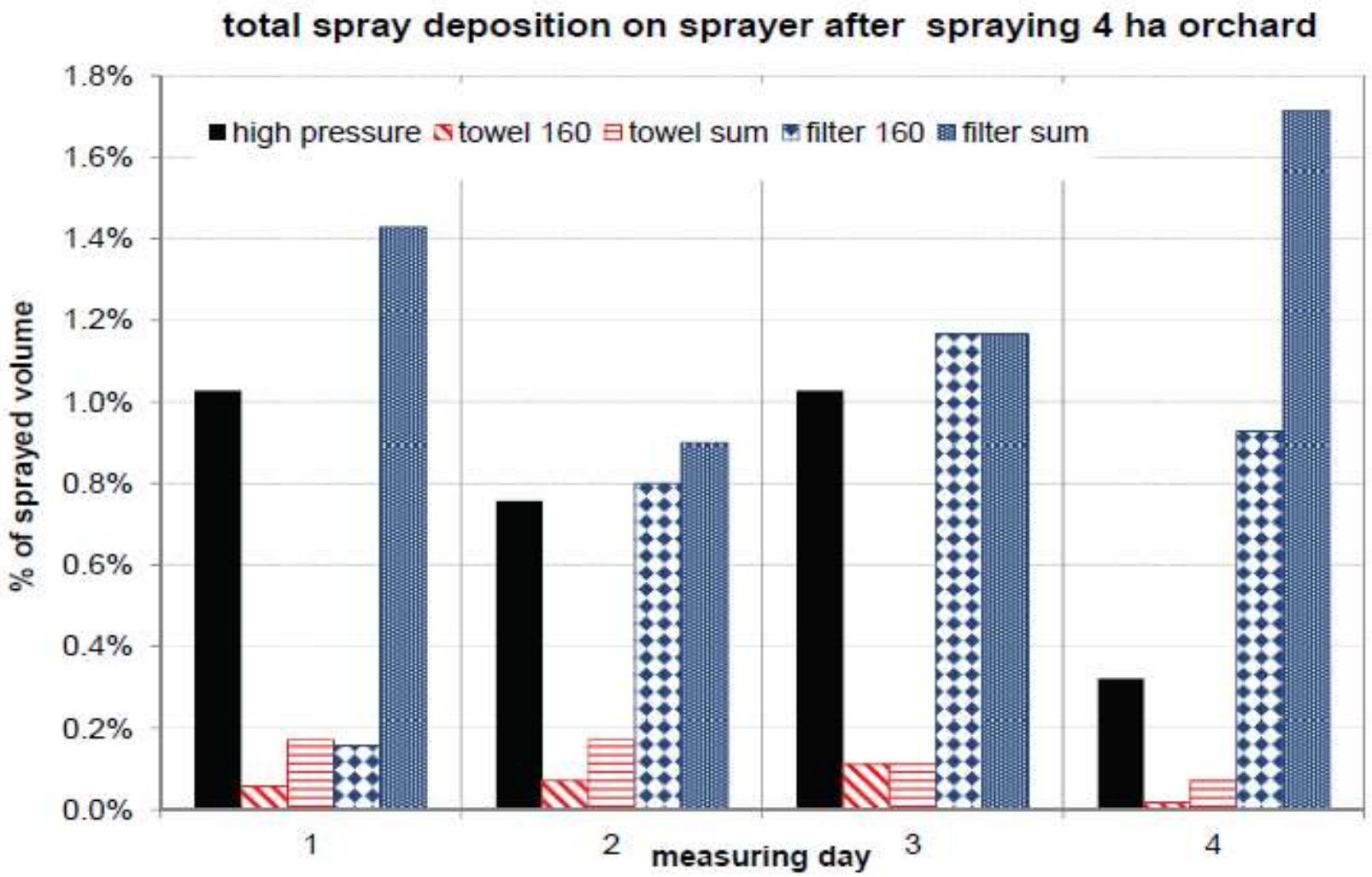



Fig. 4. Total spray deposition (% of sprayed volume) on the sprayer after spraying 4 ha of orchard (160 mins) for four different days (repetitions) for high pressure cleaning of the total sprayer, wiping with towel 10 × 10 cm² surface area and on filter collectors of 10 × 10 cm² for different summed time periods during spraying (sum) and total time of spraying (160 mins).

FOTO: ANDREW LANDERS CORNELL ZDA







# UP TO 3% OF THE MIXTURE SPRAYED IS DEPOSITED ON THE EXTERNAL SURFACE OF THE SPRAYER




Če na posestvu z 10 ha v sadovnjaku škropimo 25 krat letno vsakič s 3000 g AS na ha, potem na letnem nivoju na dvorišču sprostimo 2,25 kg AS, kar je približno količina AS za eno škropljenje enega ha sadovnjaka.

# The Need for In Field Cleaning: External surfaces.



Spray deposits can adhere to external surfaces in high concentrations sometimes after a short time

FOTO: ANDREW LANDERS CORNELL ZDA



## Pesticide residues, (micro-grams of chemical detected)

| Location | Tractor | | | | | Self-propelled | | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | SR 1 | SR 2 | SR 3 |
| Cab Windshields - Interior | | 1.89 | | | | 2.46 | | |
| Cab Windshields - Exterior | | | 0.59 | 2.39 | | | | |
| Under Seat Areas | 2.35 | | 1.05 | 3.53 | 3.37 | 1.67 | | |
| Steering Wheel & Gauge Areas | 6.17 | 4.21 | 2.5 | 4.65 | 3.59 | 2.08 | 2.79 | |
| Inlet Vent | 2.55 | 1.98 | 1.78 | 1.99 | | 2.01 | 3.33 | |
| Outlet Vent | 2.15 | 2.09 | 1.32 | 1.66 | | 1.72 | 9.13 | |
| Cloth Seats | 33.64 | | | | | | 151 | 85.06 |

Kline, A.A., Landers, A.J. Hedge, A., Lemley, A.T., Obendorf, S.K. and Dokuchayeva, T. (2003) *A Engineering in Agriculture* 19 (4) 397- 403

FOTO: ANDREW LANDERS CORNELL ZDA

Velike količine FFS lahko najdemo tudi v notranjosti kabine. !!!!!!!!!!!!!!!!

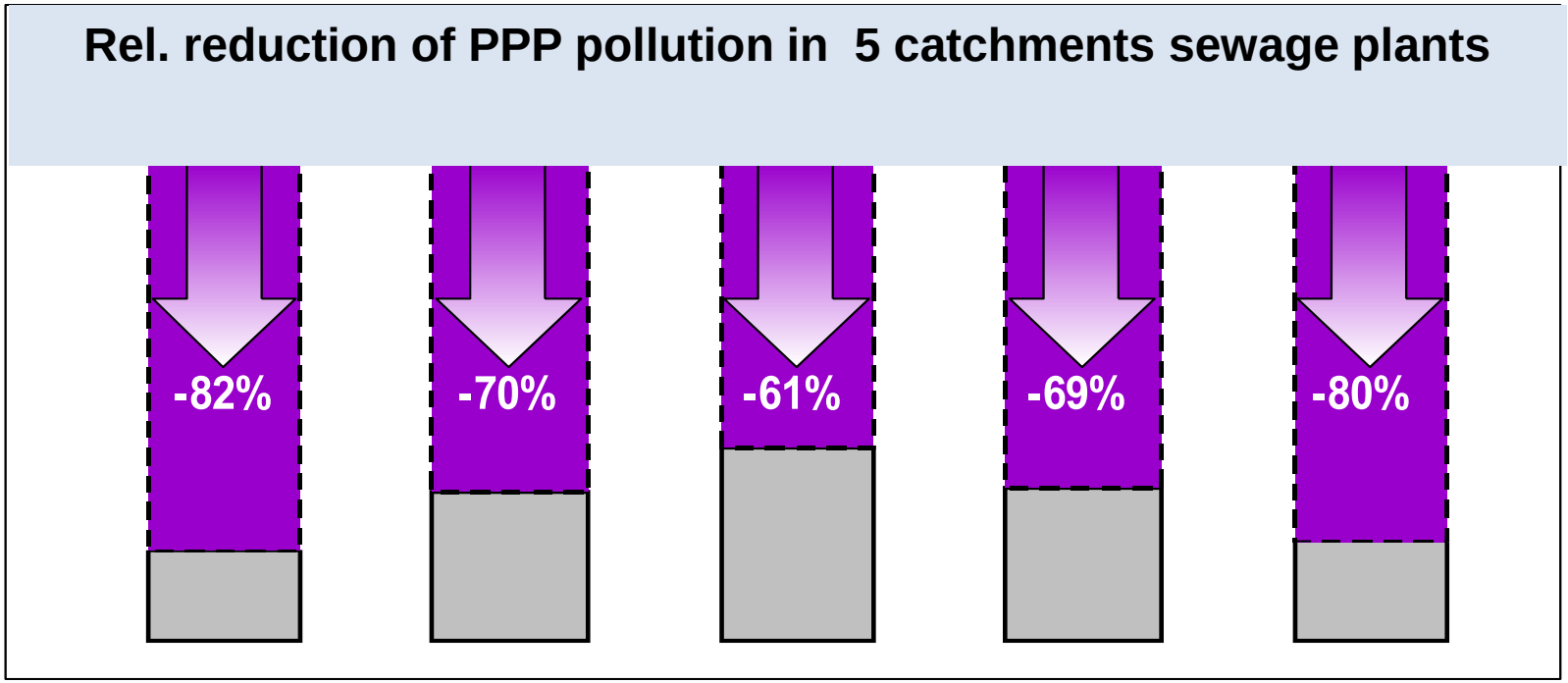


DEPOZITA ŠKROPIVA NA TRAKTORJU JE TAKO VELIK, DA SE SPLOH NE VIDI OSNOVNE BARVE TRAKTORJA
JOHN DEERE JE OBIČAJNO ZELEN

V TUJINI SO V RAZISKAVAH UGOTOVILI, DA SE S STROKOVNIMI AKTIVNOSTMI DA ZNAČILNO ZMANJŠATI OBSEG PREHODA FFS V VODE POVEZANEGA S PRANJEM NAPRAV

# Reduction Potential for Point Sources

## Reduced PPP in surface water after intensive training and transfer of sprayer cleaning to the field .




Transferring cleaning processes away from the farmyard and out to the field can reduce point source pollution by about 70% !

Presented by Prof. Frede Univ. Giessen at TOPPS Forum Germany Oct 2006 (changed)

## POSLEDICE NEUČINKOVITEGA PRANJA NAPRAV ZA NANOS FFS

1) ONESNAŽEVANJE VODA IN RAZLIČNIH POVRŠIN TER OBJEKOV NA KMETIJI

*- KO NAPRAVO PEREMO NA DVORIŠČU V VEČINI PRIMEROV NIMAMO ZAGOTOVLJENE INFRASTRUKTURE ZA ZBIRANJE VODE OD PRANJA*

*- VODA OD PRANJA PREIDE V SISTEME ZA ODVOD METEORNE VODE TER V KANALIZACIJSKE SISTEME IN POJAVI SE ONESNAŽEVANJE OKOLJA*

2) IZPOSTAVLJENOST LJUDI IN ŽIVALI NA KMETIJI

*- S POVRŠINE NEOČIŠČENIH NAPRAV SE SPROŠČAJO FFS KATERIM SO IZPOSTAVLJENI MIMOIDOČI*

3) TEHNIČNE NAPAKE PRI DELOVANJU NAPRAV

*- BOLJ POGOSTO MAŠENJE FILTROV IN ŠOB*

*- POVEČANJE POGOSTOSTI POJAVA NAPAK PRI DELOVANJU ŠOB MED APLIKACIJO FFS IN POSLEDIČNO TOČKOVNA NEUČINKOVITOST FFS*

*- VEČJA PORABA ČASA ZA ŠKROPLJENJA ZARADI VEČJE POGOSTOTI ODSTRANJEVANJA NAPAK*

*- KRAJŠA ŽIVLJENJSKA DOBA NAPRAV IN ŠOB*

4) POJAVI FITOTOKSIČNOSTI IN POJAVI NEDOVOLJENIH OSTANKOV FFS V TRETIRANI KULTURI

- ČE IZVAJAMO NANOS FFS S POMANJKLJIVO OČIŠČENO NAPRAVO SE LAHKO NA TRETIRANIH RASTLINAH POJAVI FITOTOKSIČNOT IN LAHKO SE POJAVIJO OSTANKI NEDOVOLJENIH FFS

OSNOVNI DEL PROBLEMA JE ODTOK FFS V POVRŠINSKE VODE – SO PA ŠE DRUGI VIDIKI

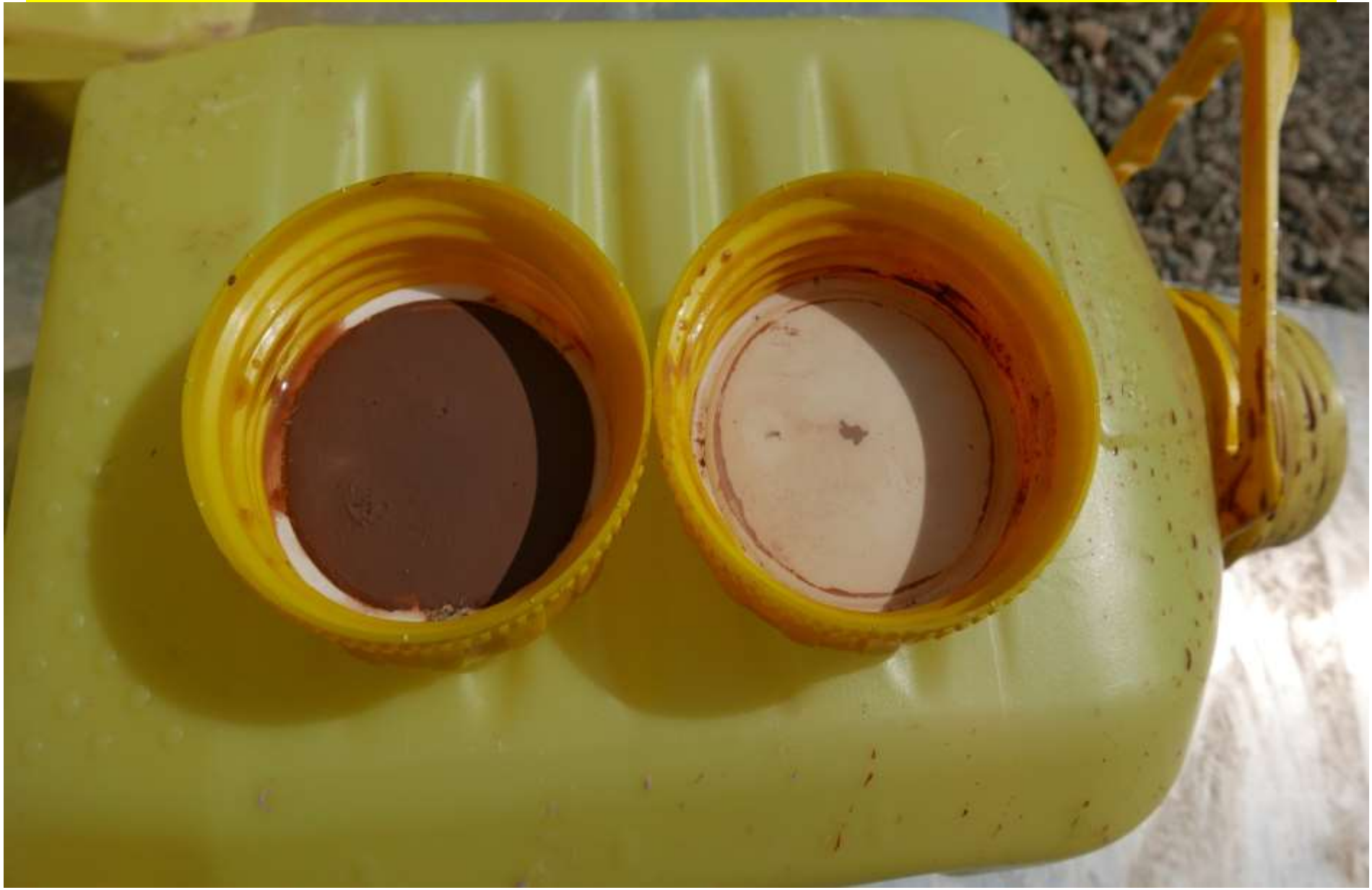


Sodobna analitika lahko zaznava izjemno nizke koncentracije aktivnih snovi v vodi

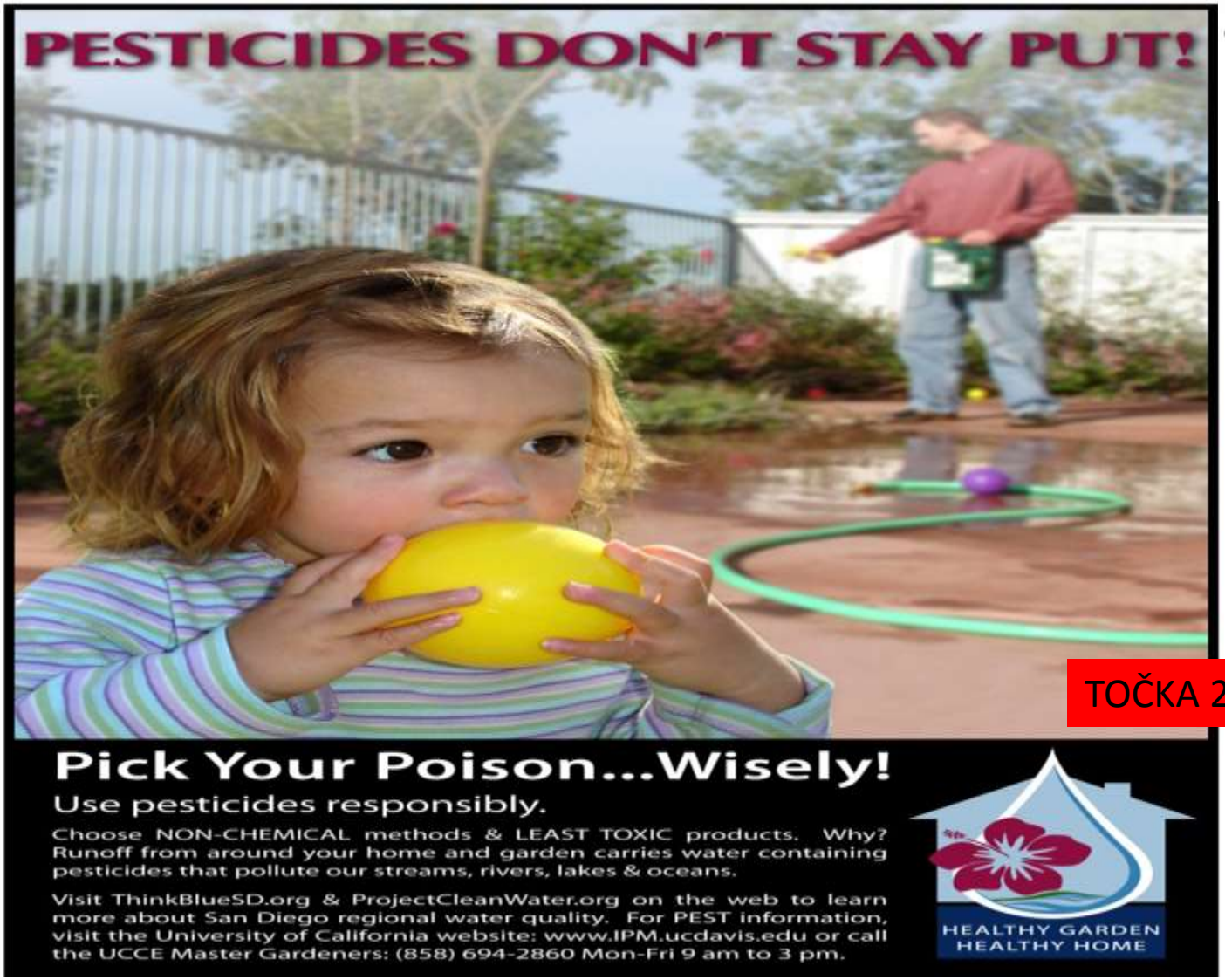
TOČKA 1



ČE EN TAK POKROVČEK  V MARIBORU VRŽETE V DRAVO LAHKO FFS  DETEKTIRAJO  V DONAVI V BEOGRADU



NA DVORIŠČU KJER IZVAJAMO PRANJE SE GIBLJEJO LJUDJE IN ŽIVALI
Z OSTANKI OD PRANJA SE LAHKO KONTAMINIRAJO TUDI ONI




TOPPS
Water Protection

TOČKA 2

## Tehnične napake pri delovanju naprav

TOČKA 3

*- bolj pogosto mašenje filtrov in šob*

*- povečanje pogostosti pojava napak pri delovanju šob med aplikacijo ffs in posledično točkovna neučinkovitost ffs*

*- večja poraba časa za škropljenja zaradi večje pogostosti odstranjevanja napak*

*- krajša življenjska doba naprav in šob*





**Contaminated sprayers will rot away – note the corrosion on this AgTec sprayer**



Solvents within the pesticides are particularly harmful on some types of hose and components;

# PROBLEMI FITOTOKSIČNOSTI HERBICIDOV (HORMONCI IN SULFONIL SEČNINE)



http://ephytia.inra.fr/en/C/21100/Potato-Symptoms





# PROBLEMI FITOTOKSIČNOSTI HERBICIDOV (HORMONCI IN SULFONIL SEČNINE)












PPP-108.pdf - Adobe Acrobat Reader DC

Datoteka Urejanje Pogled Okno Pomoč

Domov Orodja PPP-108.pdf ×

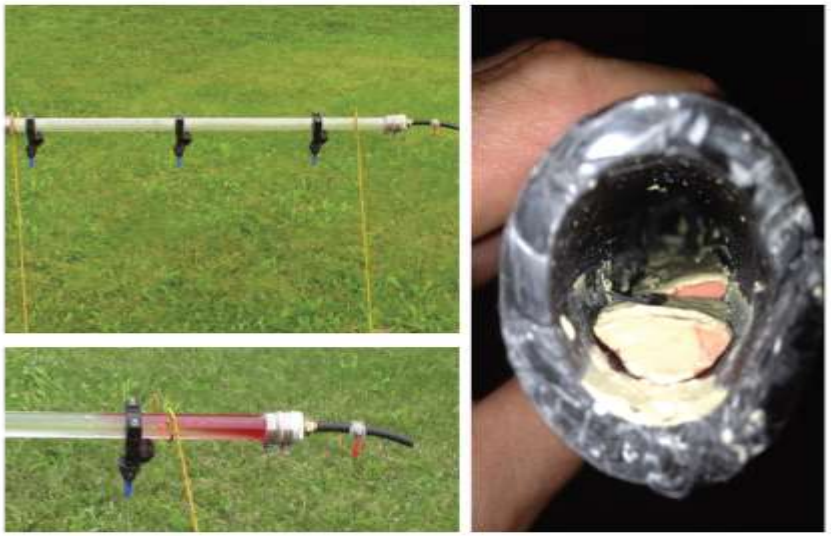
1 / 52 69,9%

PURDUE EXTENSION

PPP-108

# Removing Herbicide Residues from Agricultural Application Equipment





*The accumulation of product at the end cap is a major problem (top right). A transparent boom demonstrates sprayer boom end cap issues during cleanout (top left and bottom left). The operator fills the boom with red dye (representing an herbicide) and attaches it to a sprayer boom via a nozzle body and quarter-turn attachment. The operator flushed the boom with water for 15 minutes while jostling and shaking the boom to emulate sprayer turns. The dye, compressed at the boom end, never moved, but slowly mixed and was emitted from the final nozzle. Once we opened the small valve at the far end (representing any number of end-cap valves) it took two seconds to clear the dye. This demonstration really drives home the end-cap accumulation issue.*

https://sprayers101.com/dicamba-rinsate/

Sprayers 101

SPRAY BASICS | BOOM SPRAYERS | SPECIALITY SPRAYERS | MULTIMEDIA | TABLES & APPS

Home > Boom Sprayers > Cleaning & Maintenance > Testing the effectiveness of sprayer rinsing methods using dicamba

# Testing the effectiveness of sprayer rinsing methods using dicamba

Spray_Guy  Boom Sprayers, Cleaning & Maintenance

*This work was performed with Mike Cowbrough (@cowbrough), Weed Management Specialist (Field Crops) with OMAFRA.*

The unprecedented number of dicamba drift complaints in the United States has proven to be a polarizing issue in the agriculture community. The debate continues as to the relative influence of contributing factors.

The sensitivity of soybeans to trace amounts of dicamba has been known for more than 50 years (Wax et al. 1969). Research has shown that less than 0.2% of the highest recommended use rate can cause a 10% yield loss in non dicamba-tolerant soybean (Robinson et al., 2013). Many horticulture and ornamental crops are equally sensitive to low doses of dicamba.




Sort by month

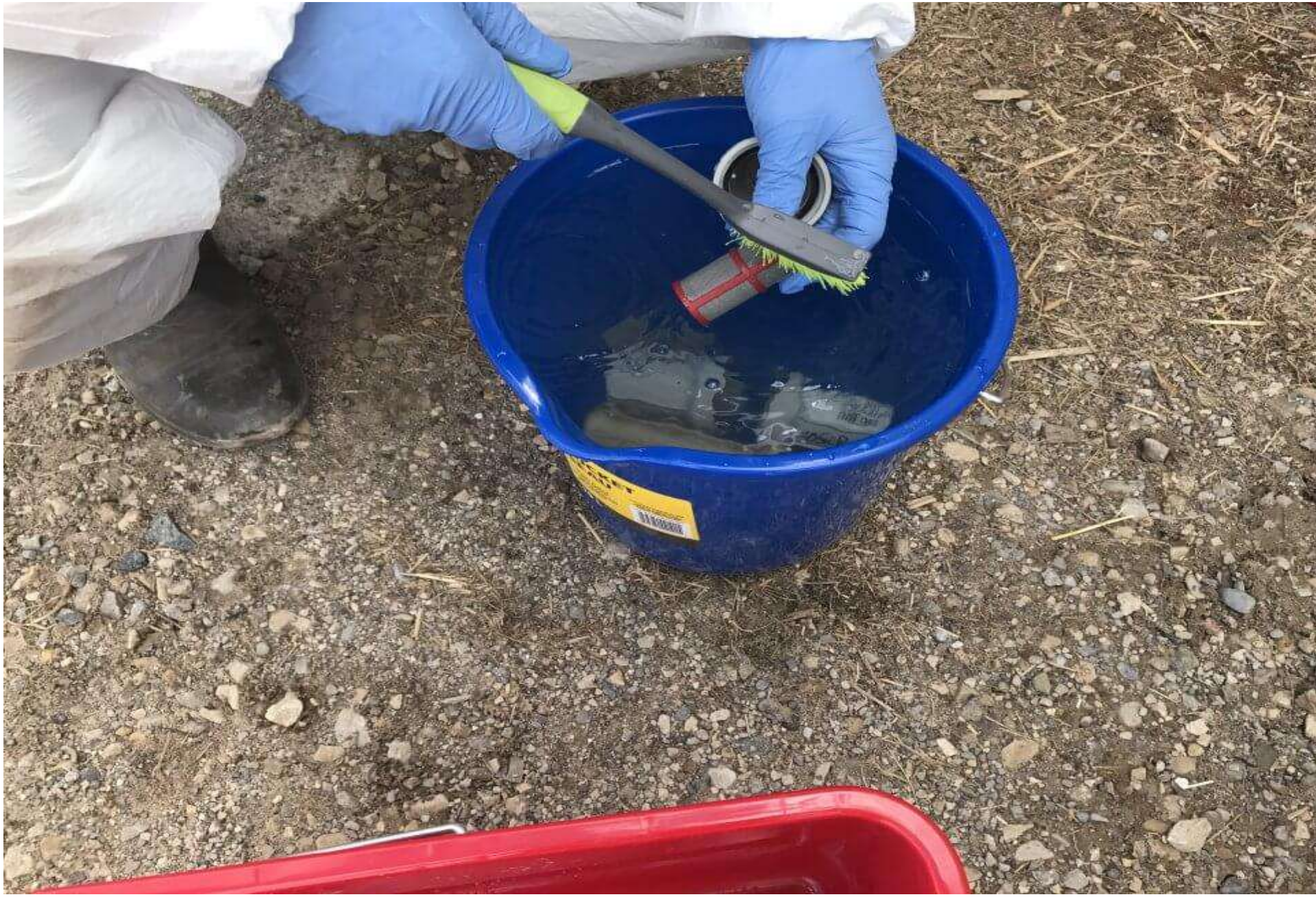
- June 2017
- May 2017
- April 2017
- March 2017
- February 2017
- January 2017
- November 2016
- October 2016
- September 2016
- July 2016
- June 2016
- May 2016

VELIKO JE POJAVOV FITOTOKSIČNOSTI KI JIH S PROSTIM OČESOM NE VIDIMO

PRIMER RAZISKAVE O UČINKOVITOSTI PRANJA IZ ZDA

RAZLIKE V UČINKOVITOSTI PRANJA MED RAZLIČNIMI VRSTAMI KEMIČNIH SNOVI

https://sprayers101.com/dicamba-rinsate/



## Podatki o vizualni oceni stopnje poškodb soje od snovi dikamba zaradi slabo umite škropilnice pri različnih postopkih pranja

| Treatment | Elora | Ridgetown | Winchester | Woodstock |
|---|---|---|---|---|
| | *% Visual Injury at 14 days after application* | | | |
| Crop stage at application | V5 | V2 | V6 | R1 |
| Weed-Free Control | 0 | 0 | 0 | 0 |
| RU Xtend | 100 | 100 | 100 | 100 |
| Serial Rinse # 1 | 100 | 75 | 100 | 100 |
| Continuous Rinse # 1 (25% water) | 100 | 95 | 100 | 100 |
| Serial Rinse # 2 | 75 | 65 | 90 | 90 |
| Continuous Rinse # 2 (50% water) | 85 | 70 | 95 | 95 |
| Serial Rinse # 3 | 55 | 50 | 60 | 75 |
| Continuous Rinse # 3 (75% water) | 55 | 50 | 60 | 75 |
| Serial Rinse # 4 | 25 | 10 | 25 | 35 |
| Continuous Rinse # 4 (100% water) | 25 | 10 | 25 | 35 |
| Filters – Serial Rinse | 15 | 30 | 10 | 25 |
| Filters – Continuous Rinse | 15 | 30 | 10 | 25 |
| Filters – Continuous with 1% ammonia | 25 | 45 | 20 | 35 |

## Izguba pridelka soje zaradi poškodb od snovi dikamba, ki je ostala v škropilnici zaradi nestreznega pranja

| Treatment | Elora | Ridgetown | Winchester | Average |
|---|---|---|---|---|
| | *Yield (% of weed-free control)* | | | |
| Crop Stage at application | V5 | V2 | V6 | V2-V6 |
| Weed-Free Control | 100 | 100 | 100 | 100 |
| RU Xtend | 0 | 0 | 0 | 0 |
| Serial Rinse # 1 | 0 | 44 | 1 | 15 |
| Continuous Rinse # 1 (25% water) | 0 | 13 | 0 | 4 |
| Serial Rinse # 2 | 33 | 65 | 10 | 36 |
| Continuous Rinse # 2 (50% water) | 22 | 61 | 3 | 28 |
| Serial Rinse # 3 | 74 | 89 | 66 | 76 |
| Continuous Rinse # 3 (75% water) | 72 | 89 | 57 | 76 |
| Serial Rinse # 4 | 86 | 96 | 86 | 89 |
| Continuous Rinse # 4 (100% water) | 86 | 97 | 82 | 89 |
| Filters – Serial Rinse | 93 | 96 | 100 | 96 |
| Filters – Continuous Rinse | 87 | 97 | 95 | 93 |
| Filters – Continuous with 1% ammonia | 79 | 85 | 92 | 85 |

Najdbe nedovoljenih ostankov FFS  v vzorcih poljščin, vrtnin in sadja so vse bolj pogoste.
Eden od vzrokov je tudi neustrezno čiščenje  naprav za nanos FFS.
Nekoč analitske metode niso bile tako razvite in nizkih nivojev ostankov v laboratoriju niso zaznali,  pri današnjih metodah zaznamo izjemno nizke koncentracije, ki so posledica neustreznega pranja naprav za nanos FFS.



## PRAKTIČNE TEŽAVE V SLOVENIJI

Škropilna tehnika različnih razvojnih stopenj
Najslabša situacija stara škropilnica brez rezervoarja za čisto vodo in z zelo nizko kapaciteto pretokov in brez notranjih čistilnih šob
NI MOŽNO PRANJE NA NJIVI – REZEN ČE ČISTO VODO V POSADH PELJEMO S SEBOJ

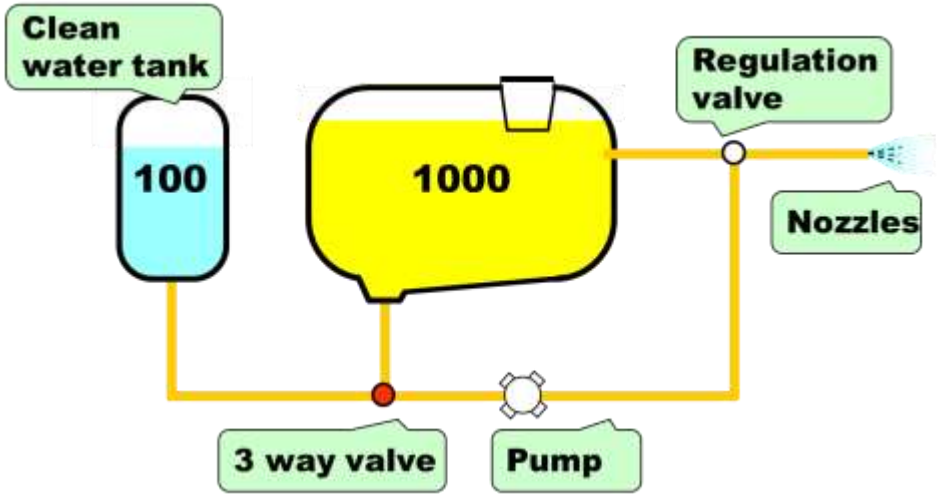
Več kot 30 % naprav pri nas je v tej kategoriji



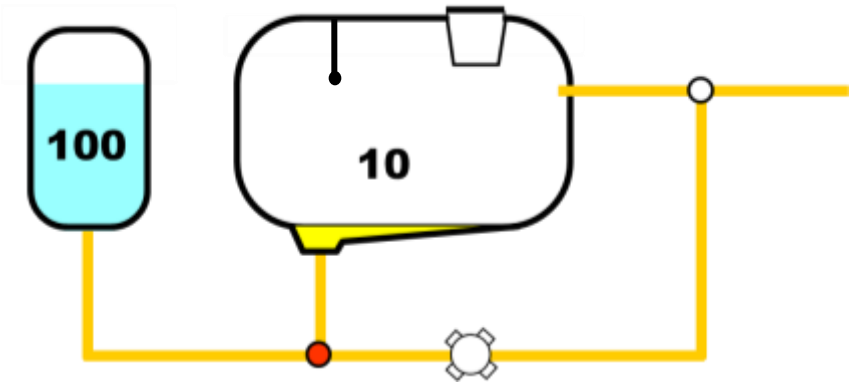
# PRIMERI POSTOPKOV ČIŠČENJA

## *MOŽNOST 1: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO A BREZ BY-PASS VENTILA*

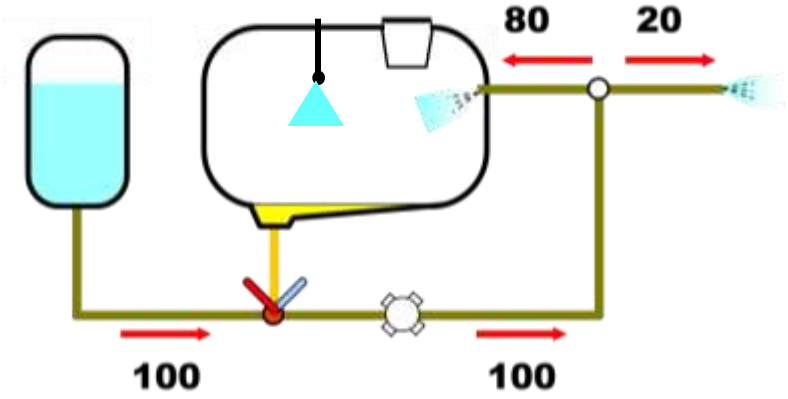
**Pred nanosom FFS**




**Ob zaključku nanosa FFS**




**Običajen postopek pranja**



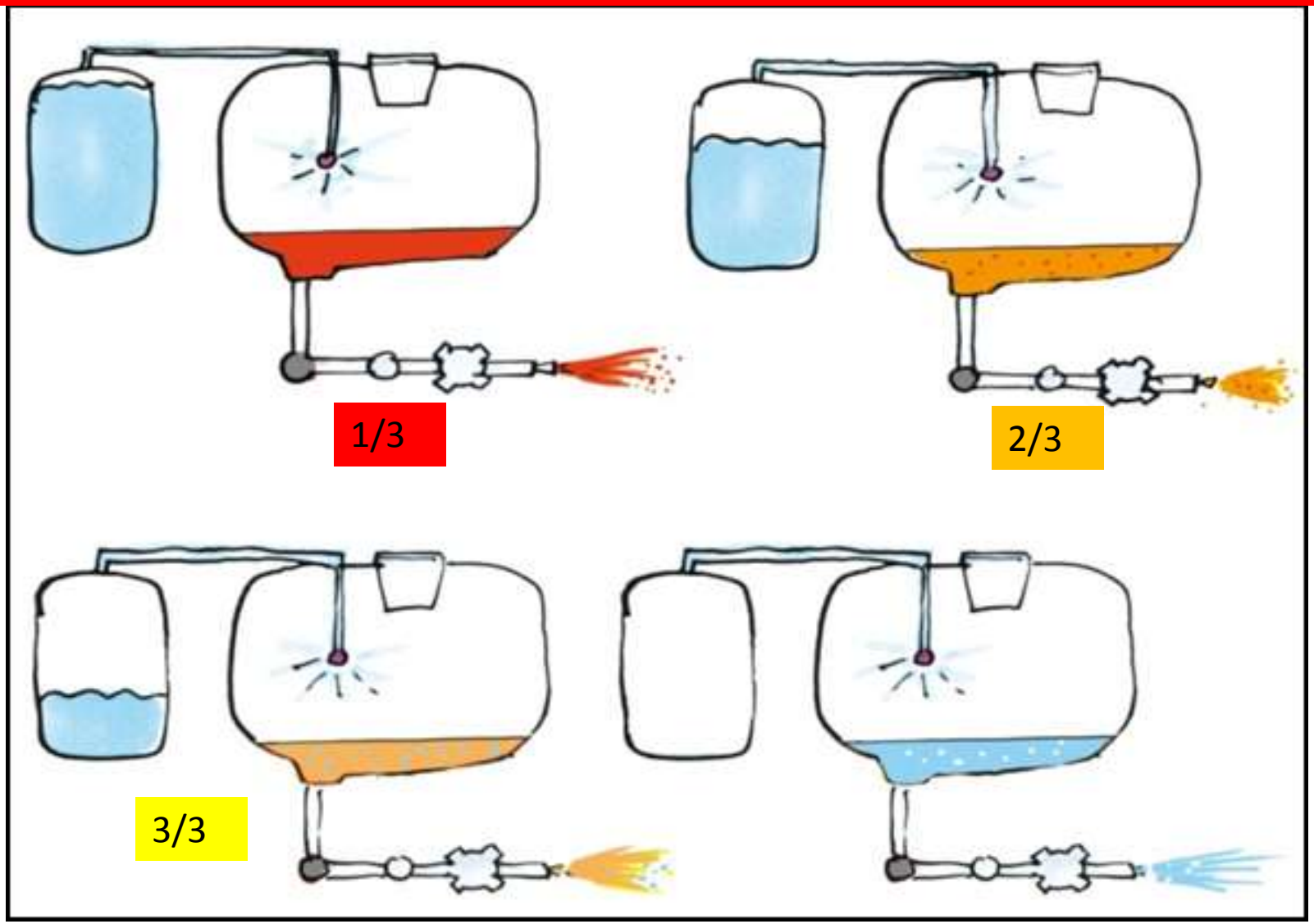

**Sistema škropilnice ne moremo izprazniti do konca. Vedno ostane tehnični minimum (TM).**

TOPPS Water Protection

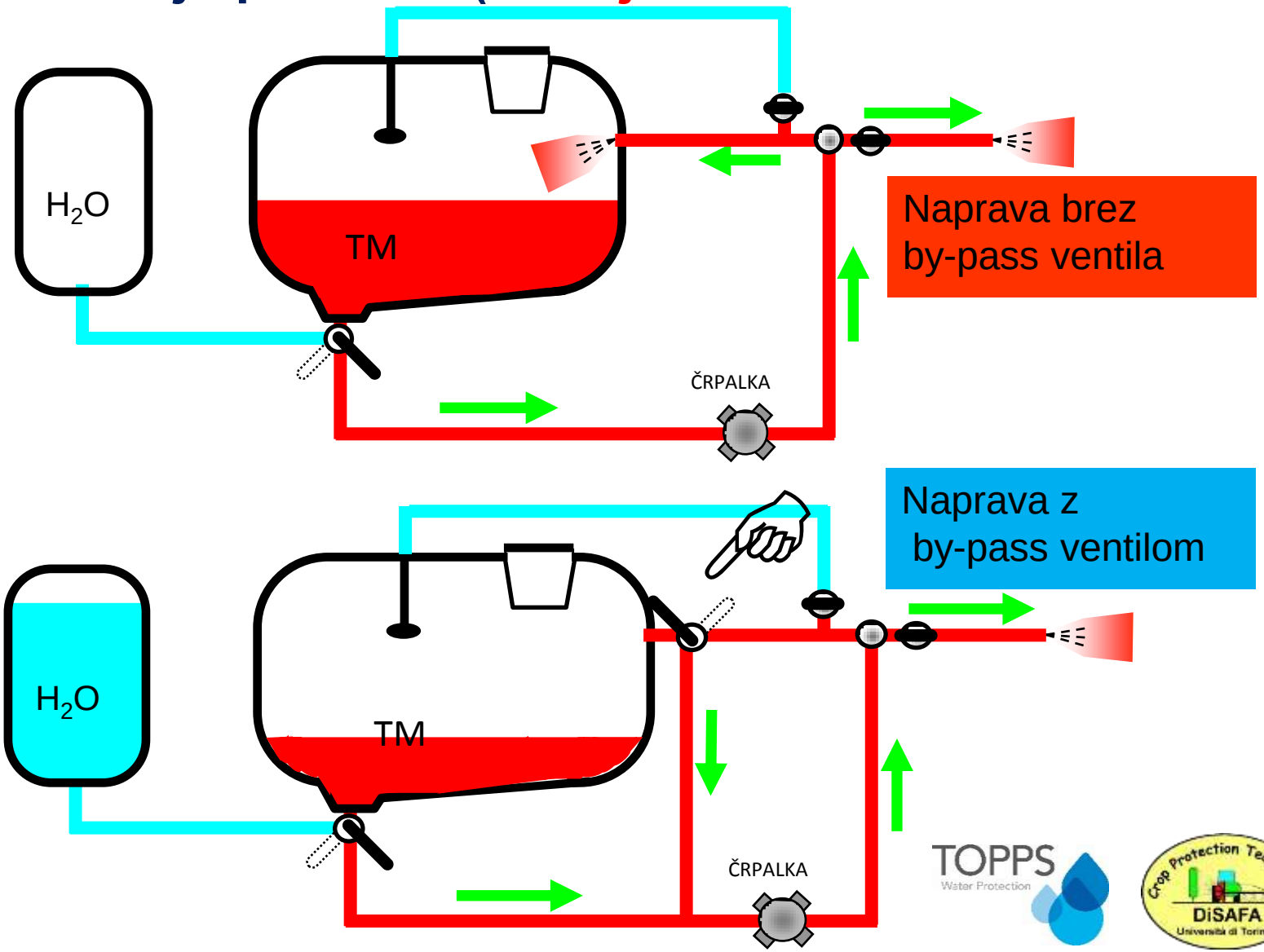
Crop Protection Technology DiSAFA Università di Torino

OBIČAJEN POSTOPEK PRANJA S TRIKRATNIM IZPLAKOVANJEM
NA NJIVI ČE IMA ŠKROPILNICA DODATNI REZERVORA ZA ČISTO VODO

PRAKTIČNA NEVŠEČNOST VEČKRATNO PREKLAPLJANJE VENTILOV

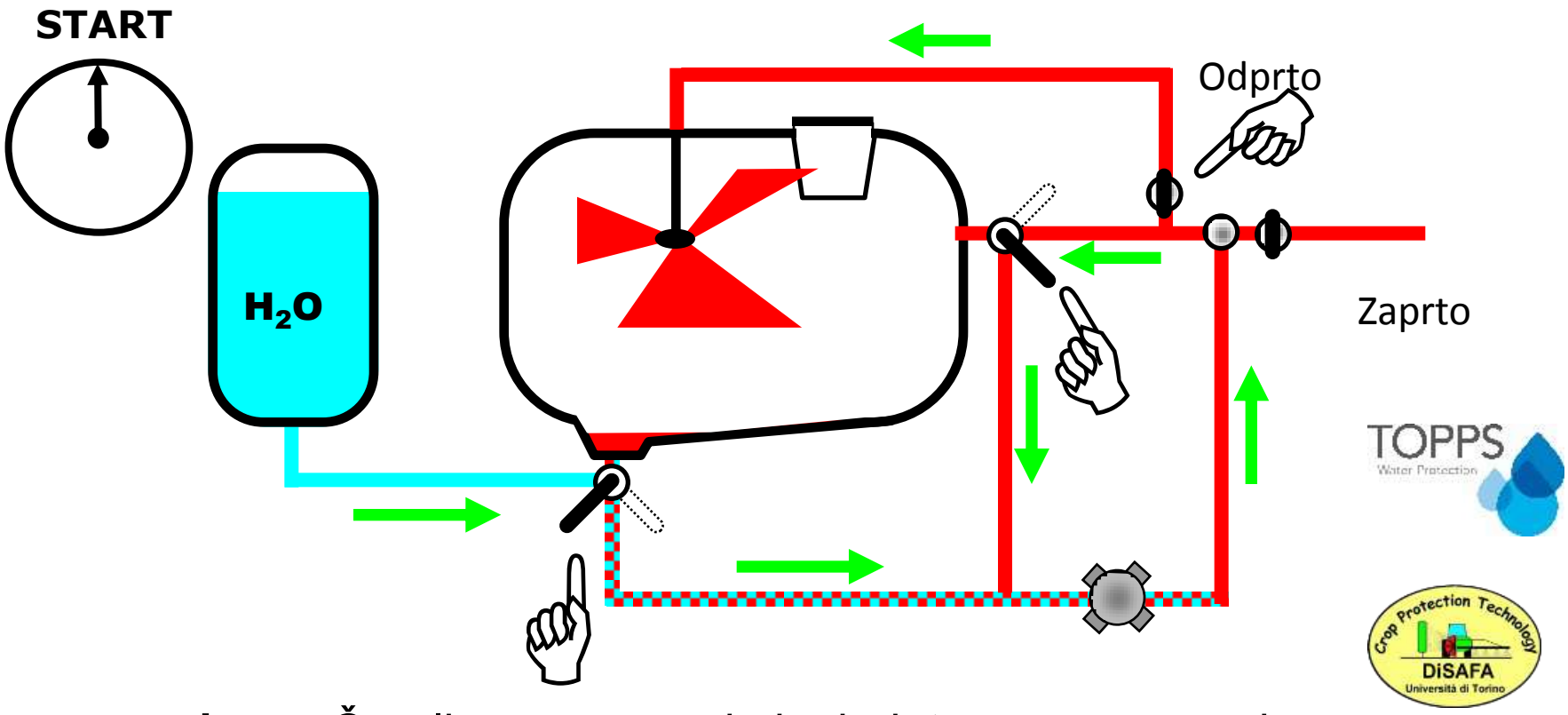


# Naprave z by-pass ventili omogočajo bolj natančno čiščenje ker preprečujejo povratni dotok škropilne brozge na že očiščeno notranjo površino (zmanjšan tehnični minimum TM)



# PRIMERI POSTOPKOV ČIŠČENJA

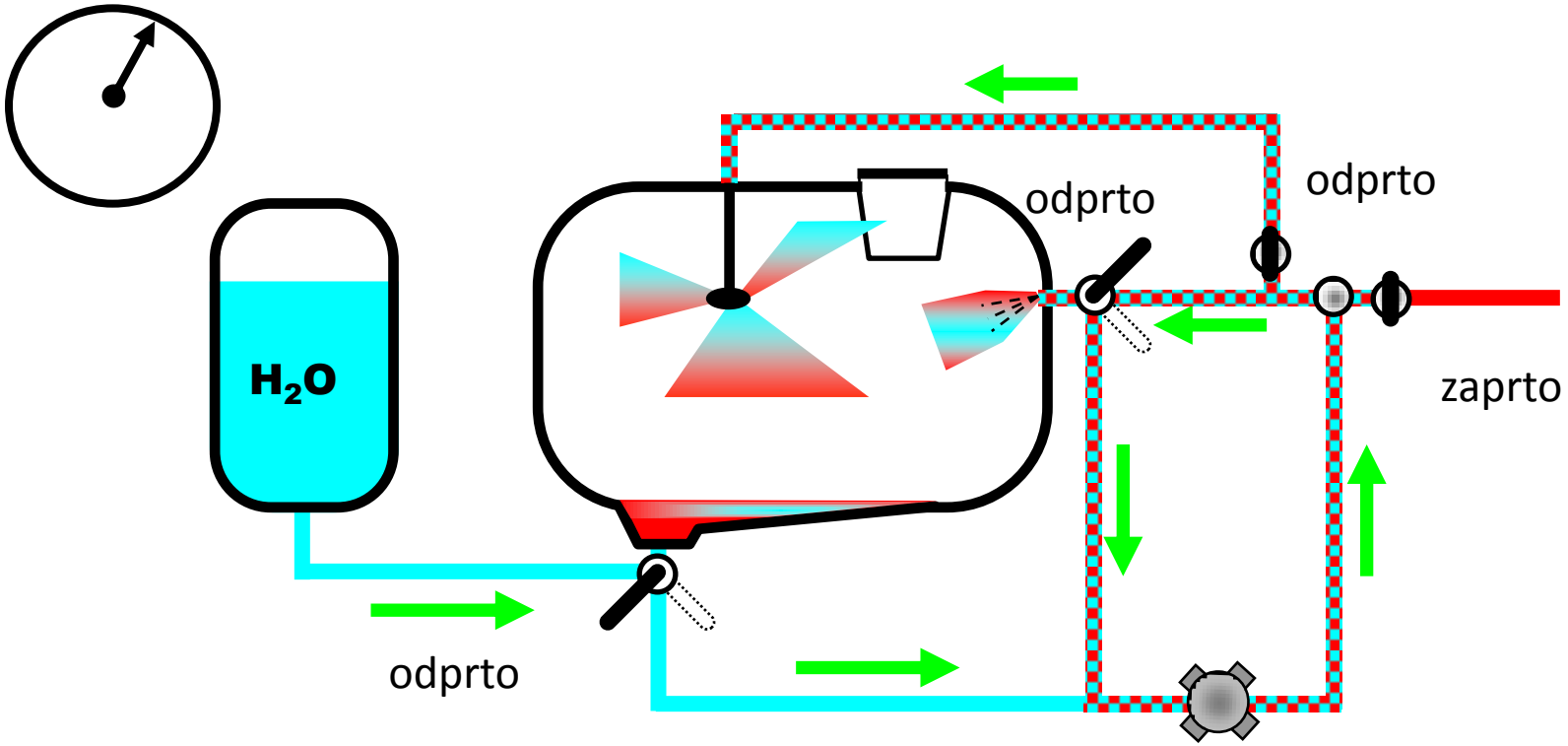
## *MOŽNOST 2: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO IN Z BY-PASS VENTILOM*




**Korak 1** – Črpalka vzame vodo iz dodatnega rezervoarja s čisto vodo in jo požene do šobe za notranje čiščenje. Povratni vod (by-pas ventil) je odprt in preko njega se sprosti voda za razredčenje ostanka škropilne brozge.

# PRIMERI POSTOPKOV ČIŠČENJA

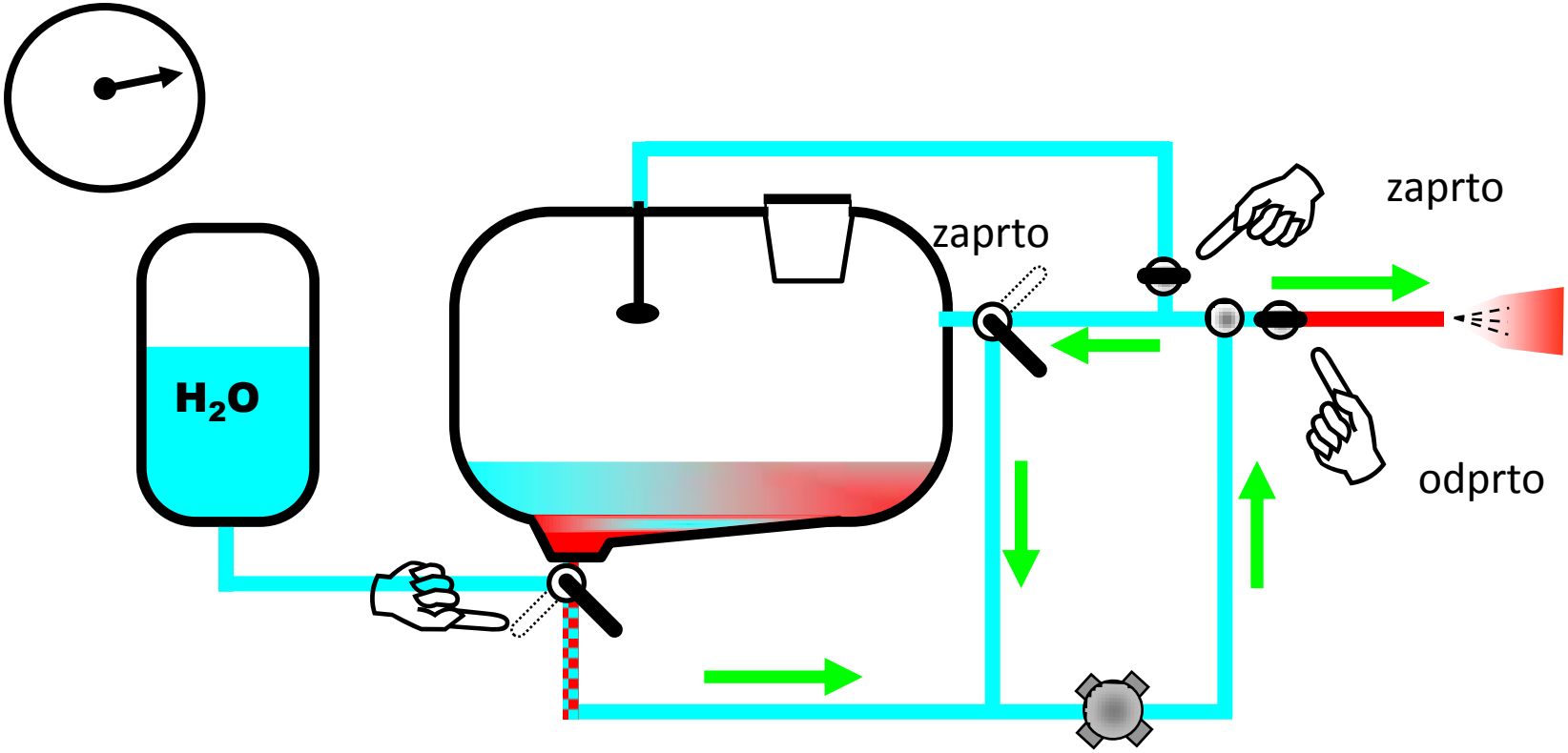
## *MOŽNOST 2: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO IN Z BY-PASS VENTILOM*




Čista voda in FFS vsebujoča voda, ki kroži v sistemu se mešata in izvaja se proces redčenja. Stene rezervoarja se sicer čistijo a se vedno znova delno umažejo s FFS preko povratnega voda.

# PRIMERI POSTOPKOV ČIŠČENJA

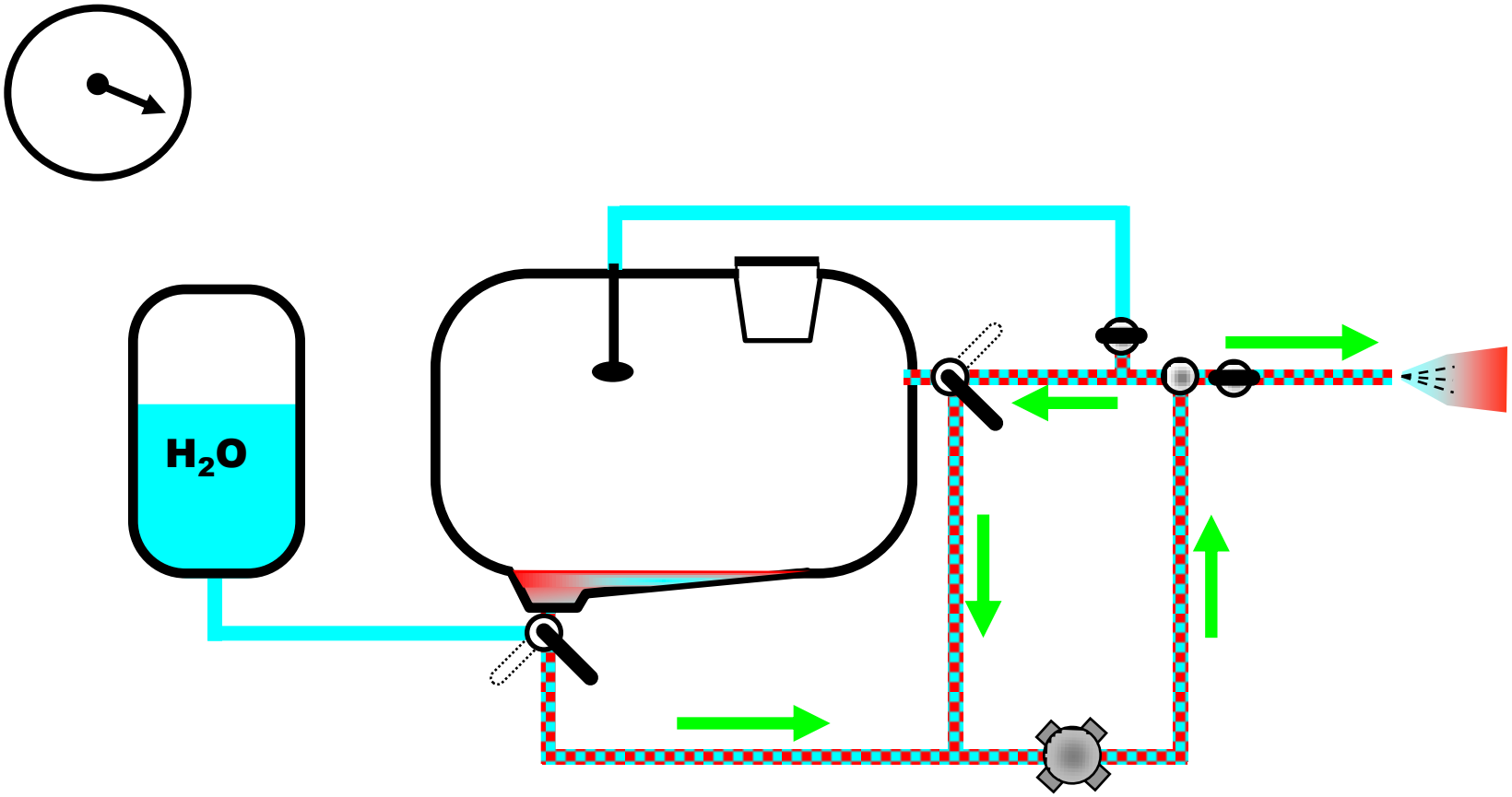
## *MOŽNOST 2: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO IN Z BY-PASS VENTILOM*




**KORAK 2** – Črpalka začne črpati razredčeno škropilno brozgo iz glavnega rezervoarja in jo sproščati skozi šobe. Dotok čiste vode zaprt. By-pass ventil za pretok v povratni vod se zapre in prične se zaprto kroženje razredčene brozge v krogotoku črpalke in vodov brez dotoka čiste vode.

# PRIMERI POSTOPKOV ČIŠČENJA

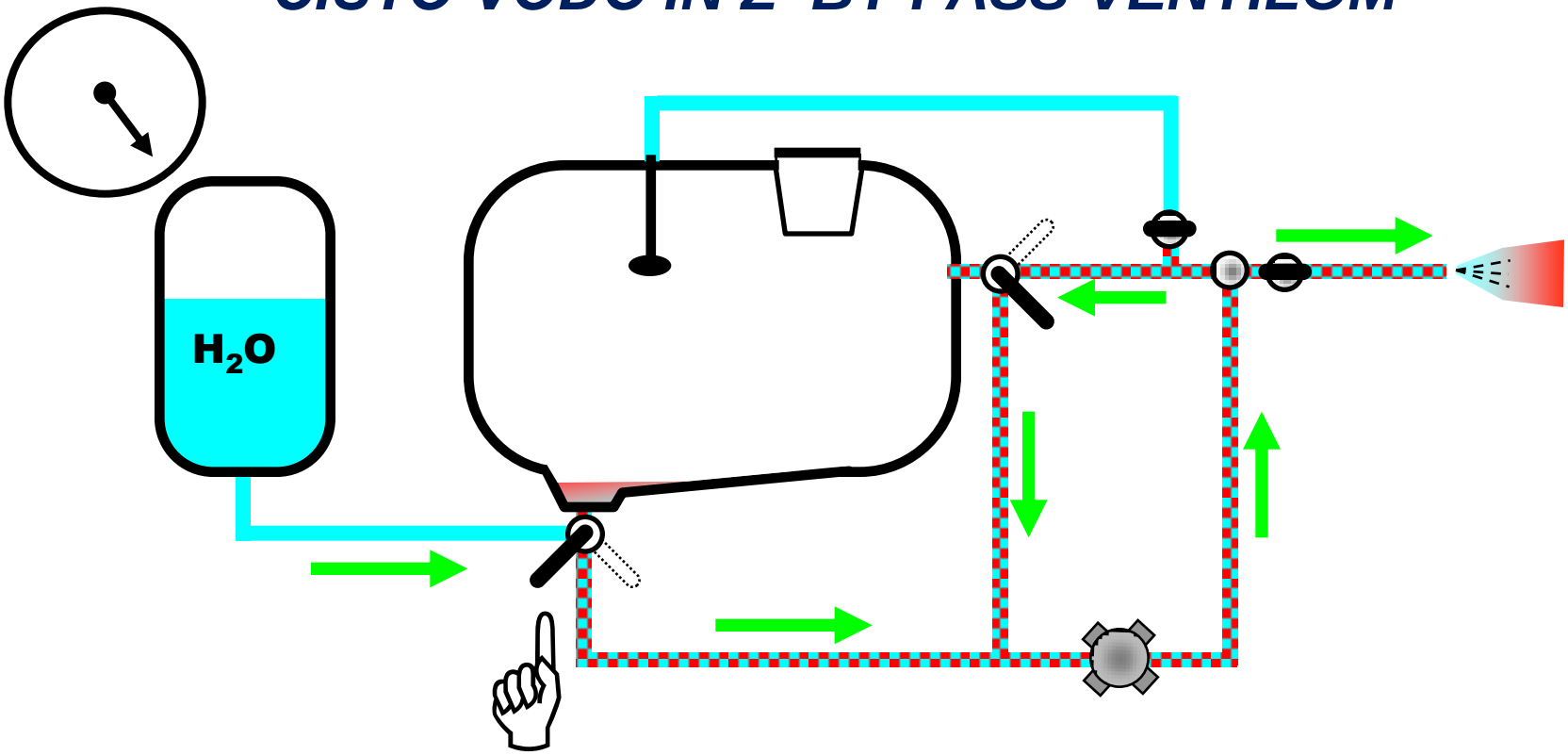
## *MOŽNOST 2: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO IN Z BY-PASS VENTILOM*




Količina razredčene škropilen brozge v glavnem rezervoarju se polagoma zmanjšuje in stene rezervoarja se ne čistijo. Porabljena manj kot polovica zaloge vode. Čista voda zaprta.

# PRIMERI POSTOPKOV ČIŠČENJA

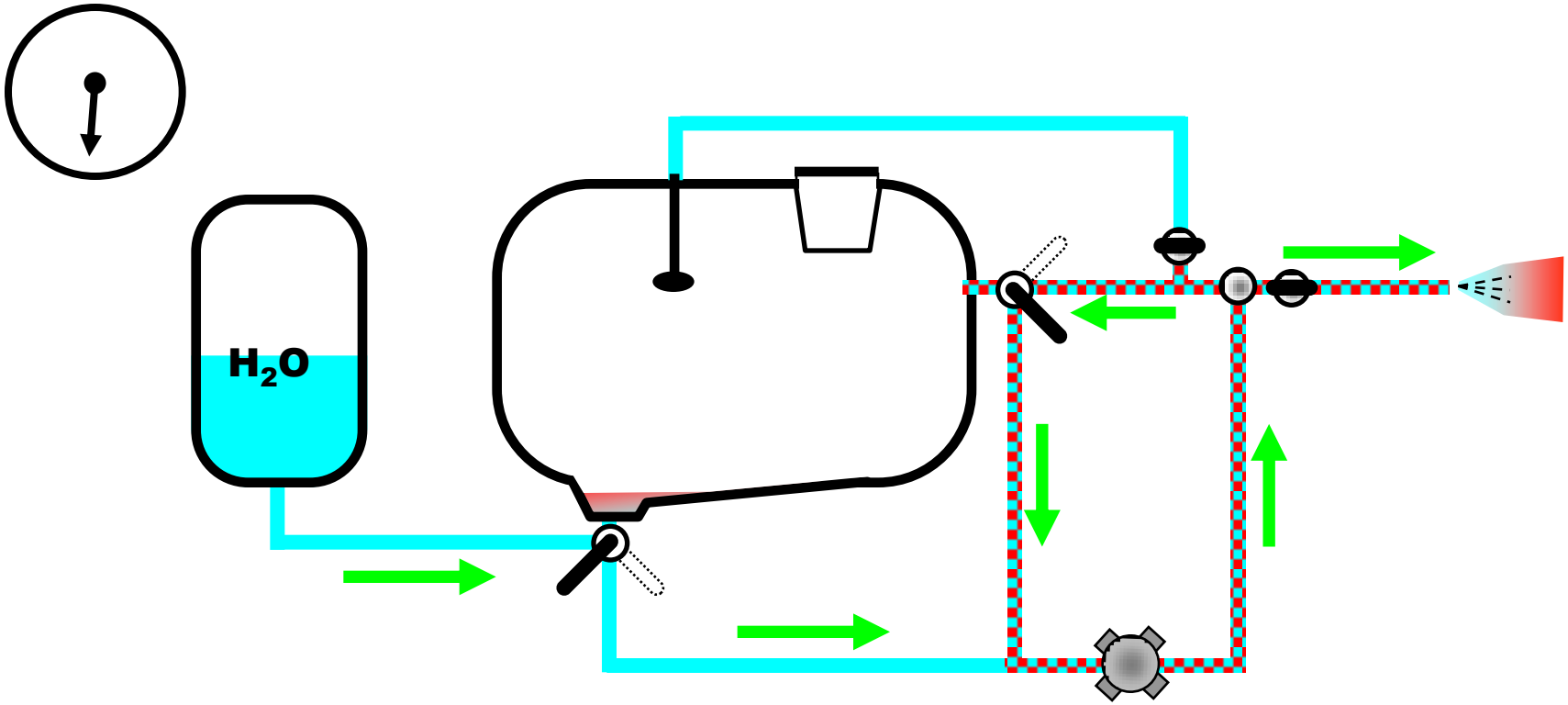
## *MOŽNOST 2: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO IN Z BY-PASS VENTILOM*




**KORAK 3** – Črpalka zajema čisto vodo in jo usmerja v armaturo s šobami. By-pass ventil za pretok v povratni vod je še vedno zaprt in izvaja se zaprto kroženje razredčene brozge v krogotoku črpalke in vodov ob dotoku čiste vode. Ni pretoka vode za notranje čiščenje sten rezervoarja.

# PRIMERI POSTOPKOV ČIŠČENJA

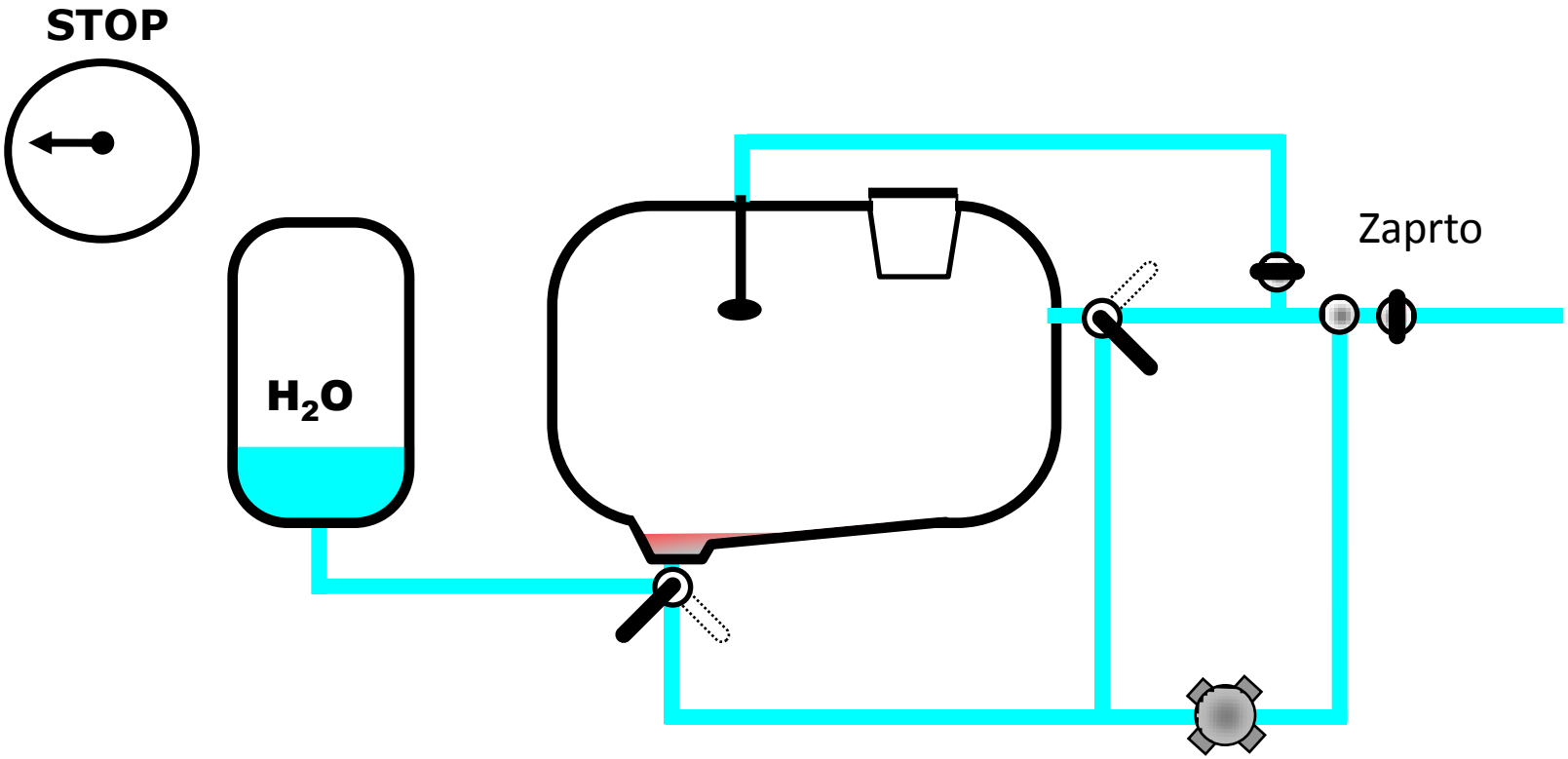
## *MOŽNOST 2: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO IN Z BY-PASS VENTILOM*




Količina razredčene škropilen brozge v glavnem rezervoarju se polagoma zmanjšuje in stene rezervoarja se ne čistijo. Porabljena polovica zaloge vode. Razredčene škropilne brozge ni več veliko.

# PRIMERI POSTOPKOV ČIŠČENJA

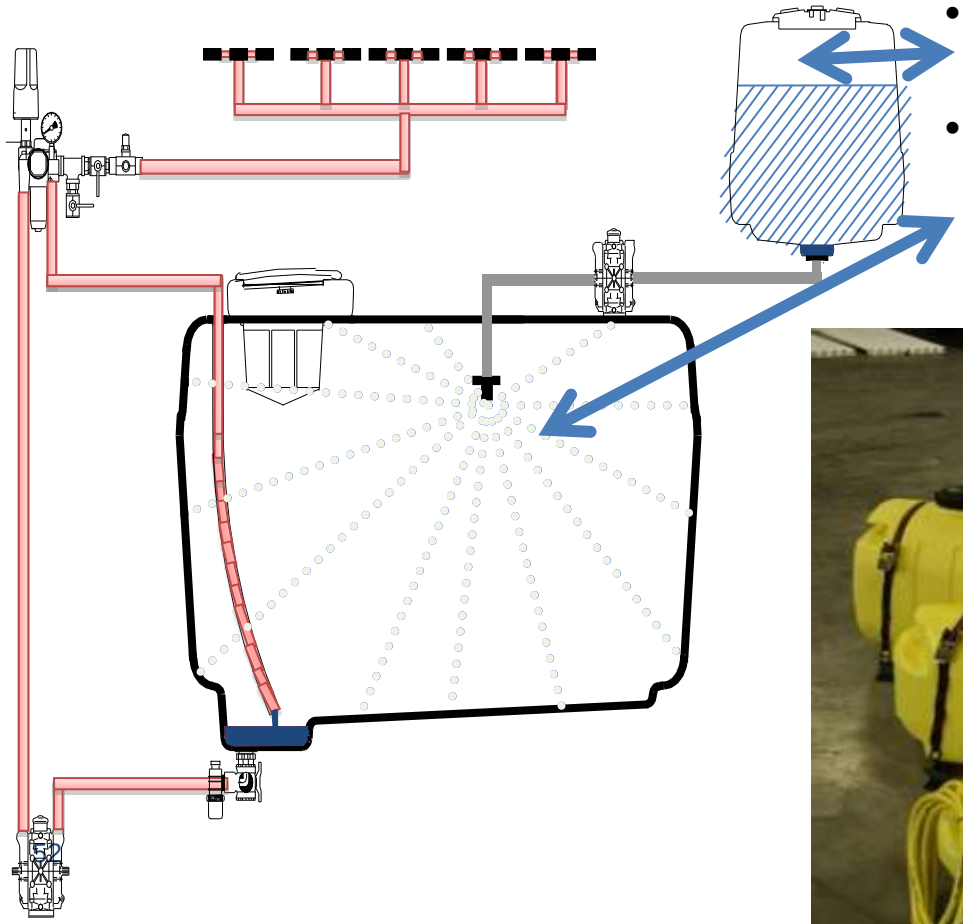
## *MOŽNOST 2: ŠKROPILNICA Z REZERVOARJEM S ČISTO VODO IN Z BY-PASS VENTILOM*




**KORAK 4** – Ko je glavni rezervoar z minimalnim ostankom škropilne brozge skoraj prazen ostane še nekaj vode v rezervoarju s čisto vodo, ki jo porabimo za zunanje pranje škropilnice.

# Tehnična izboljšava in povečanje učinkovitosti pranja

# Dodatna oprema za povečanje učinkovitosti čiščenja za vzpostavitev sistema kontinuiranega pranja naprav - angl. continuous cleaning
# Vgradnja by-pass ventila in dodatne črpalke – rinsing upgrading kit



- Dodatna črpalka električna ali hidravlična
- Povezana z dodatnim razpršilcem za notranje čiščenje




TOPPS
Water Protection

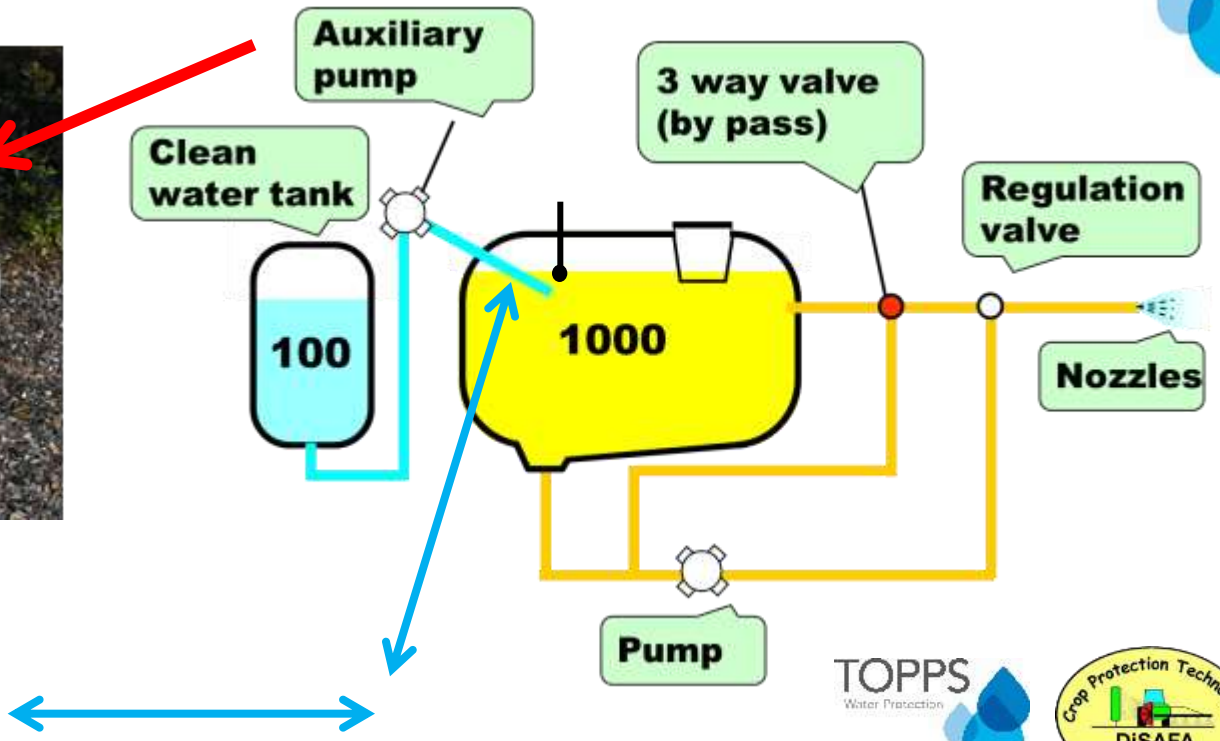
Paolo Balsari, Paolo Marucco

# PRIMERI POSTOPKOV ČIŠČENJA

## *MOŽNOST 3: NAPRAVA OPREMLJENA Z REZERVOARJEM ZA ČISTO VODO IN Z DODATNO ČRPALKO ZA DOVOD ČISTE VODE IN SISTEMOM ZA KONTINUIRANO ČIŠČENJE: «CONTINUOUS CLEANING»*

## Shematski prikaz sistema

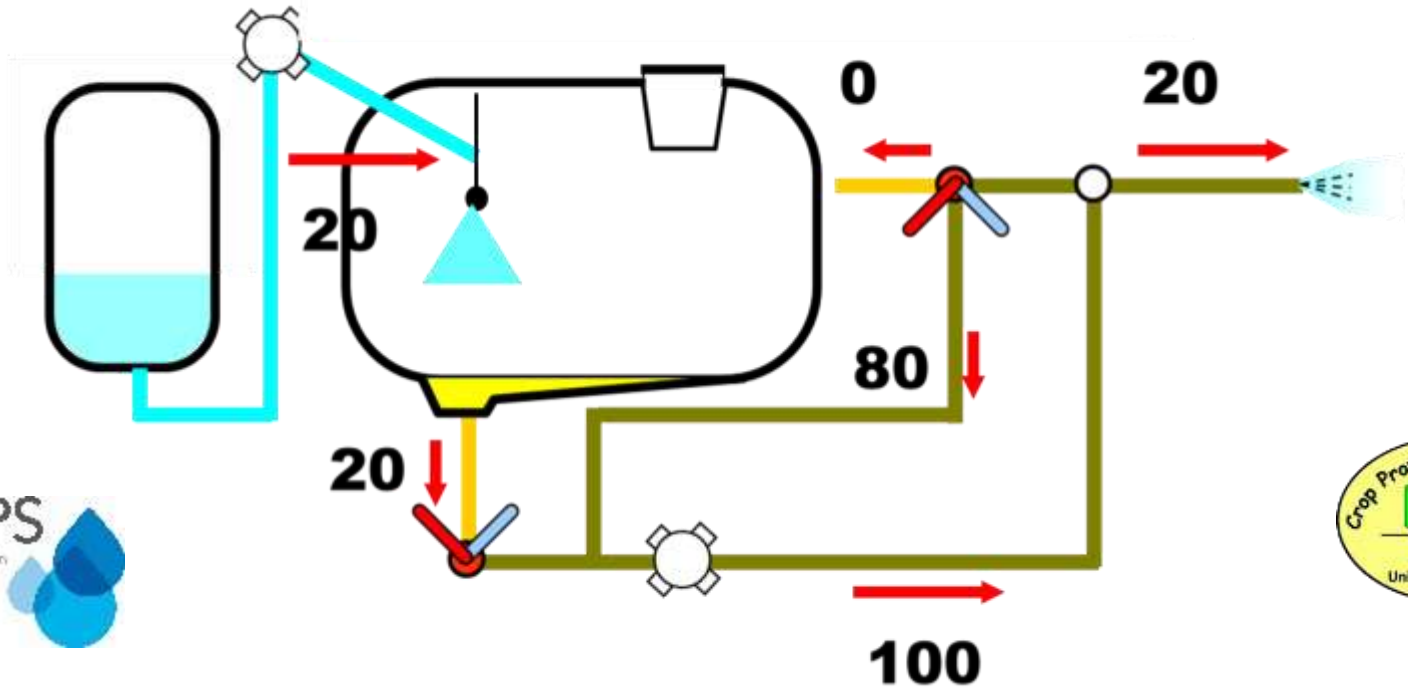



Dodatna črpalka
Dodatni razpršilec
za notranje čiščenje

# PRIMERI POSTOPKOV ČIŠČENJA

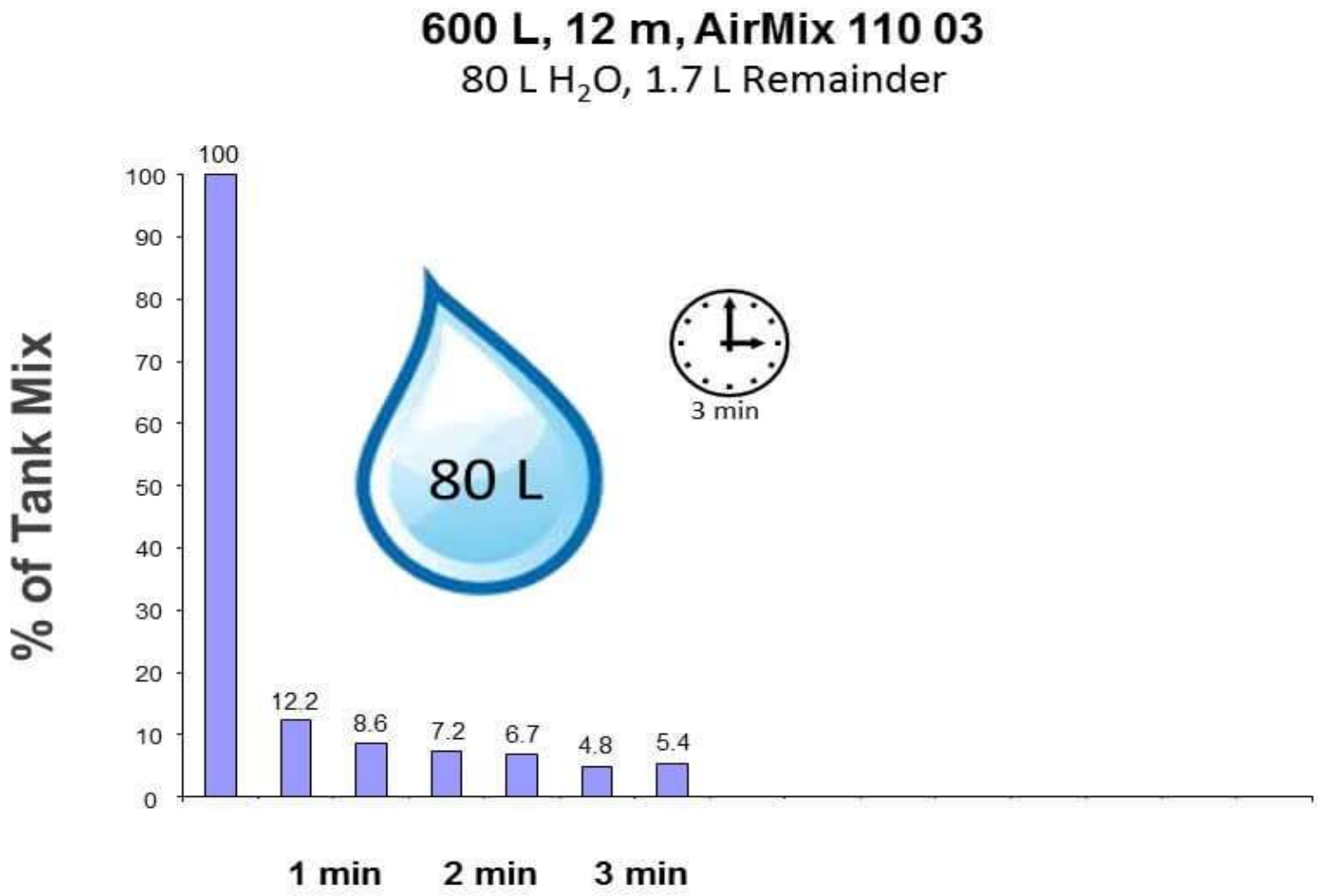
## *MOŽNOST 3: NAPRAVA OPREMLJENA Z REZERVOARJEM ZA ČISTO VODO IN Z DODATNO ČRPALKO ZA DOVOD ČISTE VODE IN SISTEMOM ZA KONTINUIRANO ČIŠČENJE: «CONTINUOUS CLEANING»*




Sistem omogoča da šoba za notranje čiščenje konstantno dovaja čisto vodo, ki čisti od znotraj med tem ko razredčena škropilna brozga izteka skozi šobe in delno kroži skozi sistem črpalke in vodov brez vračanja v rezervoar. Dosežemo večje razredčenje rezidualnega volumna in manjšo količino rezidualnega volumna.

Postopek je hitrejši in imamo manj dela.

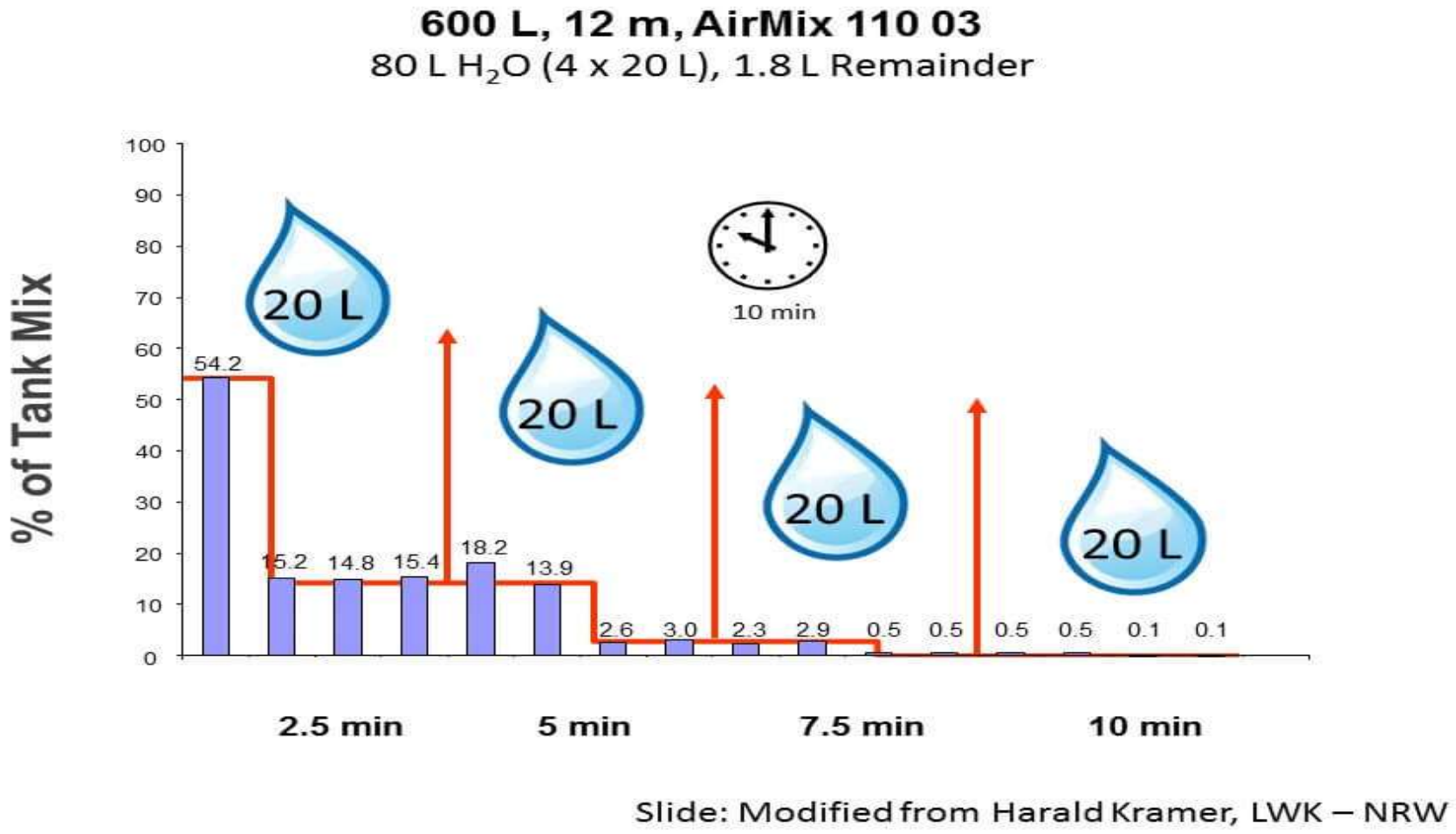
Primer analize zmanjšanja količine FFS v napravi po enkratnem izpiranju 3 minute z 80 L vode




Slide: Modified from Harald Kramer, LWK – NRW

https://sprayers101.com/continuous-rinsing/

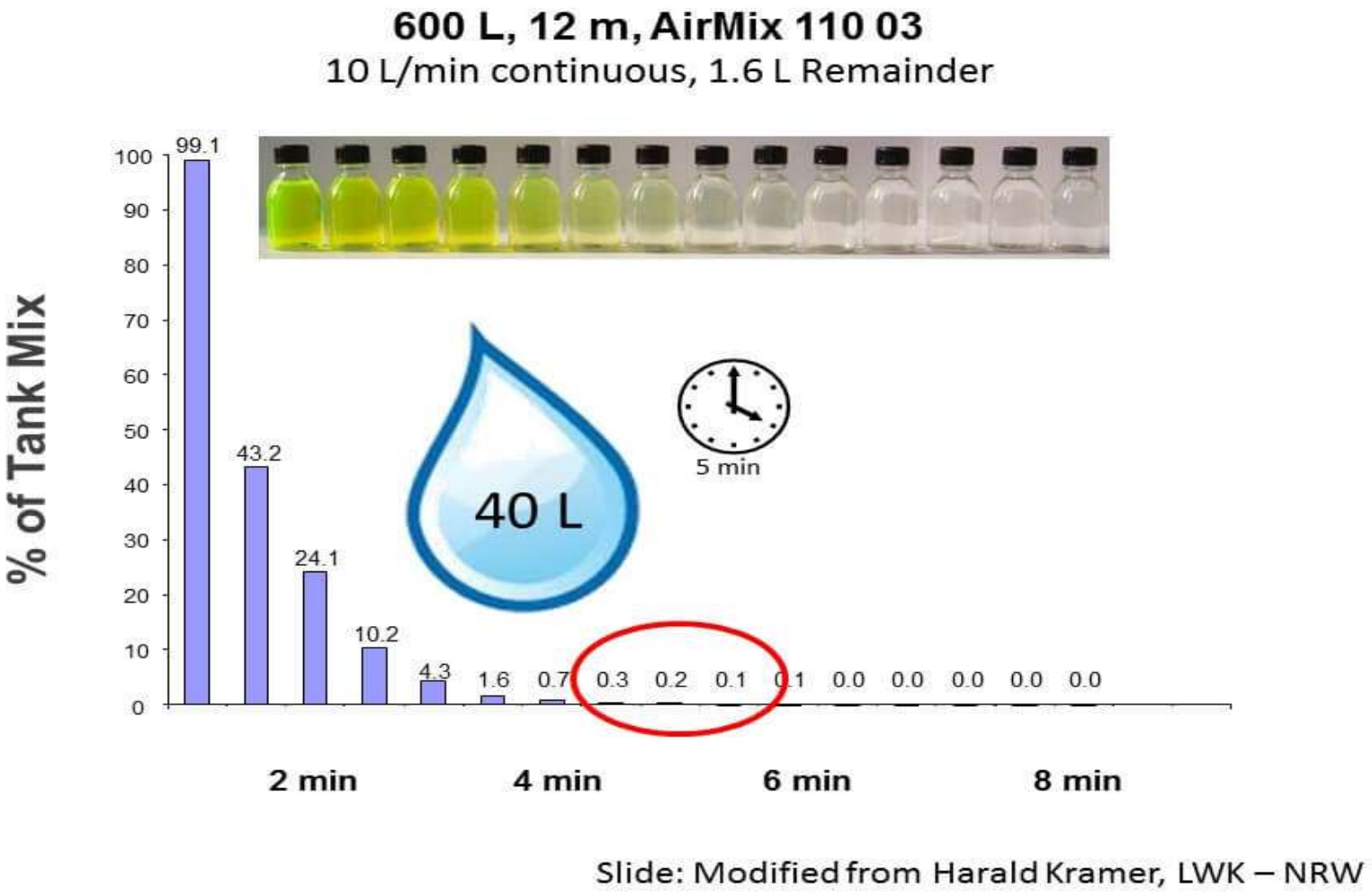
Primer analize zmanjšanja količine FFS v napravi po 4-kratnem izpiranju 2,5 minute z 20 L vode




Slide: Modified from Harald Kramer, LWK – NRW

https://sprayers101.com/continuous-rinsing/

Primer analize zmanjšanja količine FFS v napravi po enkratnem izpiranju 4 minute z 40 L vode
Kontinuiran način pranja




Slide: Modified from Harald Kramer, LWK – NRW

https://sprayers101.com/continuous-rinsing/

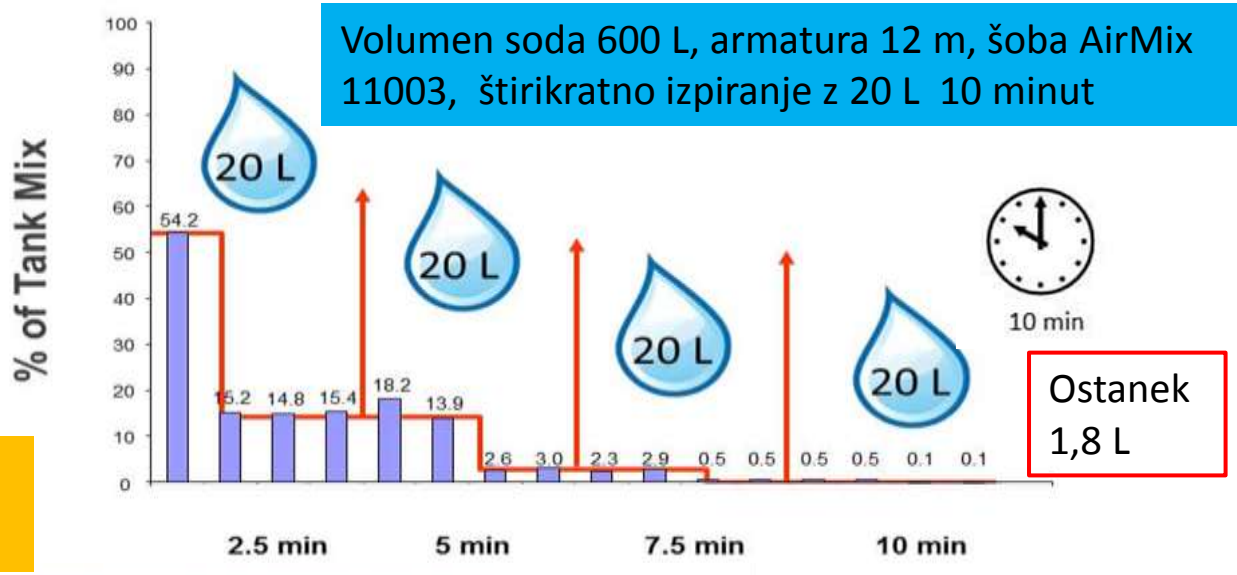
# Primerjava učinkovitosti pranja – različna količina vode v različnem času – različen postopek

Volumen soda 600 L, armatura 12 m, šoba AirMix 11003
Enkratno izpiranje z 80 L 3 minute




Ostanek
1,7 L

Volumen soda 600 L, armatura 12 m, šoba AirMix 11003, štirikratno izpiranje z 20 L 10 minut




Ostanek
1,8 L

https://sprayers101.com/continuous-rinsing/






Volumen soda 600 L, armatura 12 m, šoba AirMix 11003, Kontinuirano pranje z 40 L 5 minut

**Bolje očiščeno v krajšem času z manj vode**

Ostanek
1,6 L

# TRIJE PRIMERI NADGRADNJE ŠKROPILNICE S SISTEMOM ZA KONTINUIRANO ČIŠČENJE NA NOŠENO POLJEDELSKO ŠKROPILNICO

Niels Enggaard Klausen, AgroTech, Jens Johnsen Høy, AgroTech, Per Gummer Andersen, Betterspraying ApS





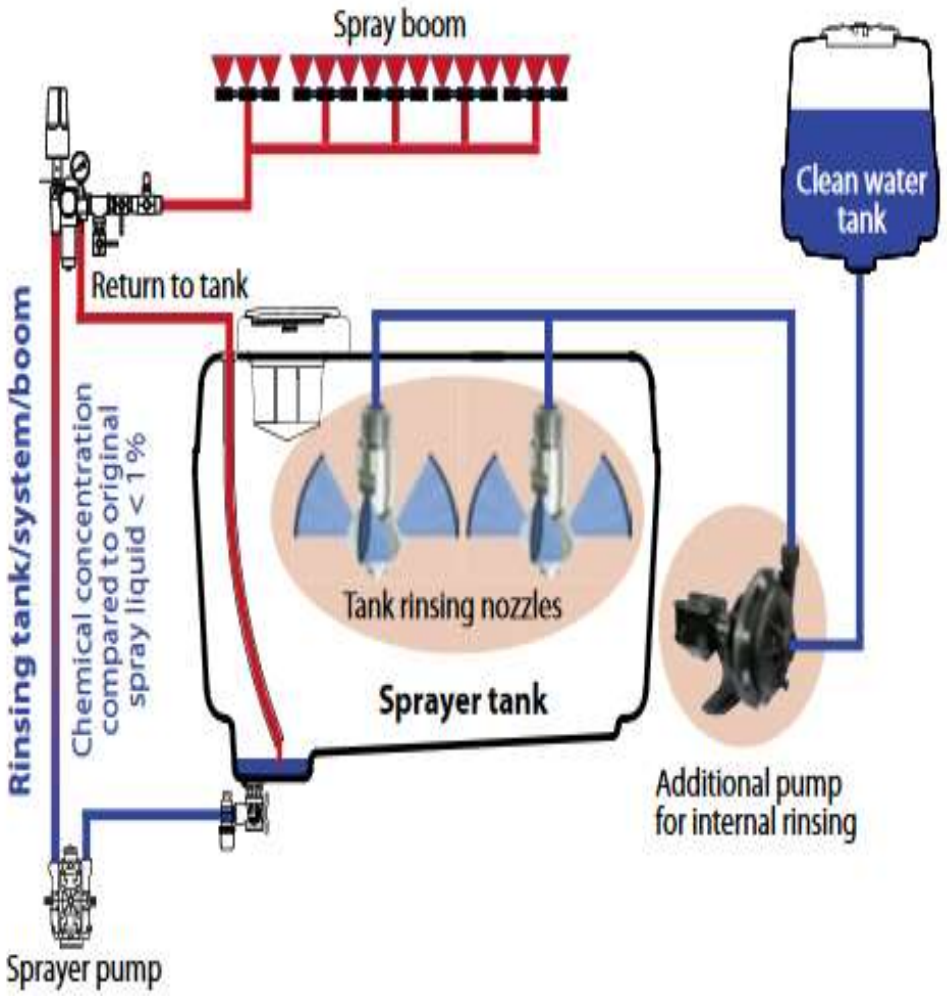


HARDI AAMS KINDESTOFT

Ker z bolj učinkovitim pranjem porabimo manj vode, nam ostane voda za zunanja pranje naprave






## Rinsing procedure

- Empty the sprayer tank **on the field** (regular application)
- Liquid pressure drops, nozzles start to spit
- Switch on the rinsing pump, continue regular application on untreated area or at reduced rate on treated area
- After 1/3 of the clean water is used up, switch on/off several times all boom sections, agitation and circulation lines. Continue spraying while flushing all contaminated pipes till they are complety rinsed.
- Internal cleaning is finished when clean water tank is empty

## Tank-rinsing-kit for field sprayers



- ACE-Centrifugal pump FMC-75HYD-204



- two rotating tank rinsing nozzles made from stainless steel, AG 1/2", Flow rate 28 l/min at 3 bar, including back pressure valve 3/4" IG



- All fittings, hose barbs, washers and clamps, required for installation
- Plain instruction manual
- Additional tank rinsing nozzle for large tank sizes 4000 l plus

### General note for all tank-rinsing-kits:

Pressure and suction hoses, as hydraulic pipes are not included and must be purchased according to the individual set up of the sprayer.

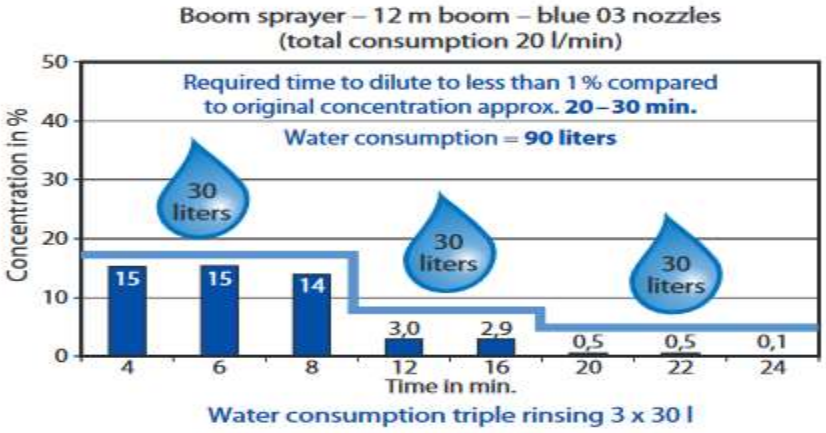
## Mounting arrangements for continuous internal rinsing systems





## Comparison of different sprayer rinsing procedures

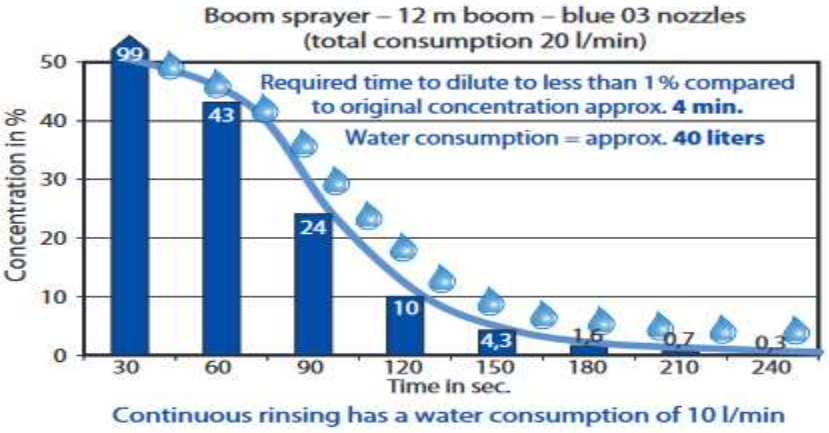
### Standard procedure – triple rinsing




Water consumption triple rinsing 3 x 30 l

**Time required 20 – 25 min. + 90 l clean water (incl. time to step down and up from the tractor plus time required to spray the rinsing water on the field)**

### Continuous internal rinsing




Continuous rinsing has a water consumption of 10 l/min

**Required time approx. 5 min. + 40 liter clean water (the complete procedure can be operated from the tractor with no need to stop)**

MENENJE KMETA O UP GRADE KIT-u

### Family Helminger, horticultural farmers from Goldach/Germany

On our property we grow over 20 different vegetables, each requiring special chemicals plus liquid or foliar fertilizers. Most vegetables are very sensitive to residues remaining in the tank from earlier applications of other crops. Therefore, a completely clean sprayer tank (and plumbing) is a must for us before we prepare a new spray for a different crop. In spring 2010 we equipped our field sprayer with a tank rinsing system from **agrotop**. The assembly kit was easy to install, even on our used sprayer, and we used it a hundred times since then. It is an efficient, easy to use and time saving tool giving us a perfectly clean tank. We would never like to be without it again.



PRAKTIČNO DOMA NAREJENE NADGRADNJA PRŠILNIKA

Cornell University

Application Technology Group
NYSAES, Geneva, NY

# Tank rinsing on a vineyard sprayer





FOTO: ANDREW LANDERS CORNELL ZDA

PRAKTIČNO VPRAŠANJE: POTENCIALNA ODZIVNOST DOMAČE INDUSTRIJE IN SERVISOV KMETIJSKIH STROJEV DA POMAGA PRIDELOVALCEM IZVESTI NADGRADNJO STAREJŠIH NAPRAV

## Sensor controlled continuous internal sprayer rinsing

## fast ■ safe ■ clean

A sensor is mounted outside at the base of the sprayer tank. The sensor checks the filling level of the tank and, when empty, the sensor activates the KIR rinsing pump, starting the rinsing procedure automatically. If the liquid level in the tank builds up again, during the rinsing process, the sensor will switch off the risning pump. The sprayer continues with the application of the rinsing water. When the level inside the tank drops again below the sensor level, the rinsing pump is activated again, continuing the rinsing with clean water. Manual switching of the rinsing pump at the right time by the driver is unnecessary with this. Existing continuous internal sprayer rinsing systems can be easily upgraded by KIR-o-Matic techology.



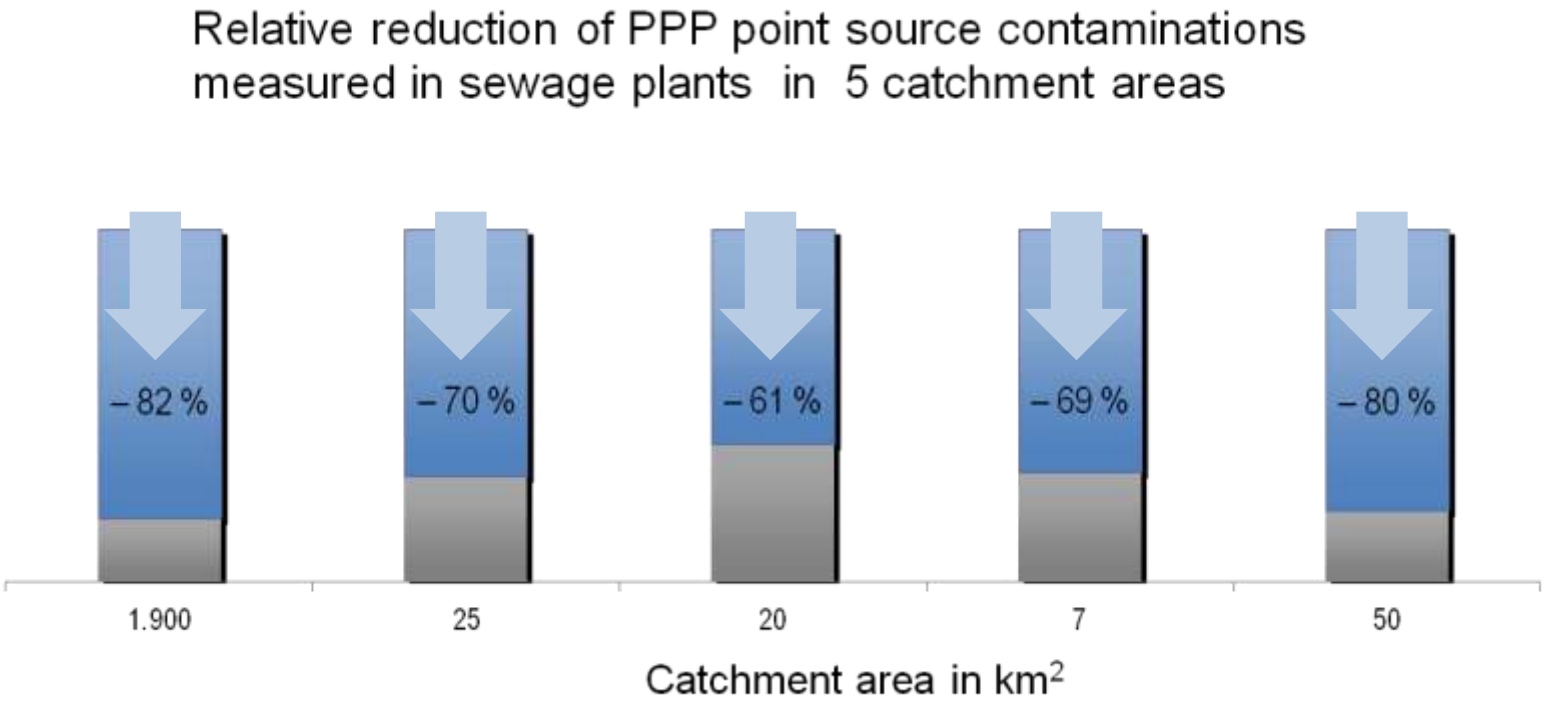



agrotop spray technology

Pomen takojšnjega pranja na njivi ali v trajnem nasadu – MERITVE IZ NEMČIJE



# Research results University Gießen Germany




The cleaning of sprayers was executed only in the field :
Result – point source pollution could be reduced by about 70%.

Source: Prof. Frede et.al.2006

ČIŠČENJE NA NJIVI LAHKO TUDI DO 70 % ZMANJŠA KONTAMINACIJO POVRŠINSKIH VODA

# PROJEKT TOPPS - ANKETA GLEDE NAČINA PRANJA ŠKROPILNIC

# (OBKROŽI ODGOVORE)

Anketo je izpolnilo 161 obiskovalcev prikazov pranja škropilnic

1) ALI IMA VAŠA ŠKROPILNICA DODATEN REZERVOAR ZA ČISTO VODO?

DA (61,49 %) NE (38,51 %)

2) ALI IZVAJATE NOTRANJE PRANJE ŠKROPILNICE NA NJIVI KO ZAKLJUČITE S ŠKROPLJENJEM?

NIKOLI (36 %) VEDNO (29,2 %) VČASIH (34,8 %)

3) ALI IZVAJATE ZUNANJE PRANJE ŠKROPILNICE NA NJIVI KO ZAKLJUČITE S ŠKROPLJENJEM?

NIKOLI (77,6 %) VEDNO (3,8 %) VČASIH (18,6 %)

4) ALI POZNATE KONTINUIRAN NAČIN PRANJA ŠKROPILNICE?

NE POZNAM TEGA SISTEMA PRANJA (53,4 %)

POZNAM PRINCIP TEGA NAČINA PRANJA (46,6 %)

**PROJEKT TOPPS - ANKETA GLEDE NAČINA PRANJA ŠKROPILNIC**

**(OBKROŽI ODGOVORE)**

Anketo je izpolnilo 161 obiskovalcev prikazov pranja škropilnic

5) KAM SPROSTITE VODO OD PRANJA ŠKROPILNICE IZVEDENEGA DOMA NA DVORIŠČU?

NA GNOJIŠE ALI V JAMO Z GNOJEVKO (41,0 %)

NA ZELENICO NA ROBU DVORIŠČA (20,5 %)

NA GRAMOZMO PREPUSTNO POVRŠINO NA ROBU DVORIŠČA (24,8 %)

NA PLOŠČAD, KI JE POVEZANA S KANALIZACIJO ALI ODTOKOM METEORNE VODE (13,7 %)

6) ALI STE PRIPRAVLJENI VLOŽITI V OBNOVO ŠKROPILNICE DA IZBOLJŠATE MOŽNOSTI ČIŠČENJA?

DA (55,9 %) NE (44,1 %)

7) ALI BI IZVEDLI OBNOVO VAŠE ŠKROPILNICE ČE BI BILA OBNOVA SUBVENCIONIRANA?

DA (88,2 %) NE (11,8 %)

Aplikacijska tehnika in čistila – dokaj redka uporaba v Sloveniji – ZAKAJ ??????



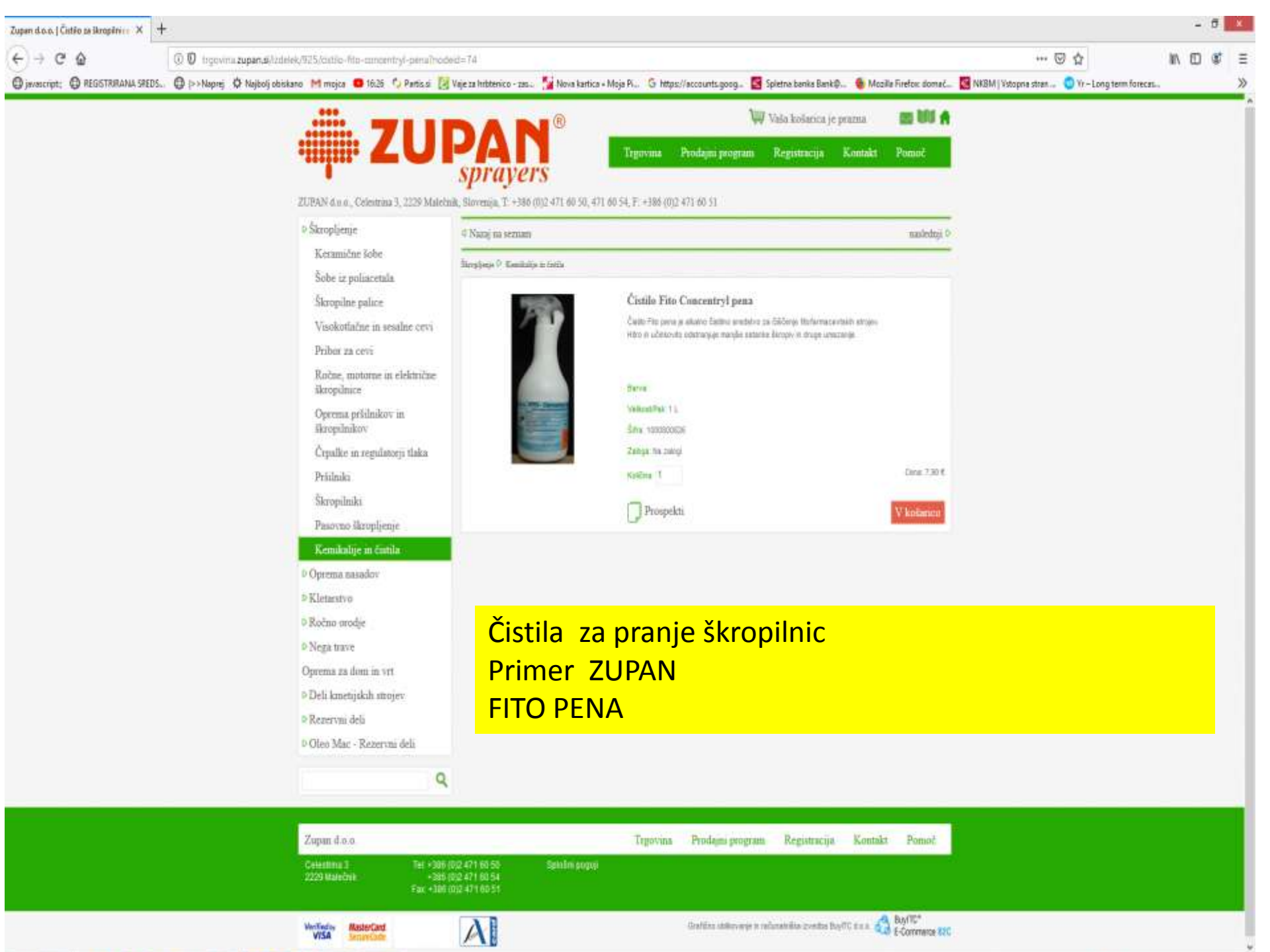
Čistila za pranje škropilnic
Primer KARSIA
TECNET GD



- Uporaba: Tecnet uporabljamo za:
- • za redno, sprotno ali periodično čiščenje;
- • za temeljito čiščenje po končanem tretiranju, ko za naslednje tretiranje izberemo drugo skupino FFS ali/in zamenjamo ciljno kulturo;
- • za konzervacijo pred zimo, da preprečimo oksidacijo in zaščitimo zunanje spoje in cevi. POZOR: Tecnet GD ni sredstvo proti zmrzovanju (ni antifriz);
- • za čiščenje zunanjih površin škropilnic in ostale opreme.

- Odmerek:
- ▪ redno sprotno čiščenje: 0,1 % konc. oz. 100 g/100 L vode; čas pranja min 15 min;
- ▪ temeljito čiščenje: 0,1-0,2 % konc. oz. 100-200 g/100 L, odvisno od stopnje zamazanosti in ostankov škropilne brozge na stenah rezervoarja; čas pranja min 15-20 min, lahko tudi preko noči, če je potrebno;
- ▪ čiščenje za konzervacijo preko zime: notranjost škropilnice očistimo kot pri temeljitem čiščenju, le da rezervoarja NE ISPIRAMO. Speremo pred prvo uporabo.
- ▪ čiščenje zunanjih površin: v odmerku 30-50 g/10 l vode; napravo omočimo in s pomočjo pršilke/škropilnice nanesemo stopljeno sredstvo na napravo. najbolj umazane dele očistimo s pomočjo gobe ali ščetke in speremo z vodo.

- 
- Sredstvo Tecnet GD se lahko uporablja za čiščenje notranjih in zunanjih površin naprav za nanašanje FFS in ostale opreme. Priporoča se še posebej pri odstranjevanju trdovratnih aktivnih snovi kot so npr. hormonski pripravki, florasulam, sulfonil sečnine, žveplo, mankozeb, urea. Zaradi načina delovanja sulfonil sečnin, je pri slednjih postopek čiščenja potrebno opraviti še posebej skrbno: zagotovimo dobro razporeditev čistila na vse dele škropilnice in pustimo delovati dlje časa kot pri običajnih aktivnih snoveh. Tecnet GD lahko uporabljamo tudi s tlačnimi čistilci.




Čistila za pranje škropilnic
Primer ZUPAN
FITO PENA



Močla

www.picount.si/vr/index.php/izdelki/mocila/106-izdelki/cistilo

javascript: | REGISTRIRANA SREDS... | [>>Naprej | Najbolj obiskano | mojca | 16:26 | Partis.si | Vaje za hrbtenico - zac... | Nova kartica - Moja Pi... | https://accounts.goog... | Spletna banka Bank@... | Mozilla Firefox: domač... | NKBM | Vstopna stran ... | Yr – Long term foreca

PICOUNT

Picount.si | Varstvo rastlin | Izdelki | Tiskovine | Aktualni nasveti | Podajalnica FFS

Začetna stran › Izdelki › Močila › Izdelki › Čistilo

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# DUPONT™ ALL CLEAR EXTRA® ČISTILO

**Uporaba:** **DuPont ALL CLEAR™ EXTRA** je sredstvo za čiščenje škropilnic, ki odstranjuje ostanke škropiv in drugih ostankov kot so ostanki olj iz rezervoarjev, cevi, odtokov, filtrov in šob.

**Odmerek:**

| Velikost rezervoarja | 100L | 250L | 500L | 1000L |
|---|---|---|---|---|
| Količina sredstva **ALL CLEAR™ Extra** | 500mL | 1,25L | 2,5L | 5L |

**Postopek čiščenja:**

1. Čiščenje pričnite s popolnoma izpraznjeno škropilnico. Ostanke na zunanji strani škropilnice sperite s čisto vodo.
2. Notranjost rezervoarja sperite s čisto vodo in ga popolnoma izpraznite skozi cevi in odtok. Poraba vode za čiščenje naj bo 1/10 količine porabljene škropilne brozge.
3. Napolnite rezervoar do polovice in dodajte sredstvo **DuPont ALL CLEAR™ EXTRA** v priporočenem odmerku. Dobro premešajte in nato sperite cevi in odtok z čistilno raztopino. Do vrha napolnite rezervoar in med neprestanim mešanjem pustite čistilno raztopino 15 minut v škropilnici. Ponovno sperite cevi in odtok s čistilno raztopino, ter popolnoma izpraznite škropilnico.
4. Snemite filtre in šobe, ter jih očistite z sredstvom **DuPont ALL CLEAR™ EXTRA** v odmerku 50 mL/10L vode.
5. Notranjost rezervoarja sperite s čisto vodo in ga popolnoma izpraznite skozi cevi in odtok. Poraba vode za čiščenje naj bo 1/10 količine porabljene škropilne brozge.
6. Nastale ostanke odstranite v skladu z zakonodajo. Z ostanki ne škropite občutljivih kultur.

Če ni možno popolnoma izprazniti rezervoarja je potrebno kork 3. Ponoviti, preden začnete s korakom 4.

PDF Adobe ETIKETA

PDF Adobe VARNOSTNI LIST



# Minimum dobre prakse pranja naprav za nanos FFS v primeru zastarele opreme

- pravilno določiti potrebno količino škropilne brozge in nazaj na dvorišče pripeljati najmanjšo možno količino brozge

- pranje izvesti takoj po zaključku nanosa
- če na kmetiji ni naprav za procesiranje vode od pranja se voda od pranja sprosti na aktivno biološko površino (dobro razvito travinje) in ne na:
- - gramozno prepustno podlago
- - na betonske in asfaltne podlage, ki so povezane z odtočnimi sistemi

- **Sprostitev vode od pranja v gnojne jame je pogojno možna, če z gnojevko gnojimo predvsem travniške in pašniške površine**
- **PRI GNOJENJU VRTNIN LAHKO IMAMO TEŽAVE Z OSTANKI NEKATERIH SNOVI KI RAZPADAJO ZELO POČASI IN JE DOBER SPREJEM SKOZI KORENINE (primer kobulnice)**

http://www.hse.gov.uk/research/rrpdf/rr792.pdf
Iskanje ...
hse.gov.uk
Datoteka Urejanje Pojdi na Priljubljene Pomoč

HSE

Health and Safety Executive

# Decontamination of agricultural sprayers

NAPRAVE ZELO TEŽKO TEMELJITO OČISTIMO !!!!!!!!!!!!!!!!!!!

Prepared by the **Health and Safety Laboratory**
for the Health and Safe[illegible]

## EXECUTIVE SUMMARY

It is now recognised that pesticide residues on the external surfaces of sprayers could present a significant route of exposure for the spray operator and these residues exist despite sprayers being washed. The current study was undertaken to examine factors influencing the removal of residues from sprayer surfaces, to trial any developments on decontamination techniques on working farms, and to quantify operator exposure to pesticides during the actual washing process.

### Objectives

- Examine factors influencing the removal of residues from sprayer surfaces.
- To trial any developments on decontamination techniques on working farms.
- Quantify operator exposure to pesticides during the actual washing process.

Start

PRIMER POSKUSA ZA ANALIZO UČINKOVITOSTI ČIŠČENJA

### 3.1.1 Active ingredient

The active ingredients were chosen to represent a range in physico-chemical properties, particularly solubility, for commonly used pesticides. A range of pesticide types was also represented, namely insecticides (I), herbicides (H) and fungicides. A summary of the pesticides and their properties is given below (Table 1).

**Table 1 Properties of the pesticide used in the experiments**

| | Solubility $mg.l^{-1}$ | Koc | ADI $mg.kg^{-1}$ bw | App rate kg $ai.ha^{-1}$ | Type | Product | a.i. $(g.l^{-1})$ | Formulation |
|---|---|---|---|---|---|---|---|---|
| Azoxystrobin | 6 | 423 | 0.1 | 0.25 | F | Amistar | 250 | SC |
| Carbendazim | 29 or 8 | 225 | 0.03 | 0.25 | I | Bavistin | 500 | SC |
| Flusilazole | 54 | 650 | 0.001 | 0.2 | F | Lyric | 250 | EW |
| Isoproturon | 65 | 154 | 0.0062 | 2.0 | H | Trump | 236 | SC |
| Tebuconazole | 36 | | 0.03 | 0.25 | F | Folicur | 236 | SC |
| Pendimethalin | 0.3 | 13400 | 0.1 | 2 | H | Trump | 250 | EW |

PREGLED METOD PRANJA V POSKUSU

## 3.3 DECONTAMINATION METHOD

Methods currently used by farmers can be broadly categorised as rinsing (low pressure) both with and without brushes, pressure washing, and steam cleaning all either with or without a cleaning agent. The decontamination methods investigated were:

1. Low pressure (*c*. 4 bar) – *hose*.

   This was achieved using an ordinary garden hose attached to a mains tap with a Hozelock® variable nozzle set at a jet spray.

2. Low pressure + brush (CPA advised) – *brush*.

   A Hozelock® brush was fitted to the garden hose.





3. High pressure (*c.* 150 bar) – *high p* or *hp*.

   A Karcher® industrial cold water pressure was used (model HD 855s) with the triple nozzle set at high pressure and the pressure at *c.* 150 bar.

4. Pencil spray – *pencil*.

   The pressure washer nozzle was set at pencil spray. This delivers a narrower jet than the high-pressure jet for the same pressure.

5. High pressure + non-ammonia based detergent – *detrg 1*.

   The detergent was applied at label-application rate (0.5%) thus the chemical take-up rate on the pressure washer was set to '1'. The chemical was applied using the 'chemical' nozzle on the washer. The chemical was left for 2.5 minutes on the tank after which it was subject to the standard high-pressure wash. The detergent used was All Clear Extra® (Dupont).

6. High pressure + ammonia-based detergent (detergent already known to many farmers for the decontamination of internal surfaces) – *detrg 2*.

   The same procedure as above was used for applying the detergent. The detergent was an old, but still used, formula of All Clear Extra® (Dupont).

7. High pressure + initial wetting – *wet + hp*.

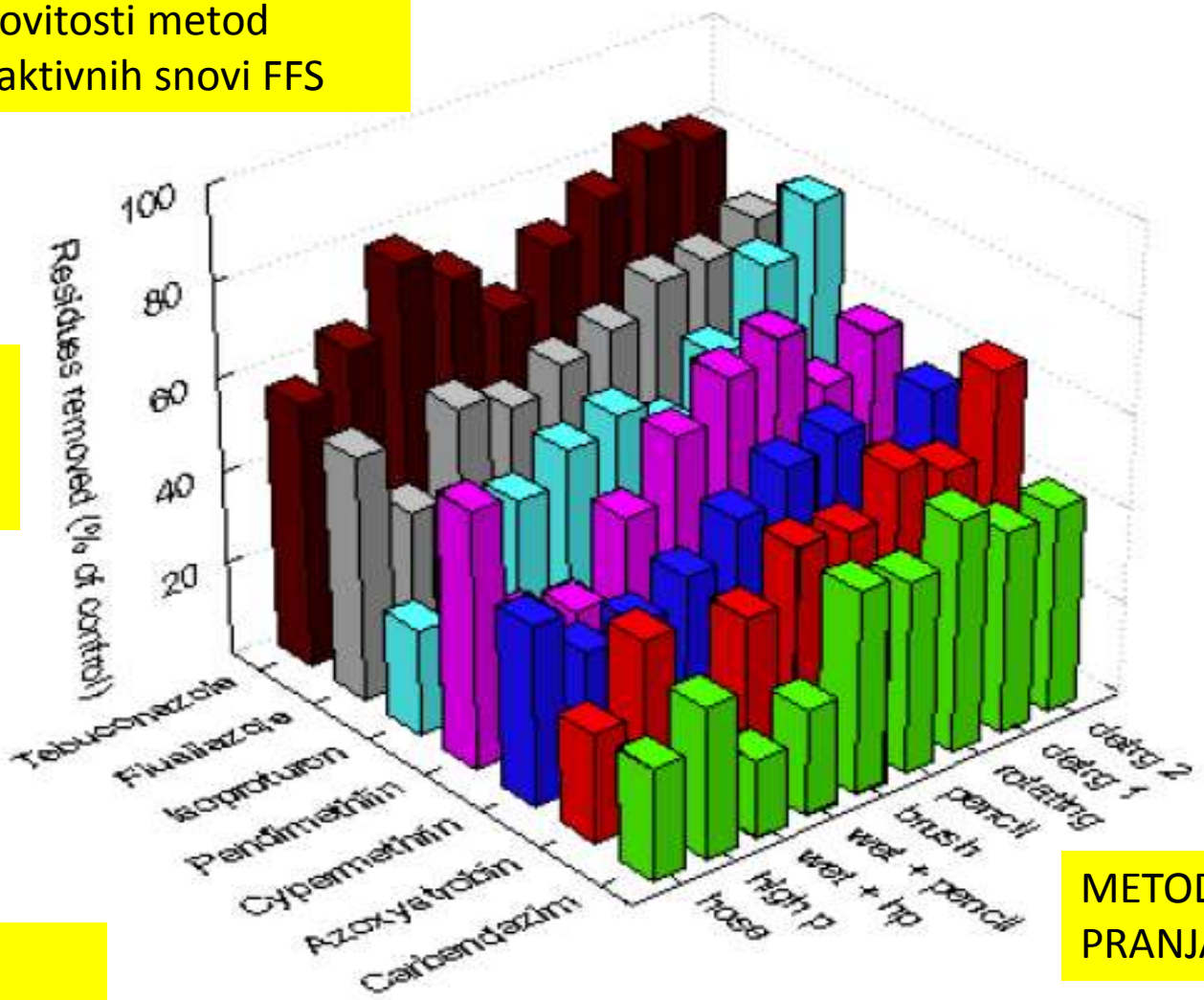
   This comprised wetting the test surface with water for 2.5 minutes prior to a full pressure wash. This method served as a control for investigating the effect of detergents, but it could also be an additional method in its own right.

8. Pencil jet + initial wetting – *wet + pencil*.

   The test surface was wetted with water for 2.5 minutes prior to washing with the pencil jet.

Primerjava učinkovitosti metod
za različne vrste aktivnih snovi FFS

DELEŽ
ODSTRANJENEGA
FFS

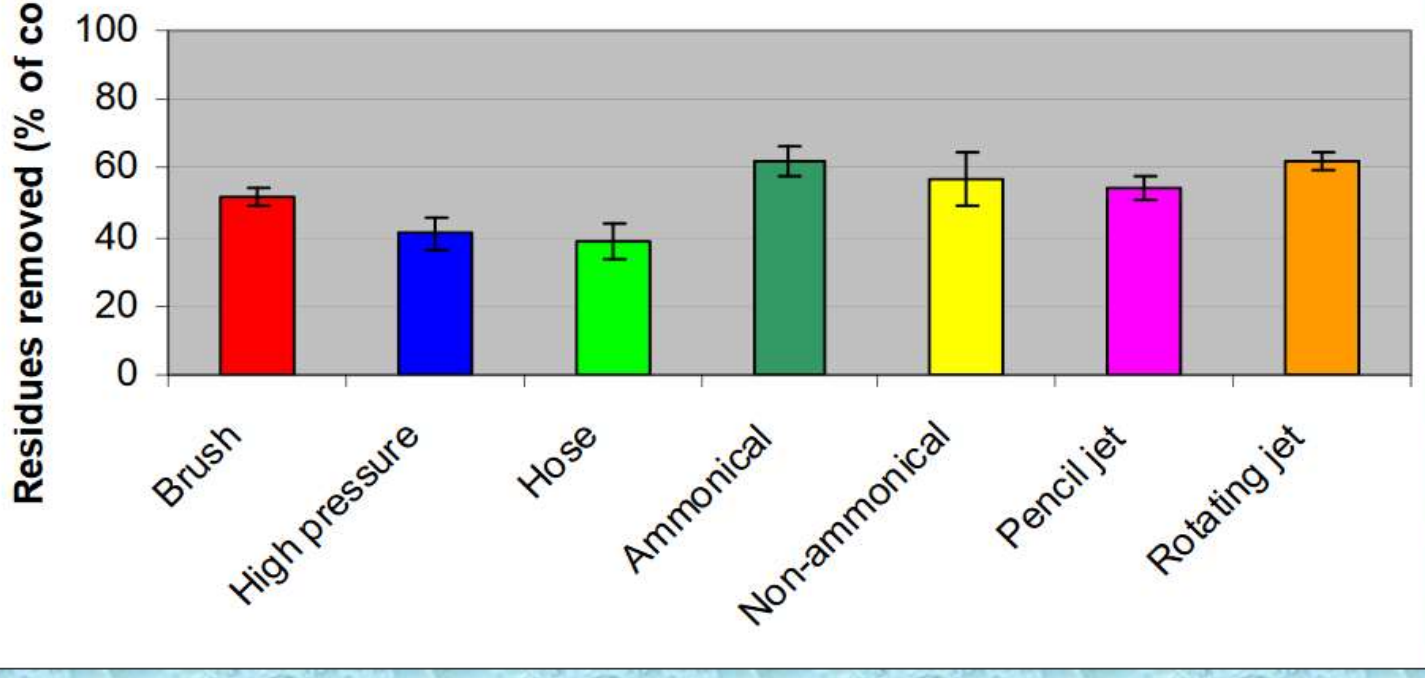



METODA
PRANJA

PESTICIDI
AKTIVNE SNOVI

**Figure 1 The efficiency of different decontamination methods for indiv pesticides**

## Effectiveness of decontamination methods showing the mean and 1±SE (Ramwell C T, Johnson P D, Corns H).



RAZISKAVE IZPOSTAVLJENOSTI LJUDI FFS ZARADI SLABO OPRANE ŠKROPILNE TEHNIKE IN TRAKTORJEV

HSE Health & Safety Executive

**Exposure to pesticide residues on agricultural spraying equipment**

## 3.4 Pesticide residue distribution over the sprayer

### *3.4.1 Frequency of detection*

To identify whether or not pesticide residues would collect on certain areas of the sprayer the number of positive detections per sampling site was calculated irrespective of dose or compound. A note was also made of the number of zero detections, *i.e.* an absence of residues (Table 1).

Prepared by
re for EcoChemistry
nd Safety Executive

**Table 1** Number of positive detections per sampling site on individual sprayers

| *Sample* | *Number of positive detections of all pesticides per sprayer (n = 28)* | *Number of zero detections per sprayer* |
|---|---|---|
| Boom | 253 | 0 |
| Nozzle | 248 | 0 |
| Spray tank | 177 | 2 |
| Mudguard | 121* | 4 |
| Door | 63 | 5 |
| Rear window | 50+ | 9 |
| Windscreen | 31 | 13 |
| G cab | 73 | 6 |
| G maintenance | 97 | 7 |
| G general | 147 | 3 |

RAZLIČNI DELI NAPRAV IN FREKVENCA NAJDB SEDIMENTA FFS

# External deposits.





FOTO: ANDREW LANDERS CORNELL ZDA

**Can be a risk to operators e.g door handles and when maintaining sprayers. The spray residue may be washed off and contaminate ground water.**

V SLOVENIJI MANJKA NAVODIL ZA PRANJE NAPRAV ZA NANOS FFS

PRIMER NAVODIL IZ ZDA



A Self-Learning Resource From MSU Extension

MONTANA STATE UNIVERSITY EXTENSION

MontGuide

# Maintenance, Cleaning and Storage of Ground Sprayers

by Reeves Petroff, MSU Extension Pesticide Education Specialist, and Dr. Greg Johnson, MSU Entomology Department Head

Revised by Dr. Cecil Tharp, MSU Extension Pesticide Education Specialist, and Amy Bowser, MSU Extension Pesticide Education Technician

**Proper storage and cleaning techniques can add years to the life of spraying equipment. This fact sheet offers tips for preparing pesticide spraying equipment to be stored for the winter, including a list of which cleaning agents are most effective for various pesticides.**

MT198917AG Revised 12/17

V SLOVENIJI MANJKA NAVODIL ZA PRANJE NAPRAV ZA NANOS FFS

PRIMER NAVODIL IZ ZDA

**TABLE 1. Cleaning Solutions for Pesticides***

| Pesticide Used | Step 1 (25 Gallons Cleaning Solution) | Step 2 | Step 3 |
|---|---|---|---|
| Hormone Herbicides (2,4-D salt, amine, brush killers, MCPA, dicamba) | 1 qt. household ammonia | Agitate solution for 15 minutes. | Let stand overnight. Flush with clean water. |
| | – *OR* – | | |
| | 1 lb. washing soda (sal soda) | Agitate solution for 15 minutes. | Let stand for 2 hours. Flush with clean water. |
| | – *OR* – | | |
| | 2 lb. trisodium phosphate | Agitate solution for 15 minutes. | Let stand for 2 hours. Flush with clean water. |
| | – *OR* – | | |
| | ½ lb. fine activated charcoal + ½ cup detergent | Agitate sprayer for 2 minutes. | Let stand for 10 min. Flush with clean water. |
| Hormone herbicides, ester form (2,4-D, brush killers, MCPA) | 1 lb. washing soda (sal soda) + 1 gal kerosene + ¼ lb detergent | Rinse inside of tank and flush small amount through system. | Let stand for 2 hours. Flush and rinse. |
| Amino Acid Inhibitors (SU's including primisulfuron, prosulfuron, and halosulfuron) | 2% household ammonia then circulate for 15 minutes and flush. | 1% household ammonia, circulate for 15 mins then flush. | Rinse tank for minimum of 5 minutes using clean water. |
| Organophosphate or carbamate insecticides | 1 qt. household ammonia + ¼ lb detergent | Flush a small amount through system. | Rinse with clean water. |
| Other herbicides and insecticides | ¼ lb detergent | Flush a small amount through system. | Rinse with clean water. |

* Applicators should always read and follow any pesticide product label cleaning instructions.

Na kmetiji je potrebno poiskati pravo točko za sproščanje vode od pranja naprav za nanos FFS,
ČE KMETIJA NIMA NAPRAV ZA PROCESIRANJE VODE OD PRANJA
TO PRAKTIČNO NI ENOSTAVNO - VELIKO POTENCIALNIH TOČK JE PROBLEMATIČNIH



Urejene  točke za pranje na velikih kmetijah v tujini
Združeno mesto za polnjenje škropilnic  in za pranje

https://thefarmingforum.co.uk/index.php?threads/revamped-sprayer-filling-area.1824/



defra Department for Environment Food and Rural Affairs

Business Link


- Contents
- The LERAP Scheme: Operator Advice
- Pesticides and Conservation
- Biobeds
- Emergency Procedures
- Pesticide Storage
- Spray Operator Training
- Protective Equipment
- Pesticide Handling Areas
- Nozzle Selection and Maintenance
- Pesticide Labels
- Safe application of slug pellets
- Avoiding drift
- Container Cleaning
- Hand Protection
- Container Incineration
- Record keeping
- Pesticide Disposal
- Sprayer Cleaning
- Pesticide Container Disposal
- Skylark Plots
- Every drop counts




# After Spraying — Sprayer Cleaning

## Why Sprayer Cleaning Matters?

Good sprayer cleaning is essential as it avoids risks to other crops sprayed and ensures the sprayer is ready for the next job. It is especially critical after using herbicides where even tiny traces of chemical left in machinery can damage later sprayed crops. Washing also helps avoid blockages. Using pesticides according to the label and following best practice should ensure their impact on the environment is minimised, however there is clear evidence that poor practice when cleaning up after spraying can pollute surface and groundwater. To reduce the risk of Groundwater contamination any disposal to land of surplus spray and washings that does not take place in the crop requires a Groundwater Authorisation from the office of the local environment agency.

## The Sprayer

- The Sprayer manual will give guidelines on best washing procedure. Use this advice together with any specific product advice;
- Sprayer cleaning can be speeded up dramatically by tank rinse nozzles. They allow the job to be done in the field quickly with minimal water
- Electronic rate measuring devices can help you spray accurately and ensure a suitable area is left for placement of tank washings if required;
- A hose and brush attachment, which is available on some sprayers, can be used to clean the outside;
- Remember it is easier to clean the sprayer before any spray solution has dried on to the sprayer.

### Keep Water Clean

- Make sure that streams and watercourses are not contaminated;
- Never pour pesticide in any form (including pack washings) into soakaways, sewers, drains, ditches or rivers etc.

## Where to clean the sprayer ?

The best place to clean the sprayer is on an unsprayed or under dosed area of the field last treated. The field is also the best place to clean the exterior of the sprayer. Cleaning the sprayer in the field does not require a Groundwater Authorisation. It is also possible to clean the sprayer in the farmyard; however any washings must be collected and sprayed back on the crop. Advice on pesticide handling facilities is included in the CPA Guides on Pesticide Handling Areas and Biobeds.

Disposal of any washings to a site other than a crop for which the pesticide(s) is approved will require a groundwater authorisation. A Groundwater Authorisation application pack can be obtained by contacting the relevant environment agency . These sites may only be used after approval by the office of the local environment agency. Authorisation will only be granted if there is no risk of surface or groundwater contamination.

### Environment Agencies

Environment Agency (England & Wales)
0845 933 3111

Scottish Environment Protection Agency www.sepa.org.uk

Environment and Heritage Service, Northern Ireland
www.ehsni.gov.uk

### Hot Spots

| Interior | Exterior |
|---|---|
| Sump | Boom |
| Pump | Back of Tank |
| Filters | Rear Wheels |
| Pipes | |
| Induction Bowl | |

## Preparation before Spraying

- Check the sprayer is clean
- Sequence spraying operations to minimise the number of rinsing operations needed
- Make sure the sprayer is calibrated
- Check the product label for any special cleaning advice and warnings about sensitive crops
- Mix enough pesticide for the job, just too little is better than too much
- Identify when and where you will be cleaning the sprayer
- Choose an area of crop suitable for spraying out washings: make sure there is no risk of exceeding the maximum recommended dose by washing out in the field

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Skylark Plots
Every drop counts



**Before Spraying** | **Pesticide Handling Areas and Biobeds**

## Why Pesticide Handling Areas are Important

At least 40% of surface water pollution by pesticides may come from the pesticide handling areas. Water is vulnerable from tiny splashes and spills that occur when filling the sprayer and when rinsing the container. Inappropriate wash down, cleaning and disposal activities can also have significant adverse environmental impact. Just one dropped foil seal can contain enough pesticide to contaminate 30 km of stream. In one study it was possible to reduce the pesticide contamination coming from the handling area by 99%. A key step to achieving this change was to review the site and the surface used for filling and wash down activities.

Pesticide users and sprayer operators must therefore not only look carefully at the design and surfaces used in the handling area, but also their own practices so that we can do more to protect water from accidental pesticide contamination.

## Reviewing the Site

Siting and design of pesticide handling areas has developed over the years for operational convenience rather than pollution control. New research has shown that the concrete filling area, so typical of many pesticide handling areas, is potentially the worst surface for handling pesticides; things can be made even worse when the water from the concrete pad drains into a local ditch.

Changing the site, its layout and surface to improve the management of waste liquid and run-off can show reductions in pesticide load of 1000-100,000 fold. Under the Voluntary Initiative, all pesticide users and spray operators are being encouraged to review their current sites and to consider solutions and practices which can prevent, control, retain and degrade pesticide residues and significantly reduce pesticide pollution of water.

Keep Water Clean
Prevent spills
Clear up immediately & dispose of waste safely

## Planning Ahead

Before making any changes to your existing arrangements you should consider carefully two factors:

***1: Local Water Priorities***

Establish if and how local water sources may be affected by what you do at your handling area. Advice and information on water quality risks is available from your local office of the Environment Agency. They can also advise you if you are in a Groundwater Protection Zone as well as giving you background information on local hydro-geology. In any event, you should ensure that the pesticide handling area is sited:

- At least 10m away from any watercourse or vulnerable site;
- At least 50m away from any borehole spring or well;
- Away from existing farmyard flash flood routes, rain water outlets and gutter outfalls;
- Away from farmyard drains and not above any tile or mole drains;
- Aside from main business traffic routes;
- On well structured soil with at least 1.6m depth of soil and sub-soil before bedrock;

Ensure as far as practical that any pesticide contaminated water is handled separately from other drainage water. Use a bund (low concrete lip) to keep the handling area water within the area and to keep rain water and other vehicles out of the filling area.

***2: Handling Area Purpose***

Any handling area should allow the operator to work safely and efficiently, but it is also important that the area contains any contamination. Thus the handling area should collect all drips and splashes and run-off from rainfall. (Note: Any significant spillages should be soaked up and removed for separate disposal). However, the key decision is whether the handling area will be used just for sprayer filling or whether wash- down activities will also take place. If the sprayer is being washed down it will:

- Increase the amount of waste liquid This means that for some solutions a larger disposal area may be required.
- Require a Groundwater Authorisation (GWA) All cleaning and wash down operations that do not take place in the crop are regarded by environment agencies as disposal. This means that you require a GWA from your local environment agency. There is a one-off

Iz slabo oprane opreme se sproščajo FFS, ki lahko preidejo na ljudi na farmi, ki se gibljejo v bližini parkiranih naprav










Ko skladiščimo naprave na prostem se pri vsakem dežju iz njih sproščajo FFS.




















Ne prati naprav za nanos FFS na površinah, kjer se zbrana voda od pranja steka v odtoke meteorne vode ali v kanalizacijski sistem

NE PRATI NAPRAV NA GRAMOZNIH PREPUSTNIH POVRŠINAHA IN KJER JE AKTIVNOST ŽIVALI






ANDREW LANDERS CORNELL ZDA

PRI IZBIRI TOČKE JE POTREBNO PREUČITI LASTNOSTI TAL IN MOREBITNE DRENAŽNE SISTEME






TUDI VSE TRAVNE POVRŠINE NISO PRIMERNE

ČE OBSTAJA MOŽNOST KONCENTRIRANJA ODTOKA TRAVNA POVRŠINA NI PRIMERNA





TUDI VSE TRAVNE POVRŠINE NISO PRIMERNE

ČE OBSTAJA MOŽNOST KONCENTRIRANJA ODTOKA TRAVNA POVRŠINA NI PRIMERNA

TUDI TRAVNE POVRŠINE SO LAHKO PREVEČ PREPUSTNE NA NJIH SE NE SME STEKATI METEORNA VODA





VODE OD PRANJA NE SMEMO SPUŠČATI NA TRAVINJE KI JE DRENIRANO



https://www.google.si/search?biw=1024&bih=691&tbm=isch&sa=1&ei=9lruXe7vI9mT8gLep7zoCA&q=field+boom+sprayer+parked+in+yard&oq=field+boom+sprayer+parked+in+yard&gs_l=img.3...291614.294319..296061...0.0..0.209.1114.10j1j1.....0....1..gws-wiz-img.1r00_NJ5xqs&ved=0ahUKEwjuwvSb5KjmAhXZiVwKHd4TD40Q4dUDCAY&uact=5#imgrc=HRw4nTTtw8PTrM:&spf=1575902137240

Za pranje bi morali poiskati dobro vzdrževano aktivno travno rušo, kjer je omejen dostop ljudi in živali. Ravno prav velika površina, da rastlinstvo prenese breme FFS.



Možen je prehod vode iz betonskih in asfaltnih površin na pripravljene biološko aktivne površine – POSEJANA RUŠA  NA USTREZNO PRIPRAVLJENI  PODLAGI

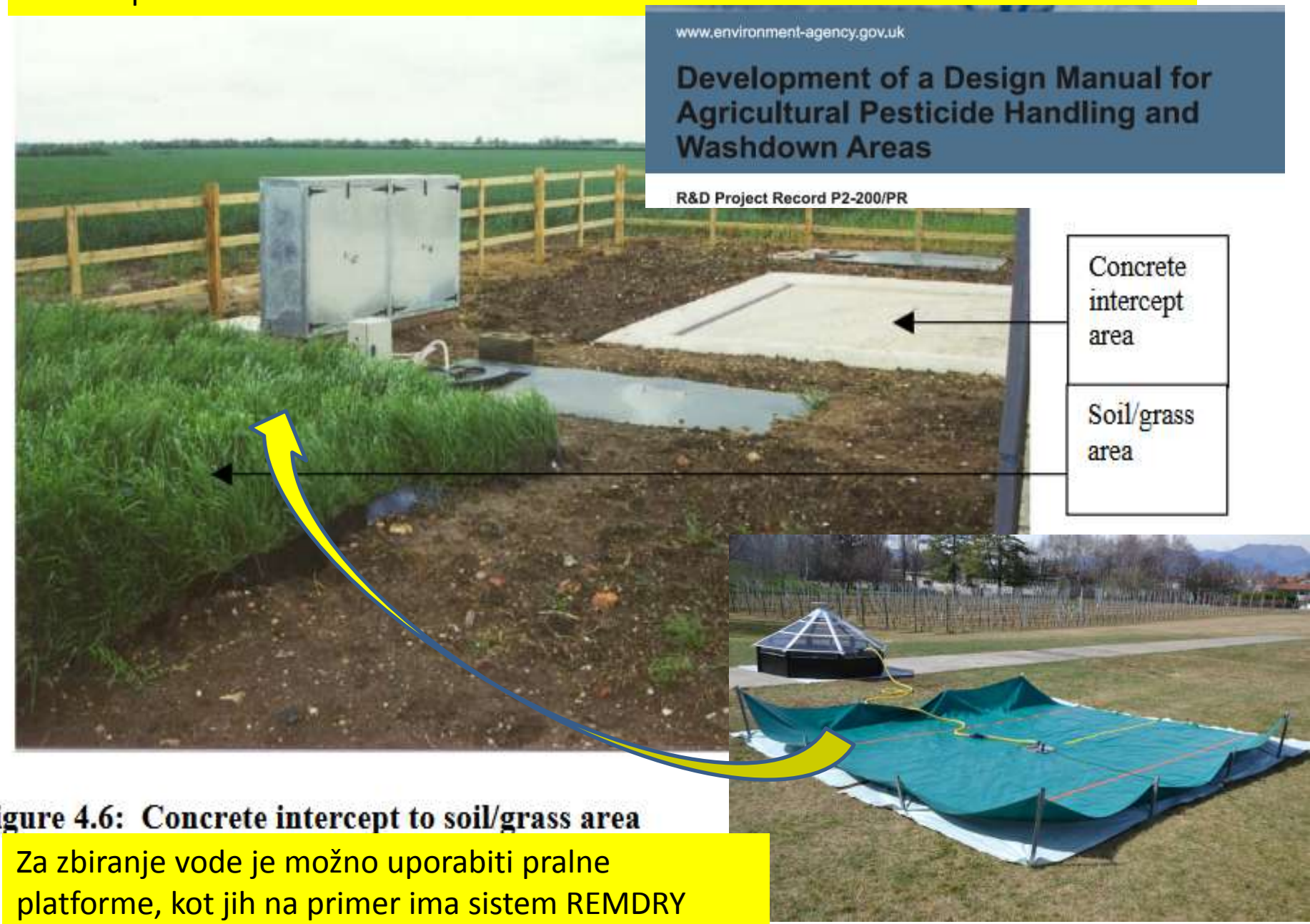



**Figure 4.6: Concrete intercept to soil/grass area**

Za zbiranje vode je možno uporabiti pralne platforme, kot jih na primer ima sistem REMDRY

Mini FIELD biobed





https://sprayers101.com/biobeds-for-pesticide-waste-disposal





Preprosti poljski BIOBED za manjše kmetije v polni vegetacijski aktivnosti



# https://cropscience.bayer.co.uk/blog/

Biobed za zbiranje vode od pranja škropilnic



Preprosta globoka betonska ploščad iz katere voda ne more odteči nikamor in voda ima veliko površino da izhlapeva - praksa v Franciji in Španiji na območjih z veliko sonca
Hkrati postaja za polnjenje škropilnic



http://www.charentes.cuma.fr/content/aires-de-lavage

# ZAKLJUČKI

- V SLOVENIJI NIMAMO JASNE STRATEGIJE GLEDE ČIŠČENJA NAPRAV ZA NANOS FFS (NA POLJU ALI NA KMETIJI ALI ZDRUŽENE VAŠKE PRALNICE ???)

- NIMAMO IZDELANE ZAKONODAJE GLEDE TEGA
- NIMAMO TEHNIČNIH STANDARDOV GLEDE NAPRAV ZA PRANJE NA DVORIŠČU
- NAMAMO STROKOVNIH NAVODIL GLEDE IZBIRE MEST ZA SPROSTITEV VODE OD ČIŠČENJE NA KMETIJI

- NIMAMO SUBVENCIJ ZA TEHNIČNO NADGRADNJO STAREJŠIH NAPRAV
- NIMAMO SUBVENCIJ ZA GRADNJO ČISTILNIH NAPRAV NA DVORIŠČU KMETIJE

- SERVISI KMETIJSKE OPREME NE PONUJAJO MOŽNOSTI NADGRADNJE STAREJŠIH NAPRAV

- IMAMO VELIKA PRIČAKOVANJA ZA IZBOLJŠANJE STANJE OSTANKOV FFS V VODI IN V OKOLJU NE GLEDE NA TO DA IMAMO STANJE OKOLJA PRECEJ BOLJŠE, KOT V ŠTEVILNIH DRŽAVAH EU

- POTREBNE SO KONKRETNE AKTIVNOSTI NA STRANI VEČJEGA ŠTEVILA DELEŽNIKOV
- NE SMEMO DOVOLITI PRESENEČENJ



- NOVA NADGRADNJA DIREKTIVE SUSTAINABLE USE OF PESTICIDES
- VKLJUČITEV OBVEZNIH PRALNIH MEST IN NAPRAV ZA PRANJE V CERTIFIKAT GLOBAL G.A.P

HVALA ZA POZORNOST




GLOBALG.A.P.

# GLOBALG.A.P. requirements related to plant protection products (PPP) and IPM





https://eioperator.com/pro-operator-article/funds-to-help-protect-water/



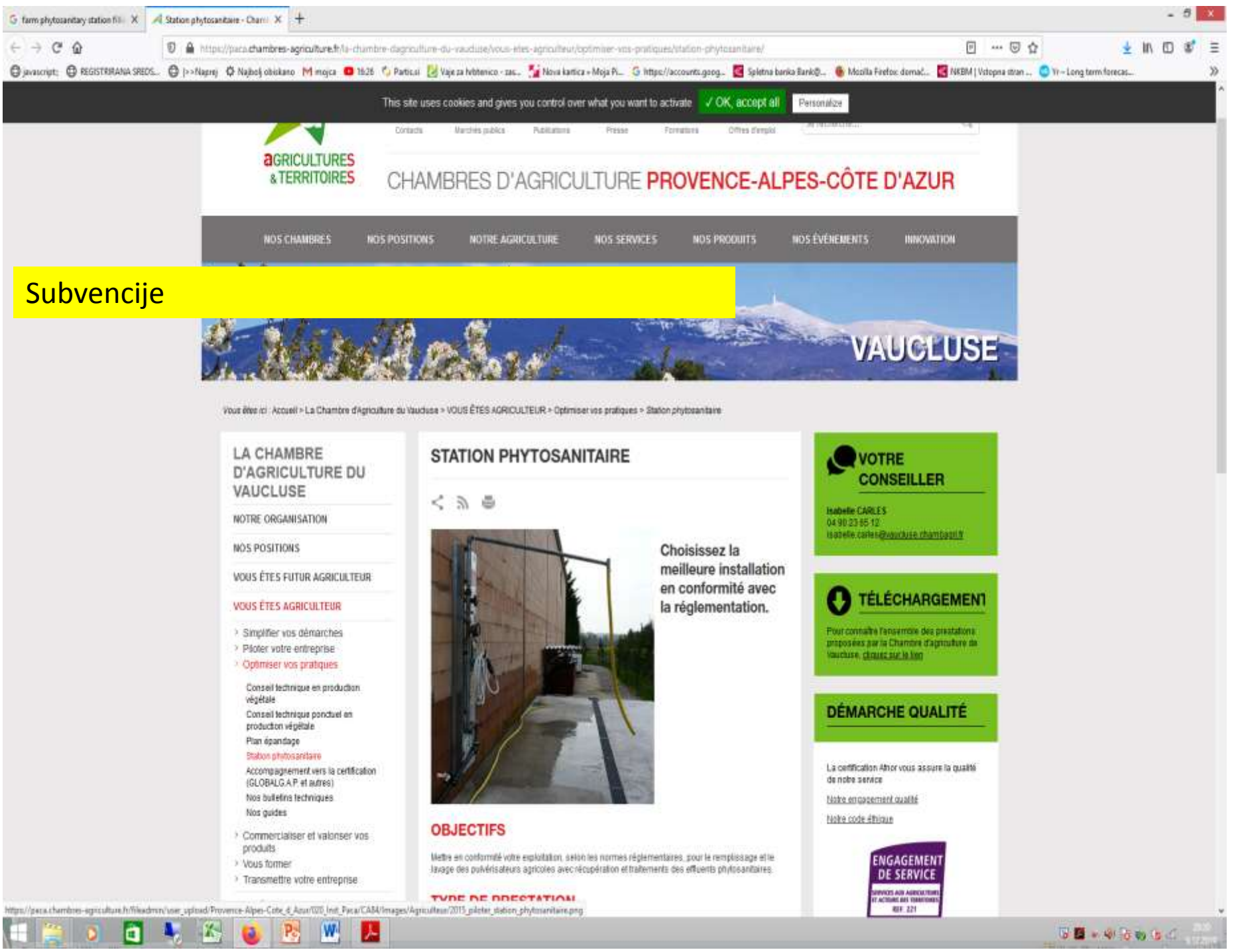
Subvencije

# Subvencije




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Assistance from the Agence de l'Eau for the sprayer filling and washing areas
PUBLIÉ LE PUBLISHED FEBRUARY 25, 2011
Because the filling and washing of phytosanitary product sprayers can be a point source of pollution for the natural environment, l'Agence de l'eau adapts its financing.
L'Agence de l'eau assists individual projects for the creation of washing and filling areas for pesticide sprayer and the treatment of the polluted water from this, as well as the collective areas developed by the local authorities, agricultural cooperatives or traders for groupings of farmers.
The subsidies are destined for those farmers who develop their phytosanitary station on their own and the agricultural cooperatives, agricultural traders, municipalities or associations of municipalities in the scope of collective projects.
This financial assistance is based on the development of studies and diagnostics in order to choose the system best adapted to each project as well as the building and fitting of the station.
The Agence de l'eau provides 50% subsidy for individual and collective projects. To this can be added subsidy from the Fonds Européen Agricole de Développement Rural (FEADER) or other financers within the limits of the ceilings fixed by European support for all public grants:
Individual stations: 75% on priority territories for pesticides and 60% elsewhere (information on the priority territories available from DDT) ;
Collective stations: 80% over all the Rhône-Méditerranée and Corsica basins.
If you need more detail on the management of phytosanitary effluents and the different existing and approved filling and washing areas
For all further information, you can send an email to contact@censo-lavande.fr or contact your DDT.
<< All focuses

Subvencije


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Piloter votre entreprise
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Plan épandage
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Accompagnement vers la certification (GLOBALG.A.P. et autres)
Nos bulletins techniques
Nos guides
Commercialiser et valoriser vos produits
Vous former
Transmettre votre entreprise
STATION PHYTOSANITAIRE
Choisissez la meilleure installation en conformité avec la réglementation.
OBJECTIFS
Mettre en conformité votre exploitation, selon les normes réglementaires, pour le remplissage et le lavage des pulvérisateurs agricoles avec récupération et traitements des effluents phytosanitaires.
VOTRE CONSEILLER
Isabelle CARLES
04 90 23 85 12
isabelle.carles@vaucluse.chambagri.fr
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# Aire de lavage pour les pulvérisateurs

13-02-2018 12:33



L'appel à candidatures pour le soutien à l'acquisition d'aires de lavage des pulvérisateurs permettant de réduire les impacts sur les sols et sur l'eau est ouvert sur le PDR Rhône-Alpes.

L'objectif de ce type d'opération est d'accompagner et d'accélérer les changements de pratiques agricoles vers plus de durabilité des systèmes, en apportant un soutien aux investissements nécessaires à l'adoption de techniques alternatives permettant d'améliorer la gestion des ressources naturelles et la préservation de la biodiversité. Il est financé par les Agences de l'eau, la métropole de Lyon et l'Europe.

Les dossiers de demande d'aide peuvent être déposés au fil de l'eau. Une session de sélection est prévue en 2018 : la date limite de dépôt des dossiers complets qui doivent être déposés en Direction départementale des territoires est repoussée au 31 mars 2018

Pour plus d'informations, cliquez ici
Publié le 13-02-2018 12:33 par Perrine Tavernier