



Prevent water contamination through point sources

BEST MANAGEMENT PRACTICES

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I. About TOPPS

TOPPS is a 3-year, multi-stakeholder project covering 15 European Countries - it stands for **T**raining the **O**perators to prevent **P**ollution from **P**oint **S**ources.

TOPPS is funded under the European Commission's Life program and by ECPA, the European Crop Protection Association.

TOPPS is aimed at identifying Best Management Practices and disseminating them through advice, training and demonstrations at a larger co-ordinated scale in Europe with the intention of reducing losses of plant protection products to water.

1. Partners

European Crop Protection Association (ECPA)

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Research Institute of Pomology and Floriculture

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www.lk-wl.de



Hardi International
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 Taastrup
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www.hardi-international.com



2. Clusters

The TOPPS Project is organised in four geographical clusters

Nordic: Denmark, Sweden and Finland

East: Poland, Czech Republic, Slovakia and Hungary

South: Italy, South France, Spain and Portugal

Mid West: Belgium, United Kingdom, The Netherlands, North France and Germany

3. Project

The TOPPS project started on November 2005 and will end October 2008. It is structured in a sequence of different steps.

a) Inventory /Status analysis

Partners collected and analysed the relevant studies, publications available to better understand the challenges related to the contamination of water by plant protection products through point sources. Also addresses of organisations and persons representing the key stakeholders in the various countries were collected to build a basis for networking and dissemination of results. Materials and addresses are documented on a web based database, which also provides networking functionalities for cooperation across country borders.(www.TOPPS-life.org)

b) Development of Best Management Practices

The development process will be explained in a separate chapter.

c) Transfer of Best Management Practices (BMP's)

Based on the BMP's, publications, trainings, workshops and presentations at big farmer events are being prepared and organised to disseminate the BMP's to the operators to create awareness and give recommendations on how to avoid contamination of water.



TOPPS – Demonstration stand

Demonstrations are conducted on 10 demonstration farms.

In 6 pilot catchments areas the transfer of the BMP's is done through intensive advice and information campaigns.

These regions are audited in the beginning of the project and at the end. The audits concentrate on the three main dimensions of TOPPS

- Awareness and Behaviour
- Technique
- Infrastructure

d) Upscaling proposal

At the end of the project the accumulated materials and experience will be used to make a proposal on how to achieve a sustainable approach across the member states to prevent pollution from point sources.

II. Best Management Practices (BMP's)

1. Development

Iterative Development of BMP's

The development of the BMP's was made in a sequential approach to ensure the involvement of a large group of stakeholders.

- Development of a proposal within the partner group of TOPPS (Oct 2006)
- Discussion of the TOPPS proposal in most countries with stakeholders on a national level (National Forums - October 2006 to end 2007)
- Extended Steering Committee with European Stakeholders Nov 2006
- European Stakeholder Workshop Feb 2007

After each discussion step the suggestions relevant were used to adapt the BMP's and to make them more agreeable for all.

Structure

BMP's are structured on the basis of defined processes, which represent a sequence of steps in the use of plant protection products.

There are 6 main processes defined:

- Transport
- Storage
- Before spraying
- During spraying
- After spraying
- Remnant management

Each of the main processes is divided in subprocesses.

Based on these definitions the BMP's are developed in a two step approach

Statements = What to do's

Specifications = How to do's

We consider the statements to represent "the European core", which should be followed by all member states. The statements proposed were a selection of about 100 major statements out of a total of 400 statements, which achieved in the development process most consensus in the various discussions.

The specifications given in the TOPPS BMP's should be considered as a proposal. It is our clear understanding that on the level of the specifications operators / advisors need to follow the local regulations, if they are existing. In situations where no regulations or guidance exist the TOPPS specifications should be considered.

In the following chapters the BMP's are presented by explaining the processes in a general way by a guidance paper to put it into perspective. Then the BMP's follow very condensed. References are made where there are statements or specifications in relation to each others.



2. Transport

TOPPS guidelines are intended to be a generic and practical way to prevent water contamination by PPP from point sources. They are an expert view on best practices taking into consideration technical limitations. It is not the intention to overrule any local legislation; on the contrary, importance of local legislation is stressed. Guidelines should be dynamic, and particularly with regard to waste management regulation, regular updating on state of the art and legal situation is recommended.

Main Process: Transport (from PPP supplier to the farm)

Sub processes involved:

- **Planning:** Any movement of PPP on public roads must be planned and properly managed. Actions may need to be taken in the long or the short term before such activities.
- **Loading/unloading:** This sub-process is critical when it comes to damaging or weakening the PPP packaging. It entails adequate handling, including careful loading, avoiding handling impacts and prevention of emergency situations.
- **During:** Personal safety first
- **Emergencies:** Be prepared for emergency situations like fire and hazards arising from accidents. All previous sub-processes can help avoiding emergency situations. In case of emergency accurate & quick responses can confine impact.

OVERALL principle(s):

PERSONAL SAFETY FIRST
AVOID spills and vehicle contamination
BE PREPARED in case of emergencies
OBEY laws related to transport of hazardous goods

General

This paragraph focuses on transport from the PPP supplier to the farm's PPP store. It is not the intention to explain in detail this highly technical subject, which is left to the professional distributors of PPP. Professional PPP distributors are likely to be well aware of their legal obligations and may be able to offer further guidance to those whom they supply. However it is important to understand the requirements they must meet if one is to appreciate your 'users' obligations. Transport, and transport of hazardous products in specific, is a general topic, not strictly linked to agriculture and definitely not to point source. Hence, legislation is ruled by International law like European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR, Geneva, 30 September 1957) and its implementation into national laws. Transport is extensively regulated all over the EU, either at EU or at Member State (MS) level. *Transport from the farm to the field is treated in a different section (Before spraying – transport to the field).* The main requirements for PPP transportation on public roads are:

- Know the **maximum PPP loads** you can carry as a farmer. Prior to or on top of that seek advice and/or support from your professional supplier (or any other professional knowledgeable person/service).
- Take necessary precaution. Avoid problems from the start and strictly obey safety instructions given by your supplier or on the product labels
- **Do avoid spills within and on the vehicle & surrounding areas** by use of proper handling equipment & procedures. Spills require clean up, and clean up means extra work and potential remnants.
- **Be prepared for emergency situations;** Quick & appropriate responses reduces any personal risk and protects the environment.

Implementing appropriate measures is in the interest of the users, the industry and stakeholders alike.

Safe transport has many benefits:

- enhanced safety for the driver, passengers and all other road users.
- reduced pollution risk and reduced insurance fees
- reduced cost for waste disposal
- reduced risk of prosecution and fines from regulators
- risk reduction in environmental & water contamination
- enhanced public relations



Background

The issue with PPPs and water is often due to point source pollution. Transport from PPP suppliers to the farm store by the farmer is the first step in a series of processes where there may be risks for point source contamination. In many cases, farmers – correctly – rely on professional dealers/ suppliers to ensure safe transport to the farm. Although this section may, therefore, have little relevance to these PPP users, the general requirements for loading and the inspection of delivered goods remain useful. Within the focus on point source it means checking that correct products are delivered with properly labelled packaging and in good condition. These are prerequisites in order to not contaminate your store, not to produce clean-up remnants of spills, ensure no leakage and not end up with unwanted stock.

Therefore this section is closely linked to some downstream processes (such as “Storage” and “Before spraying”).

Be aware that transport of hazardous goods on public roads is strictly regulated in most countries. CHECK the load limits and local conditions of exception in your region.

MAIN PROCESS: Transport					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
1140	planning	DO transport PPPs in their original containers with intact, readable label	Type approved [UN] packaging used by most manufacturers. Note: Individual containers taken from 'packs' (split-offs) may not conform; original approved containers and original label instructions.		2475
1220	during	CARRY a list of emergency numbers with you.	Have emergency numbers in transport unit. Most important is the emergency number 112 which will direct the call to the relevant authorities or medical aid.		2296
1300	loading / unloading	USE a clean, dry loading space in vehicle free from protruding screws, nails or other sharp objects and adapted to retain spills.	See also statement 1360.	1360	1360
1320	loading / unloading	Products, remnants and empty unrinsed containers MUST be stowed with the closures upmost.	See also statement 1330: "Always ensure cargo balanced, safely stowed and secure before departure" and statement 3400 "DO rinse emptied containers and seals immediately and add this rinsing liquid to spray solution".	1330 3400	1330
1325	loading / unloading	ALWAYS observe special instructions on packing such as "this way up".	See also statement 1330.	1330	1330
1330	loading / unloading	ALWAYS ensure cargo balanced, safely stowed and secured before departure.	<ul style="list-style-type: none"> - heaviest goods below - prevent free movement of containers within the load area - do not put excessive stress on containers with binders while securing load - products, remnants and empty unrinsed containers must be stowed with the closures upmost (statement 1320) - observe special instructions on packing such as "this way up" (statement 1325) 	1320 1325	1320 1325
1340	loading / unloading	DO avoid impact damage whilst on/off loading cargo.			
1360	loading / unloading	ALWAYS check pallets, packs, containers are free of damage, weakness and protruding points	See also statement 1300	1300	1300
1370	loading / unloading	ALWAYS inspect the loading space of the vehicle for spills after off loading.	See also statement 2630 concerning "spill management".	2630	
1375	loading / unloading	DO inspect off-loaded goods for damage prior to handling.	<ul style="list-style-type: none"> - Separate damaged from undamaged packs. - Wear protective clothing defined on label and/or Safety Data sheets. - Place leaking containers into sealable container, bund and then absorb spill. - Sweep up contaminant and place with leaking container. <p>See also statement 2630 concerning "spill management".</p>	2630	

MAIN PROCESS: On farm transport					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3640	farm transport	AVOID transporting unnecessarily large amounts of PPP.	Secure enclosed PPP cabinets or containers that are mounted on the outside of the vehicle or on a trailer that may be used. Such mobile stores must only be stocked from fixed stores and used within 24 hours. Other regulations may be enforced for PPPs labelled 'Toxic', 'Flammable' or 'Corrosive'.		
3660	farm transport	DO safely transport tractor, spraying equipment and PPPs with maximum stability	Sprayers containing undiluted or diluted PPPs must not leak, slop or - in any way - cause losses or pose hazards en route to treatment zone. Tank lid must allow air in but not permit the leakage of any liquid. Check coupling pins and other fastening devices for security before moving. Check tank fastenings to avoid vibration damage en route. Know emergency procedures. Ensure tank, hopper lids and pipe work are secure and do not leak or drip. Correctly ballast the tractor and balance load in case of mounted sprayers and avoid uneven roads if possible.		
3670	farm transport	DO ENSURE that no accidental or unintended PPP containing spray liquid losses occur	Sprayers containing diluted PPPs must not leak, slop or - in any way - cause losses or pose hazards en route to treatment zone. Tank lid must allow air in but not permit the leakage of any liquid. Make sure hoses and nozzles are not leaking and the tank is not overfilled. Close all valves that direct spray liquid to booms. Secure all valves for accidental opening during transport. Make sure spray tank liquid indicator is clearly visible from operators seat to detect emergency situations. Ensure all tank closures, couplings and valves controlling liquid flow are secured shut during transport. "DO rectify/adjust any equipment problem immediately " (statement 4220, During Spraying). Avoid travelling on roads with the sprayer pump running while en route from filling station to field of application. PPPs requiring constant agitation should preferably be loaded at the site of application or should be added at a suitable site close to the intended treatment area. In case this is not possible keep pressure as low as required for agitation.	4220	
3680	farm transport	DO not drive through (into) water courses	Where possible, use a bridge or tunnel. If unavoidable, clean tyres and double check for leaks prior to crossing shallow water courses (fords). See also statement 4230 " DO NOT over spray water courses, wells, drains, springs and hard surfaces" (During spraying) about exemptions such as for wet land rice.	4230	

3. Storage

TOPPS guidelines are intended to be a generic and practical way to prevent water contamination by PPP from point sources. They are an expert view on best practices taking into consideration technical limitations. It is not the intention to overrule any local legislation; on the contrary, importance of local legislation is stressed. Guidelines should be dynamic, and particularly with regard to waste management regulation, regular updating on state of the art and legal situation is recommended.

Main Process: Storage

Sub processes involved:

- **Location:** The choice of WHERE storage facilities are to be set up is a crucial decision from various points of view. It affects safety, labour efficiency and accessibility. From the TOPPS point of view, the location is also governing the infrastructural demands. It is key to consider this aspect very carefully, particularly if the storage facility is a fixed building structure.
- **Access:** Access is a bilateral issue. From the human safety point of view, there are strict MS¹ laws to comply with. It deals with door labelling, access rights for entering the store and accessibility to reach the store in case of emergency. From the point source point of view accessibility is important to reduce risk of container damage in the process of bringing in or taking out PPPs, and also on isolation and containment of spills.
- **General:** This aspect focuses on HOW storage hardware is going to be set up and managed.
- **Spills:** This topic deals with occasional spills, not with any major accidents (to learn more about major accidents see the “emergency” section). A store contains original packaging, highly concentrated PPP. Drops, spills etc. can be limited in amount, but highly concentrated. It is crucial that by handling any product, liquid or solid residues any spills are avoided. Avoiding spills is already included in the previous main process “Transport” and to some extent in some sub processes mentioned above. This section includes spill management up to the point of decision how to dispose the clean up fraction. This is extensively treated in the main process “Residue Disposal Management”.
- **Emergency:** Be prepared for emergency situations such as fire, flooding or any other accidental hazard. All previous sub-processes can help in avoiding emergency situations. In case of emergency accurate & quick response can confine impact.

OVERALL principle(s):

PERSONAL SAFETY FIRST
CAREFULLY plan WHERE & HOW to set up your PPP storage facility
IMPLEMENT proper daily store management
AVOID spills & BE PREPARED to manage them in case they occur
NEVER drain spills directly into surface water or sewage system
BE PREPARED in case of an emergency

General

Storage of PPPs is an extensively regulated issue in terms of personal and to an increasing extent environmental safety. This paragraph focuses on ON-FARM storage of PPPs. (Storage by professional suppliers is not included). Storage is usually linked to farm buildings and hence to “infrastructure”.

When planning to set up a new infrastructure or modifying an existing one, it is important to take into account legislation and safety issues, but also daily storage management aspects related to the environment. Some of these are legally enforced, some are pretty obvious, but some aspects are not as straightforward. Modifying some of these in existing infrastructure might be a difficult and expensive exercise.

- If alternatives are available, choose a **location in a non-sensitive area**; if there are no alternatives increase infrastructural standards to prevent potential risks.
- Keep distances between **store, mixing and loading and storage of residual disposables** limited. Less distance between linked work-steps enhance safety and labour efficiency.

¹ MS : Member State

- Know the **maximum amount of PPPs** you can store in advance (related to environmental permit, geographical restrictions such as drinking water extraction areas) and **limit stored quantities to your needs**. Above that seek advice and/or support from your supplier and use supply logistics such as Just-in-Time deliveries.
- A PPP store is **exclusively for PPPs** and, if local legislation allows, for intermediate storage of residual fractions such as empty containers.
- **Do avoid spills**. Spills require cleaning up, and cleaning up means extra unnecessary work and residue disposal problems.
- Take necessary **precautions to avoid uncontrolled release of PPPs through drains and gutters** connected to surface water and sewage systems.
- **Be prepared for emergency situations**; Quick & appropriate responses may prevent personal injury or help to limit damages.

Implementing appropriate measures is in the interest of users, industry and stakeholders alike.

Safe storage has many benefits:

- enhanced safety for operators and farm dwellers
- reduced pollution risk and reduced insurance fees
- reduced risk of prosecution and fines from regulators
- enhanced cross compliance & trade certification approval
- risk reduction in environmental & water contamination

Background

Major accidents with PPP-storage facilities are very limited in occurrence. However, when they occur the consequences might be significant, both from a liability as from an environmental point of view. Unlike company structures, liability is often entirely on the farmers head. Personal injury incidents due to poor access management are a well known example.

Related to point sources this liability is focussed towards environmental risks and fire safety. A fire hazard can be generated from within the store or from outside the store. Dry areas might periodically suffer from bush fires threatening their PPP storage facilities. Flooding is an example from environmental risks that might affect uncontrolled release of PPP from the store. As said before, frequency of such events is very limited. Modifying existing infrastructure might be very complex but especially in new facilities these aspects should be taken into consideration.

A less striking but nevertheless more common issue is the presence of uncontrolled drains and outlets in the storage facility. Spills and accidental losses in the storage room are usually concentrated in terms of chemical content (hazard). Since the store is a working environment (exposure) it needs regular cleaning. If store drains are directly linked to surface water or a third party sewage system are present, it represents a **serious** point source risk. This can be solved through prevention, through adaptation of the drain system (disconnect from surface water and third party sewage system), and via proper remnant disposal management (see section on remnant disposal management).

Be aware that storage of PPPs is regulated strictly in most countries. CHECK local legislation, cross compliance & trade certification schemes. CHECK situation on intermediate storage of unwanted stock and toxic waste

MAIN PROCESS: Storage					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
2120	location	DO locate store away from all sensitive zones to minimize risks	<p>In general stores must be located away from high risk zones for water and/or be constructed to be protected from such hazards and not pose risks. Always check with local authorities before constructing new storage facilities.</p> <p>For new stores of more than 1 ton PPP storage: 50m from category "high" without special provisions for store; 10 m from category "high", if compliant with fire specifications of 1 hour fire resistant, or category "medium"; if farm store within such area: avoid storage of more than 1 ton PPP simultaneously, use bunded store and with fire water collectable.</p>	2345 2520	2345 2520
2130	location	Mobile or in field (temporary) storage facilities MUST be positioned away from sensitive zones.	<p><u>As a rule of thumb for new stores:</u> For stores >1 ton of PPP storage: Stores should be located 50 m or more away; for stores less than 1 ton PPP storage: 20m from high risk zones for water and ; 10 m if properly protected by circumferential situation and for medium category; 4 m for low risk category and if closed remnant water collection system including fire extinguishing water collectable; not on slopes facing sensitive areas unless fire water collectable; always use remnant water collection system in drinking water abstraction area.</p>		
2140	location	DO provide mixing & loading site on farm adjacent to store.	<p>PPPs removed from store must always be in sight and/or protected from non-authorized access. These areas must be capable of retaining all spills and have collection facilities for emptied containers and packaging.</p>		
2250	access	NEVER leave the pesticide store unattended when unsecured	<p>Stores must be secure, never left unattended when open and managed by competent, named person.</p>		
2260	access	DO store PPP within lockable building or cupboard	<p>Ensure access from outside through any openings such as windows is not possible. Use external secure lock with internal emergency unlocking facility.</p>		
2290	access	DO keep instructions on hazards and emergency telephone numbers in visible place	<p>Instructions identifying all hazards and emergency responses for all PPP in store must be very visibly located within a reasonable perimeter of the store entrance and at eye height.</p>		
2296	access	ALWAYS display appropriate safety and hazard signs at the store entrance	<p>Mark the exterior of the store. Use the general danger warning sign [!] and/or 'Skull and Cross bones' if appropriate and put 'No Smoking' or 'Smoking and Naked Flames Forbidden' signs on the exterior door</p>	1220	

MAIN PROCESS: Storage					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
2345	general	ALWAYS use fire resistant store	Check with local regulation and fire brigade. <u>As a rule of thumb:</u> walls, doors and construction material, including structure of the roof MUST be fire resistant. Protect load bearing steel members from heat. Fire break walls SHOULD extend beyond the roof. 1 hour internal and external fire resistance in remote places or areas posing external risks (e.g. forest fires) but 30 minutes minimum resistance with rapid response of emergency services.		
2420	general	DO seal all drains within the store not related to waste water evacuation	seal should have the same height as damp proofed wall base		
2425	general	Storage room SHOULD be bunded or equipped with closed collection system	New stores more than 1 ton must have a dedicated holding tank that is at least 110% (185% if in water sensitive area, category "high") of stored volume. [ref.: Health & Safety Executive, UK] Storage facility should be able to collect at least 10 % of stored volume, 100% in sensitive areas. (ref.: German regulation)		
2460	general	ALWAYS have non-absorbent shelves that are without sharp points			
2465	general	PROTECT sacks or easily damaged packing material from sharp corners	Cushion such sharp corners by placing robust containers next to it.		
2475	general	DO store PPPs in original packages with - intact and readable - original labels	Store PPPs in their original containers with their intact labels dry under cover within a preferred temperature range of 5 to 40 °C and away from direct sunlight. Store should be frost free at any time (>0°C). Repacked leaking containers must be in a sealable container labeled with product name and hazard. See also statement 1140.	1140	
2480	general	DO inspect packaging for damage or deterioration when being moved.			
2510	general	DO isolate leaking or damaged packs within store	Place leaking and/or damaged packs in a closed sealed box that is securely located within the store in a bunded area away from other materials		
2520	general	DO store only enough PPP for current uses	PPPs must only be stored in volumes to satisfy its intended use within 6 months from delivery with a maximum of 1 year. Stores must have facilities to contain PPPs being returned to suppliers and to manage spills. ALWAYS avoid long term storage of PPPs, to prevent unwanted stock (see also main process "Remnant management").	2120	2120

MAIN PROCESS: Storage					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
2525	general	DO equip store with facilities for measuring PPPs (weight/volume)	Stores must have dedicated appropriate facilities – that are located within a bunded area (such as in the store) – for measuring PPPs.		
2540	general	DO store empty packages in a secured, dedicated and covered facility	Store containers upright with foil seals within and lids closed in a dedicated compound that provides cover and is secure adjacent to or in the store, if legally supported, over a drip collection facility or bunded area: - Such as a dedicated container or plastic bag in the PPP store. - If properly rinsed, empty packages can be legally disposed with other waste. In this case rinsed packages should also be made unsuitable for reuse before disposal.	6210	
2610	spills	Floors SHOULD have a smooth finish for ease of cleaning	Floors must be impervious to liquids and not have excessive slopes that create instability for containers and persons. The floor of the storage room must not have any hole or hump or dangerous inclines. Floors must be fixed, rigid and not slippery.		
2630	spills	DO retain and safely dispose all spills immediately	Check safety data sheet and/or label instructions; use dry sand, cat litter (for inflammable PPP) or sawdust to bund and absorb the spill. Sweep and shovel the contaminated material off hard surfaces and -together with any debris - place in sealed, labeled container in section of the store used for any obsolete PPP. Spills on soil should be absorbed with saw dust which can be scraped off - together with adjacent soil - and distributed at an appropriate rate in the field for which the the PPP is to be used. Absorbed spills can also be placed in a bioremediation system if available. Absorbent, organic contaminated wastes such as used sawdust may also be placed within sealed containers for incineration by specialist hazardous waste contractors. (see also main process "remnant management").	1370 1375 6510	
2640	spills	Storage room SHOULD be equipped with facilities to deal with spillage	Container(s) of absorbent inert material such as sand or wood-dust together with a floor brush, dustpan and plastic bags must be clearly located and always available within the store.		

MAIN PROCESS: Storage					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
2650	spills	DO NOT wash spills down drains	Spills, splashes, leaks and all other accidental losses of PPPs must be taken into account and appropriate facilities must be in place to stop any loss to ensure their safe subsequent disposal. Read the PPP label. Never wash any spills of PPP into public or field drainage systems, ditch or other water course. Only use dedicated drains that channel all liquid into a holding tank for authorised disposal using approved 'clean up' methods. (see also main process "remnant management").		
2710	emergencies	DO have emergency procedures - in case of fire - in place	Detailed clear emergency plans SHOULD be kept separately from the store in a secure place such as that used for the store key. Plans must show access routes to PPP stores, emergency telephone numbers (also shown on entrance door) and a list of those PPPs in the store and their quantities.		
2730	emergencies	IN CASE of FIRE: call emergency services immediately	Immediately call emergency services if there is any evidence of fire within or adjacent to the PPP store. Do not attempt any damage limitation until trained personnel have arrived and can supervise your actions.		
2750	emergencies	IN CASE of FIRE: avoid excessive volumes of water to keep run-off to a minimum	Powder, foam, and fine spray (not jets) may be the most appropriate and safest means of extinguishing fires without increasing the risk of uncontrolled PPPs losses to the environment. (Guidelines for the safe transport of pesticides, GIFAP, 1987, Chapter: Emergency procedures, p. 45)		
2770	emergencies	IN CASE of FIRE: DO retain and safely contain all contaminated water	New stores more than 1 ton must have a dedicated holding tank that is at least 110% (185% if in water sensitive area, category "high") of stored volume [ref.: Health & Safety Executive, UK].		
2780	emergencies	IN CASE of FIRE: collect contaminated waste for safe disposal			

4. Before Spraying

TOPPS guidelines are intended to be a generic and practical way to prevent water contamination by PPP from point sources. They are an expert view on best practices taking into consideration technical limitations. It is not the intention to overrule any local legislation; on the contrary, importance of local legislation is stressed. Guidelines should be dynamic, and particularly with regard to waste management regulation, regular updating on state of the art and legal situation is recommended.

Main Process: Before Spraying

Sub processes involved:

- **Planning:** The first step prior to any action. This planning step encompasses a significant time slot: from planning at farm level (advance preparation) to the point before treating a specific crop protection problem (pest/disease/herbicide). Planning at farm level is usually completely disconnected from the spray preparation activity itself. It includes management plans, procedures to protect sensitive areas, budget plans and execution of planned structural solutions. Buying an appropriate sprayer for PPP application is included in the next sub-process "*Equipment*" for PPP. "The Safe and Sustainable Use of Crop Protection Products" (ECPA, 2003) in general and "The Safe and Sustainable Use of Plant Protection Products: a TOPPs guide for planning" (in preparation) gives an overview on planning activities
- **Equipment:** In this context, the spray equipment is the single most important one.
- **Inspection & Calibration:** Inspection of sprayers includes a third party check up, either in a mandatory or voluntary scheme. Inspection should be in line with European Standard on inspection of sprayers (EN 13790 - 1 & 2). Calibration can be done by the operator himself or by a knowledgeable person to ensure proper daily functioning of the sprayer. It includes a check up of key elements and a calibration of sprayer operating parameters
- **Mixing & Loading:** This sub-process is a key one in the daily farm operation. It includes transporting PPP from the store, preparing the mixture and filling the sprayer with water and PPPs.
- **On-farm transport:** This sub-process includes the transport from the mixing & loading place to the field of treatment and all subsequent traffic up until returning to the parking place.

OVERALL principle(s):

PLAN in advance at farm level (long term commitment)
INCLUDE environmental issues in sprayer's choice and decisions
MAINTAIN spray equipment properly to avoid remnants and loss of time
AVOID accidental spills & uncontrolled PPP release
NEVER drain spills directly into surface water or sewage system
DRIVE carefully
ALWAYS be prepared in case of emergencies

General

"Before spraying" is a key element in preventing risks associated with PPP use in general. The same is valid for the risk of PPPs entering surface water. This part of the spray process offers unique opportunities to avoid downstream problems and costs. It is to quite some extent covered by recommendations. Hence a lot depends on the awareness and the routine implementation of good agricultural practice in this part of the PPP use process.

"Proper planning is half the job done" in terms of risk reduction and prevention. It might have an initial cost linked to it, but it will definitely pay itself back in the long run. Some planning actions are done once every decade; others are done very frequently before the job starts. Planning covers an overall farm management plan, including sustainable long term risk reduction of PPPs accidentally entering water. Examples can include mapping of sensitive areas for water, capping of wells and hedgerow & field margin management. Other decisions might be taken on the spot in a tight time sequence with the actual spraying such as nozzle choice due to variability in local conditions.

The decision making process on purchase of equipment is a complex one. Many variables come into play. Choice is largely governed by matching financial parameters (subcontracting versus own equipment, available budget) with the farm situation (such as farm size; cropping system, future

prospects; field structure); the dealers marketing and support capacity and personal preference. The equipment choice has a vast impact on use of PPP and risk on water pollution. It governs to a great extent the down stream options left and the remnant disposal cost in terms of labour and in terms of cash. **Buying a sprayer now is a mid- to long-term binding decision (typically 10 to 20 years);** a decision with a significant impact on labour efficiency, safety (such as operator exposure), crop residue control, environmental exposure risk for PPP and associated costs. The spray equipment is increasingly subject to legislation and minimal requirements. Though not always enforced at present, it is common sense to check compliance of any given equipment with both pending and enforced legislation. Key elements related to PPP and point source are the **total technical residual spray left in the sprayer** (= the fraction of spray liquid still in your sprayer at the point where you start to suck in air from the spray tank intake point) and how the sprayer can cope with this (sprayer cleaning protocol). **ASK YOUR SPRAYER DEALER to give info on non sprayable solution (TOTAL RESIDUAL VOLUME).** If you are in the process of buying a new sprayer, take this as a **decisive element in your final choice**. Other key points are: containment of spray tank liquid in case of emergency repairs, anti drip devices, safe and clean evacuation of spray left-overs, and ease of safe filter cleaning. The list is not exhaustive but already comprehensive enough to stress the major importance of it and the unique opportunity it offers to prevent problems popping up.

It also has a direct link to the next sub-process: the design of the sprayer loading facilities (**induction hopper or integrated rinse system in filling basket**) has a major impact on the loading and mixing protocol as well as on the container rinsing aspect.

This sub-process is a key one in the daily farm operation. In combination with the actions taken in the previous processes and sub-processes, most of the risk should be contained. It requires a lot of established and **routinely applied behavioural aspects**. It includes bringing out PPPs from the store, preparing the mixture and filling the sprayer with water and PPPs. However, routines can attract bad habits too, so use checklists regularly.

An adequate sprayer can only give its full benefit if properly **checked and calibrated**. Routine checking reduces the risk of problems and time loss while on the road. Proper calibration of a sprayer gives you the best guarantee of a proper spray job with minimal use of PPP evenly distributed over the treated area. It optimises the spray result and minimises exceeding maximum residue levels. Sprayer calibration is key to reduce localised under- or overdosing in the field, to minimise spray liquid leftovers or shortage events, and to not compromise the life time of your investment.

The mixing and loading areas should be equipped according to the risk level. Tendency should be to execute this activity at the lowest possible risk level. Performance of mixing and loading should meet the highest standards.

Last but not least is the **safe transport** of a vehicle loaded with dilute PPP from the loading site to the subsequent fields of application. Particular care must be taken when travelling close to or along sensitive areas such as hardened surfaces which link to areas of surface water via ditches etc.

Implementing appropriate measures is in the interest of the users, the industry and stakeholders alike.

Before spraying activities are key to:

- enhanced safety for operators and farm dwellers
- minimal effective use of PPP amounts
- optimised crop protection result
- minimal delays in spray operation
- reduced risk on in field local under- or overdosing
- reduced pollution risk in the process itself and in downstream processes
- reduced remnant disposal cost (investment, labour, cash)
- enhanced cross compliance & trade certification approval
- risk reduction in environmental & water contamination

Technical note: "The safe & sustainable use of Plant Protection Products: a TOPPs guide for planning" (to be developed)

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3010	planning	ALWAYS pre-plan and organise spraying activities	It includes both advance preparation and before treating a specific problem. It involves creating management plans for soil, energy, crops and integrated crop management, wildlife and landscape; preventing or minimizing pest problems and managing the risks among others. The complexity of this statement does not allow to reduce it in a few lines. A technical note is under preparation.		
3020	planning	USE appropriate nozzles for the intended application	Select and use a nozzle type and size that will meet the demands of the PPP, the pest, crop canopy, leaf surface requirements, the prevailing weather conditions, drift risks and any concerns for bystander exposure. The complexity of this statement does not allow to reduce it in a few lines. See also statement 4310:” Do not cause spray drift.”	4310	
3040	planning	DO identify location of all sensitive zones	Plan for the protection of wildlife and the environment. Make a survey of the farm environment and wildlife. Identify sensitive zones for water contamination and for key fauna and flora. Use topographical maps of your area if needed/ available to assist you. Develop protection measures and describe them in procedures for the operator / user of PPP.		
3050	planning	DO properly construct and cap wells	[1] Follow national regulations. [2] If other options are available, do drill new wells away from areas prone to flooding, natural sump areas and away from mixing & loading of PPP sites. Make sure spacing between borehole and casing, if used, is properly grouted. Cap wells to prevent outer contamination by direct or indirect (such as droplet drift) contamination. Preferably make well casings protrude above ground level (minimal 25 cm above final ground or pump house floor elevation and 50 cm above 100-year flood elevation). The complexity of this statement does not allow to reduce it in a few lines. [Ref = Adams E. and Hoffmann T., Abandoned Wells: Forgotten holes to Groundwater, EB1714, CE Publications]	3350	3350
3060	planning	DO properly cap abandoned wells	Uncapped, abandoned wells must be effectively sealed and capped since they are an easy route for any PPP that is being applied or has been applied in its vicinity to reach ground supplies of water. The complexity of this statement does not allow to reduce it in a few lines. A technical note is under preparation. If this can/could not be done, see 3350.	3350	

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3070	planning	DO NOT spray if ground is frozen or covered with snow.	Existing and predicted weather and ground conditions must be assessed for risk of PPP losses from the intended treatment zone. Check labels for any exceptions.		
3080	planning	NEVER spray water logged soil	See also during spraying, statement 4230 "DO NOT over spray water courses, wells, drains, springs and hard surfaces". Only specific PPP applications are exempt from this rule such as registered use against aquatic weeds & algae and authorized wet land rice applications.	4230	
3090	planning	DO NOT spray if heavy rain is forecast	DO NOT spray PPP if heavy rain is forecast; especially be aware of those areas prone to 'run-off' of PPP's into ground and surface water (due to steepness of ground, depth and composition of soils, soil cracking and the proximity of sensitive water areas). Always use label or expert advice for specific guidance on PPP use if an application is dependent on a narrow time window.		
3110	equipment	USE only CE labelled equipment and those fulfilling enforced harmonised EN standards	<u>New sprayers - and all branded equipment</u> used to apply PPP's - must conform and be maintained - to CE requirements. Application of relevant EN standards gives "presumption of conformity"; check availability of CE mark and signed declaration of conformity at purchase. Most relevant EN standards are EN 907; EN-ISO 4254-1:2006 and EN 12761. <u>Second hand sprayers</u> in use should conform with - whenever possible - the specifications of the above references and meet the minimal requirements of recognised inspection schemes. <u>Non branded equipment</u> , whether new or self made or modified, used to apply PPPs must be shown capable of compliance equivalent to that met by machinery manufacturers.		
3130	equipment	USE sprayers with nozzles fitted with anti drip devices.	Anti drip devices should stop liquid flow completely within 8 seconds after valves are switched off. Drips from individual nozzles shall not accumulate to more than 2 ml during 5 min (EN12761). This specification is used over EN 13790 (5 s after collapse of spray jet) to have a clear start & end point.		
3135	equipment	Nozzles MUST NEVER directly spray onto equipment*	* Except the sensors at the end of the boom. External disturbances or obstacles in spray patterns causing dripping or external contamination of the sprayer must be corrected before spraying.		

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3140	equipment	USE a sprayer which minimizes non sprayable solution	<p>Sprayers have a certain amount of liquid that cannot be sprayed out under normal working conditions due to technical limitations. This is called the volume of total residual or non-sprayable solution, part of which is dilutable part of which is non dilutable.</p> <p><i>New sprayers :</i> <u>For field crop sprayers and orchard sprayers</u> limits of residual volumes are specified in the European Norm EN-12761. <u>For knapsack sprayers</u> residual limits are specified in ISO19932</p> <p><i>For sprayers in use:</i> Farmers should consult their supplier of equipment to establish total residual volume (or total non sprayable solution).</p> <p>(See also statement 3160 "USE sprayers with spray rinse tanks")</p>	3160	5126
3160	equipment	USE sprayers with spray rinse tanks	<p><u>For new sprayers:</u> The spray rinse tank size should be capable of diluting any residual volume to a concentration equal to or below 1% of the applied field concentration, typically, to reach this dilution level, it requires at least 10 times the volume of the residual solution, which can be diluted. The manufacturer should supply the farmer with data on volumes of the non-sprayable solution and the means of achieving the greatest dilution rate with that sprayer. These practical rinsing protocols should be made available to the farmer. TOPPS recommends as a general rule three rinsing steps. <u>For sprayers in use</u> without a rinsing tank, reference is made to Statement "5140 – USE repeated rinse method" and the remnant disposal section.</p>	5140	3140
3170	equipment	USE sprayers with spray tanks guarded against accidental opening			
3180	equipment	USE sprayers that can collect liquid at the outlet without contamination	Operators, maintenance workers, equipment parts and the environment should not be contaminated when the sprayer is being emptied. Use properly labelled containers to collect all spray liquid and check the "remnant management section" for guidance on its safe use/disposal.		

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3210	inspection & calibration	ALWAYS verify and/or calibrate sprayer for optimised application of PPP	<p><u>Verification & calibration</u> of spray equipment is essential in preventing spray surplus or spray left over in the tank. It is also essential to achieve a good efficacy result. Equipment applying PPP's must be verified & calibrated [and adjusted if necessary] to apply the dose, water volume and drop size [spray quality] that is prescribed by the label, supporting literature and/or professional advice.</p> <p>Fulfil <u>calibration procedures</u> to define working parameters (nozzle types, pressure, driving speed) according to the desired spray volume and PPP dose. Calibration frequency is dependent on factors impacting on previous calibration (such as changing tyres, spray computer, nozzles, pressure gauge; maintenance, spray intensity among others). Verification should be done prior to each use to ensure proper functioning.</p> <p><u>General</u>: Limit spray swath to target area, select off centre nozzles at edge of swath if necessary; in case of sprayers with air support, adjust air volume and speed to canopy. Spraying or field conditions may require these settings to be modified before use - for example, to reduce drift - or during use - for example, swath width changes to meet buffer zone needs.</p>		3220 3225
3215	inspection & calibration	USE appropriate water carrier volume for the intended application	<p>Water volume is generally ruled by crop, application target, PPP, GAP and climate specific conditions to balance efficacy and environmental impact.</p> <p>In the higher volume range: optimise PPP retention on target surfaces by avoiding spray liquid run off. Minimize the volume of fine drops (lower than 100µ) produced to minimize the risk of outside contamination. Consult nozzle manufacturers / suppliers or their manuals if nozzles used are within the spray quality VF or "very fine".</p> <p>Do not exceed PPP concentrations beyond the label recommendations or in general by a factor of 10x, that is approved for normal use. Take into account the effect of increased spray concentration in your rinsing procedures. Always use expert advice if an application is required beyond these specified ranges. See also statement 3225.</p>	3225	3225

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3220	inspection & calibration	DO verify & calibrate sprayers with clean water	Verification & calibration of spray equipment is essential in preventing spray left over in the tank. Sprayers must be pre-calibrated with water. Use water without debris and other particles that could block nozzles and filters or could cause other malfunctions of your equipment. This water quality does not need to meet drinking water requirements but should not pose an operator exposure or environmental risk. Be aware that some spray solutions such as very viscous solutions might require slightly different operating settings compared to water.	3210	3225 3250
3225	inspection & calibration	USE data from calibration, label and intended treatment area(s) to calculate the total amount of PPP and water needed	No more than the maximum quantity of product required must be prepared. After selecting the spray water volume needed (stat 3215), the pre calibration with water (stat 3220) and the overall equipment verification & calibration (statement 3210) it is key to know in advance exactly what to prepare in the mixing and loading process for the area to be treated. This includes amount of carrier liquid and total amount of PPP to be used in the tank mix.	3210 3215 3220	3345
3230	inspection & calibration	ENSURE sprayer functions correctly after longer periods of non use of the equipment	Make a full examination of sprayer and then check with clean water - prior to loading with PPP - when ever it has not been used for 4 months or longer. Check for signs of deteriorating pipes, joints, and pressurised parts. Replace questionable parts at once.		4220
3245	inspection & calibration	USE inspected sprayers	Inspection - in the TOPPS context - is executed by a third party that may be, voluntary or mandatory; official or non official, but is properly recorded and documented. Inspection of sprayers is usually executed in line with EN 13790.		

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3250	inspection & calibration	PERFORM all calibration and maintenance activities away from wells, springs, drains and areas sensitive to water contamination	<p>Both for PR and remaining risk, verification & calibration activities while nozzles in operation is preferably executed away from sensitive areas for water, unless in category "low".</p> <p><u>In general:</u> Make sure proper cleaning protocols are applied prior to calibration activities, especially for nozzles. (see "After spraying" BMP statements especially 5110, 5115, 5130 & 5140). Apply statement 3220 "DO verify & calibrate sprayers with clean water". Prefer calibration of the sprayer over biological active ground such as grass covered or on bunded filling & cleaning place. Final verification using tank mixture, should be done in the field of application while driving (see statement 4250).</p> <p><u>Boom sprayers:</u> To avoid drift whilst calibrating, keep the boom at its lowest working position (generally 50 cm above ground or canopy level) when testing the sprayer and consider use of nozzles producing coarser sprays before any final adjustments.</p> <p><u>Orchard sprayers:</u> test hydraulic functions of the sprayer using the coarsest spray quality and without any air assistance.</p>	3220 4250 5110 5115 5130 5140	
3320	mixing & loading	DO NOT leave sprayers unattended when they are being filled.	Preferably use foam and liquid overfilling sensors and volumetric control devices for filling the sprayer.	3325	
3325	mixing & loading	DO NOT overfill - or let foam escape from - spray tank	<p>Have an easily readable and precise tank scale and monitor it during filling. Maximum volumes of spray liquid in the spray tank must not exceed limits defined by the equipment manufacturer. Maximum volumes [typically 110% of the rated capacity (EN 12761)] are critical to be respected to avoid any slops and foam overflow.</p> <p>Do not use tanks or other containers such as rinsing tanks that are not intended for that purpose to transport PPP's or their solutions. Always supervise tank contents when filling and consider use of tank fill alarms and/or monitors. Give special consideration not to overfill knapsack sprayers.</p>	3320	3405

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3330	mixing & loading	DO NOT leave prepared PPP solutions unattended	Sprayers being filled or containing undiluted/diluted PPP's must never be left unattended. Secure the work area and make the equipment safe from animals and unauthorised human access. Pay special attention to unauthorised access to the tank content and operating valves. In emergency cases, position the sprayer in a bunded area.		
3335	mixing & loading	PPPs - not in a secured container - must not be left unattended	PPPs must be taken - as required - from the store [fixed or mobile] for immediate use only. Unsecured PPPs must not be left unattended either in their containers, the application equipment or prepared for use, if their immediate filling is not possible.		3340
3340	mixing & loading	DO prepare spray solutions just prior to use	The less time between preparation and actual application, the less risk of changing circumstances preventing or hindering the application such as sudden rainfall events. See also statement 3335 " PPPs - not in a secured container - must not be left unattended". Avoid preparing spray solution if there is a risk due to nightfall. "Prior to use" can be: <u>[A] on the farm</u> : based on operator safety; poorly equipped sprayers for mixing & loading in the field; questionable transport conditions in some areas <u>[B] in the field</u> : based on erratic weather conditions; long transport distances from farm to field; properly equipped sprayer (see statements 3360, 3365 & 3370)	3335 3360 3365 3370	3345
3345	mixing & loading	DO minimize surplus spray solutions	Prepare just enough spray solution for the treatment area. Consider leaving untreated or under dosed areas just within the outer perimeter of the application zone, for sprayer cleaning purposes. See also statements: 3225 - "USE data from calibration, label and intended treatment area(s) to calculate the total amount of PPP and water needed" 3340 – "DO prepare spray solutions just prior to use"	3225 3340	6100

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3350	mixing & loading	DO NOT mix or load sprayer near a water course or well	<p>Or where precipitation may carry spills to such area</p> <p>[1] check label for any PPP specific or general legal distance requirements [2] check local legislation on site specific risk perimeters such as for drink water extraction points. [3] make a site specific local Risk Assessment including evaluation of well condition (see statement 3050), mixing & loading facilities & geological / pedological and geographical situation. Seek expert advice if needed. Document evaluation and act accordingly. [4] as a rule of thumb: <u>if banded</u>: minimum 4m away from sensitive zones for water TOPPS category "low" and 10 m TOPPS category "medium". 20m from sensitive zones for water TOPPS category "high"; (Check local regulations) <u>if unbanded</u>: minimum 20 m away from surface water, wells, drains and springs whilst working over biologically active soil. Not on very permeable soil or where there are shallow aquifers. Do not fill the sprayer on soils sensitive to erosion and/or slopes facing sensitive areas. <u>in the field</u>: same conditions as for "unbanded"</p> <p>Avoid these places for repairs en route (see statement 4220)</p>	3050 4220 3360	4220 3060 3351 4240 5110 5130 3360
3351	mixing & loading	DO NOT install new mixing & loading areas close to sensitive zones for water	See statement 3350 for specs.	3350 3360	
3355	mixing & loading	NEVER fill spray equipment directly from wells	<p>Supplying sprayers with water from wells or tap water must only be done using methods that will not contaminate such sources with PPPs. Use techniques that disconnect water supply from the spray solution being prepared:</p> <ul style="list-style-type: none"> - an intermediate water supply such as a bowser / nurse tank / mobile tank - Ensure an air gap between the filling hose and the solution being prepared. 		

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3356	mixing & loading	AVOID filling sprayers directly from water courses	<p>Supplying sprayers with water from wells or tap water must only be done using methods that will not contaminate such sources with PPP's.</p> <p>Assure back-siphoning is not possible. Never use the sprayers pump for filling. Use techniques that prevent PPP being drawn back such as:</p> <ul style="list-style-type: none"> - an intermediate water supply such as a bowser / nurse tank / mobile tank - Ensure an air gap between the filling hose and the solution being prepared. <p>Or other methods that will not contaminate such sources with PPP's.</p>		
3360	mixing & loading	DO prevent the loading area becoming contaminated.	<p>Use dedicated foil cutters to remove secondary seals. For further details on seal rinsing and disposal see also statement 3400. Use appropriate sized containers to reduce the need to measure quantities and prefer those with wide openings that avoid 'glugs' (45 or 63 mm).</p> <p><u>Loading area on the farm:</u> Ensure hard surfaces are bunded and impermeable. Collect waste water containing PPP for immediate use in spray operation or for further treatment and disposal. Never leave spills on the hard surface after mixing and loading. Purposely made, regulatory approved drive-over systems with a biologically active matrix can also be used for loading PPP's. Keep unauthorised persons such as children out of the area.</p> <p><u>Loading area in the field:</u> Use drip trays to catch spills. Special attention to catching any spillages must be taken when loading on highly permeable surfaces or sites near watercourses or surfaces that could drain to watercourses, storm or sewer drains.</p>	3400	3340
3365	mixing & loading	DO load, mix and clean containers from a stable and safe operating position.	<p>Load PPP's into the application equipment from a safe and stable operating position. Ensure operators do not have to climb or stretch to transport PPP containers from the (fixed or mobile) store to the application equipment. PPP loading systems must be within arms reach and at waist height such that the operator can discharge these PPPs safely - without leaks and splashes - from ground level. Raised working platforms must be equally safe for operators & without risk to the environment. USE non sloppy, non retaining steps and platform. USE drip trays and/or bunded areas where resultant liquid is retained for subsequent safe disposal / degradation</p>		3340

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3370	mixing & loading	DO load, mix and clean containers with dedicated equipments.	<p>Use low level induction bowls that avoid the need for operators to reach or climb onto the equipment. If container weight demands the use of lifting machines then these requirements may be described on the PPP label.</p> <p><u>Manufacturers</u> should provide practical use instructions and protocols to the farmer (in line with ISO/CD21278-1&2 in preparation by ISO/TC23/SC6).</p> <p><u>The farmer</u> should verify the performance visually during the mixing & loading process.</p>	3400	3340
3375	mixing & loading	DO NOT damage containers/packaging when opening	Use a dedicated knife to open bags and boxes carefully and avoid any uncontrolled release of PPPs; use special cap and seal openers. Use foil cutters to remove secondary seals. See also statement 3400 which covers seal disposal.	3400	
3385	mixing & loading	USE dedicated measuring devices when/if necessary.	If small amounts are needed then measuring equipment which is dedicated for this use must be used and immediately rinsed over the induction bowl or if no induction bowl, then rinse over the tank filling mesh/filter. Mark PPP implements.		
3390	mixing & loading	DO close containers and packages immediately after product use	Put partly used containers upright with closures sealed within their outer packages and in a stable position to avoid splashes and spills.		
3395	mixing & loading	DO avoid dust, splashes and spills of PPPs when loading.	Operate always upwind when dealing with powders and avoid loading of powders in windy conditions.		

MAIN PROCESS: Before spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
3400	mixing & loading	DO rinse emptied containers and seals immediately and add this rinsing liquid to spray solution.	<p>Emptied - small volume returnable - containers must be cleaned with clean water such that their condition complies with disposal requirements/schemes.</p> <p>[1] Use integrated pressure washers (at least 20 l of water) (see statement 3370 for required specs if combined with induction hopper). Manufacturers should guarantee < 0.1% of its rated content is retained within conditions of use for new systems or</p> <p>[2] <u>triple rinse each container with a manual wash</u> and return all rinsing to the sprayer for immediate use. Visually check that container is clean at end of operation.</p> <p>Check label whether certain hazard categories require specific rinsing procedures. Foil [secondary] seals - and caps if contacted with PPPs - must be rinsed. Seals to be placed within cleaned containers, caps replaced securely and the package returned upright into - where relevant - its outer box. Check the "Remnant disposal management" section for further disposal details. Emptied containers - with all associated packaging - must be returned to secure [mobile or fixed] store or directly to dedicated compound for subsequent collection and authorised disposal. Single trip packages should be made unsuitable for re-use</p>		3370 3375 1320
3405	mixing & loading	DO load PPP into main tank only when it is half filled with water (intended use amount).	<p>Follow label instructions for loading. Typically, PPPs must never be loaded into an empty spray tank. Do load when the main tank is at least half filled such that all undiluted PPP can be distributed effectively and safely to form a uniform mixture. Follow label advice on agitation levels, sequences to add mixtures and whether this solution has lower and upper time limits for use. Labels may advise specifically on the loading of WDG, powders and water soluble sachets. Avoid sedimentation of PPP in spray tank. See also statement 3325 on foaming and overfilling.</p>	3325	
3410	mixing & loading	USE only approved mixes of PPPs.	<p>Only use approved PPP mixes. Check label or use expert advice/recommendation and check compatibilities of any adjuvant or additive used. The use of non approved mixes can be illegal and could cause PPPs to react [chemically and/or physically] such that they cannot be applied safely. In addition, there is a increased risk of having to contain, manage and dispose of hazardous waste that is likely to be trapped within equipment due to sediments or blockages.</p>		

5. During Spraying

TOPPS guidelines are intended to be a generic and practical way to prevent water contamination by PPP from point sources. They are an expert view on best practices taking into consideration technical limitations. It is not the intention to overrule any local legislation; on the contrary, importance of local legislation is stressed. Guidelines should be dynamic, and particularly with regard to waste management regulation, regular updating on state of the art and legal situation is recommended.

Main Process: During Spraying

Sub processes involved:

- **General:** Refers to “common sense” during spray operation: Applies good application practice and observes and responds to critical situations which may jeopardize the spray result itself, endangering personal safety and causing environmental concerns.
- **Direct contamination:** The spraying itself is mainly related to diffuse sources. However in this context, unauthorized spraying over wells and drains and direct spraying into water or onto hard surfaces is regarded as a point source. Only specific PPP applications are exempt from this general rule: registered use against aquatic weeds, algae and in wet land rice for example.
- **Drift & run off:** Typically diffuse pollution sources. In some cases the boundary line is not so sharp, such as spraying on water logged or snow covered land.

OVERALL principle(s):

ENSURE the safety of operators’ and bystanders
CHECK & RESPOND to spills & leakages at once
NEVER spray directly over wells, into water or onto hard surfaces
AVOID drift
RESPECT buffer zones

AVOID spray operation if soil or weather conditions are favourable for point source pollution (such as water logged & snow covered)

General

If the “before spraying” process is properly executed, the spray activity itself should not impose a major risk on point source contamination anymore. Good spray application practice aims at optimal biological efficacy and minimal environmental and human exposure. It is a trade-off between various elements such as:

- Economic damage thresholds (monitoring, warning systems)
- IPM and anti-resistance management
- Environmental risk assessment (geographic location and temporal)
- Optimal biological timing and sequencing of PPP application (pest - crop interaction)
- Optimal climatic timing (PPP specific or general requirements)
- Adequate PPP choice and dosing
- Pre-harvest intervals & re-entrance rules

Given this multi-factorial setting, common sense laid down in good application practice is ruling the spray process. Merging the strongly reinforced legal use of the PPP with the crop and climate specific good application aspect should adequately handle risks associated to the spray application process.

The spray application process remains a mechanical and technology driven process. Hence the operator should be knowledgeable about the spray application process and remain vigilant during operation. Older or intensively used (without appropriate maintenance) sprayers will trigger a higher risk of in field problems, unless carefully maintained.

Direct contamination is mainly associated with poor application practice such as unauthorized direct spraying into open water bodies and over wells. As a general rule it is also recommended not to spray onto fields at times of snow cover, frozen or water logged conditions..

Droplet and vapour drift are typical examples of diffuse sources. Drift can be a major water pollution risk in water rich orchard or vine growing areas. It is important that droplet drift is a very visible aspect of the spray process in general and the water pollution risk in particular. Run off can be minimised in the “before spraying” planning operation such as ploughing along the contours and employing vegetated buffer strips. Spray quality also affects outside sprayer contamination level. In general the finer the spray the higher the outside contamination. Hence the higher the risk for point source contamination if not properly managed.

Implementing appropriate measures is in the interest of users, industry and stakeholders alike.

During spraying activities the following elements are key to:

- enhanced safety for operators and bystanders
- minimal effective use of PPP amounts
- optimised crop protection result
- reduced risk on in-field local under- or overdosing: heterogeneous spray application in the field caused by the sprayer, will be reflected in heterogeneous deposit on the crop
- reduced pollution risk in the process itself and with regard to diffuse source pollution
- enhanced cross compliance & trade certification approval
- risk reduction in environmental & water contamination

Technical note: nozzle technology

MAIN PROCESS: During spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
4220	direct contamination	DO rectify/adjust any equipment problem at once	<p>Stop spraying and rectify problem if the equipment presents any hazard such as leaking hoses or blocked/dripping nozzles. Repair and rectify any fault taking care to wear the appropriate protective clothing and containing all spills. Follow machinery manufacturers guidance.</p> <p>Respect buffer zones and all environmentally sensitive areas. If unsure then consider advice in statement “3350 – DO NOT mix or load sprayer near a water course or well” can be used as guidance for repairs en route but should not cause delay in repair.</p> <p>See also statement 3230 to prevent problems occurring.</p>	3230 3350	3670 4240
4230	direct contamination	DO NOT over spray water courses, wells, drains, springs and hard surfaces.	Adjust spray swath. Close nozzles and/or sections on the boom according to situation. Only specific PPP applications are exempt from this general rule such as registered use against aquatic weeds & algae and authorized wet land rice applications. Respect also bufferzones if needed.		3080 3680
4240	direct contamination	DO avoid contamination of soil around well heads.	<p>Respect bufferzones or non spray areas around wells if established. Check for local regulation or BMP. Prefer medium to coarse spray quality and take into account wind speed and direction. Avoid any situation with a loaded sprayer standing stationary next to a sensitive water zone over a prolonged period. Check for label specific requirements. Apply safety distances such that PPP deposits do not become a contaminant of (drinking) water.</p> <p>Apply in specific statements 3350 – DO NOT mix or load sprayer near a water course or well 4220 – DO adjust any equipment problem at once 4250 – DO NOT spray PPP mixture when the sprayer is stationary</p> <p>Check that wells and boreholes are capped and their structural condition is safe.</p>	3350 4220 4250	

MAIN PROCESS: During spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
4250	direct contamination	DO NOT spray when the sprayer is stationary	<p>Spraying PPPs when the sprayer is stationary - for example, when priming hoses and booms - will exceed approved doses and increase risk of (ground)water contamination.</p> <p>(1) Use recirculating systems for priming or</p> <p>(2) prime in the field of application while driving, accept that there will be some underdosed area at 'start up' and use that for spraying internal cleaning liquid at end of operation, respecting maximum allowed dose.</p>		3250 4240 5130
4310	drift	DO NOT cause spray drift	<p>Do not cause spray drift. Check local regulation and label for PPP specific requirements.</p> <p>Always use equipment - within the scope of label recommendations - that is capable of minimizing spray drift.</p> <p>Check the weather conditions before chemical application.</p> <p>Adjust spray quality to temperature and wind conditions (coarser spray quality for higher wind velocities and temperatures).</p> <p>Avoid spraying when turbulent uplifting air movement will occur such as on hot wind still summer afternoons. If possible delay spraying to the cooler evenings.</p> <p>Always use expert advice on PPP behaviour if an application is required beyond these specified ranges.</p> <p>Adapt spray parameters if needed such as lowering the boom height, spray pressure and driving speed and for orchard sprayers reduce air support. See also statement 4330</p>	4330	3020
4320	drift	DO NOT over spray buffer zones	<p>Use of PPPs may not be permitted in - or adjacent to - areas that are sensitive for either environmental, public safety or water purity reasons. 'Sensitive' zones may therefore be adjacent to protected flora and fauna, schools and hospitals, surface water, wells and springs.</p> <p>Authorities have identified and defined, when and how PPPs may be used when considering the need to protect such areas and people. PPP labels and expert advice must be followed. Buffer zones or water courses must never be intentionally, accidentally or otherwise over sprayed. If in any doubt then leave minimum of unsprayed areas of 2 m for boom sprayers and 5 m widths for air assisted bush & tree crop sprayers from all surface water, springs, wells, boreholes, herb plantations, and other sensitive areas.</p>		

MAIN PROCESS: During spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
4430	run off	DO avoid applications of PPP if there is a risk of loss to drainage systems.			
4445	run off	DO NOT cause spray run off	Do not produce run off of pesticides from target areas which can be caused by use of too coarse droplets, over spraying or too high volume rates, too little distance between nozzle and target area.		

6. After Spraying

TOPPS guidelines are intended to be a generic and practical way to prevent water contamination by PPP from point sources. They are an expert view on best practices taking into consideration technical limitations. It is not the intention to overrule any local legislation; on the contrary, importance of local legislation is stressed. Guidelines should be dynamic, and particularly with regard to waste management regulation, regular updating on state of the art and legal situation is recommended.

Main Process: After Spraying

Sub processes involved:

- Cleaning sprayers: Both internal and external cleaning of the spray equipment, in the field, or on the farm, are included. It is a key element in point source contamination.
- Records: If appropriate and needed, keep records of all spraying (required under cross compliance)
- Storage & maintenance: These items are grouped since sprayer storage and regular maintenance of sprayer is often undertaken in the same place. Both activities are also linked to preparation for storage of sprayers (if required in appropriate climatic & storing conditions).

OVERALL principle(s):

ENSURE internal & external cleaning is remote or isolated from sensitive areas
USE multiple rinse methodology
NEVER expose sensitive water areas to spray liquid residuals
STORE & MAINTAIN sprayer in safe area for humans & environment

General

THE main point in the after-spraying process is the management of the PPP fraction left at the end of the spray process. This includes:

- Inside sprayer
 - spray left-overs (surplus spray liquid)
 - non-sprayable solution (total residual volume (both non- and dilutable fraction))
 - pockets of PPP deposits in the “empty” spray tank
 - deposits of PPPs on filter meshing
- Outside sprayer
 - external sprayer contamination due to drift etc

The amount of remnant left is strongly linked to the level of implementation of source solutions (see “before spraying” section). A high level of implementation will greatly reduce workload and costs in this and the next section.

The spray surplus problem should only occur occasionally, due to unforeseeable events. If not, action should be taken to detect the problem and to adjust the sprayer settings if needed.

Another effective way in preventing point sources is to keep the amount of non-sprayable solution minimal. This fraction is typically linked to the sprayer construction and to the boom length. It should be kept to a minimum but minimal without affecting the even distribution profile of the nozzles due to drop in pressure at the end of the boom sections. **ASK YOUR SPRAYER DEALER to provide you with info on the non-sprayable solution (TOTAL RESIDUAL VOLUME) of your sprayer.** (If you are in the process of buying a new sprayer (see before spraying section), take this as a decisive element in your final choice). The non-sprayable solution will give you an indication on how much rinsing water you will require to avoid crop damage from one spray activity to the next.

Do not allow **pockets of PPPs to accumulate in your spray tank**. Spray tank should be designed for optimised mixing of PPP. Also in this case, proper sprayer selection is key. In addition to that, proper mixing and loading procedures should routinely be applied to avoid incomplete and insufficient stirring. The problem can be alleviated by installing spray tank rinsing nozzles.

Changes in PPP formulations, mainly for reasons of reduced operator exposure, and nozzle use, puts more constraints on proper mixing and loading of agrochemicals into the sprayer (see “before spraying, mixing & loading”). Both the order of mixing and method of mixing play an important role. Inadequate mixing and loading often results in **excessive spray deposits on the filter mesh**.



Regular cleaning of filters should take care of that problem. Ensure that self cleaning filters should not re-introduce new point source issues.

The outside contamination of the sprayer is often linked to sprayer design and concept. As a general rule, air assisted sprayers have a higher level of outside contamination. This is also valid for air-assisted boom sprayers due to increased outer surface area close to the nozzles. The closer to the nozzles, the higher the contamination level. PPPs are often designed to stick on plant surfaces and will stick on sprayers too. **The less time between end of spray operation and outside decontamination, the more effective the cleaning operation will be.** Or stated differently: the less water will be needed for the same level of decontamination.

Record keeping might be a memory aid or a legal requirement as well.

Regular maintenance and correct storage will prolong the life of your equipment and will enhance the reliability of the spray operation. It is important however to avoid secondary risks associated to these activities.

Implementing appropriate measures is in the interest of users, industry and stakeholders alike.

After spraying activities are key to:

- enhanced safety for operators and farm dwellers
- reduced risk of crop damage due to carry over effects
- reduced risk of PPP residue on the crop
- prolong equipment life
- enhance operational reliability
- dramatically reduce point source problem

Technical note:

- ***Extended Cleaning Protocols (under development)***

MAIN PROCESS: After spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
5110	cleaning sprayers	DO clean sprayer externally	<p>Not removing external deposits quickly and effectively may result in high localised contamination in their stored vicinity, may damage/weaken the equipment and could be a hazard to humans. Most important parts are the sprayer boom, the construction parts around the nozzles, the fan & air guidance structures (if applicable) and the wheels. External deposits on the sprayer and the tractor will accumulate with time, by use of finer sprays and also with raised boom heights and stickier ground conditions. It is good practice to remove these deposits in the last field of use at the end of the working day and before travelling on any public roads by cleaning with a spray lance and clean water</p> <p>The frequency of external sprayer cleaning depends on the external contamination generated. This depends on:</p> <ul style="list-style-type: none"> - The spray frequency and spray peak periods - the crops - the PPP used - storage facility of the sprayer (open air, bunded, under cover) - spray quality of the nozzles used - sprayer type (with or without air assistance) <p>generally:</p> <ul style="list-style-type: none"> - according to label specifications if mentioned - at the end of each spray peak - at the end of the spraying day when a long period of non-use is anticipated - according to user needs <p>[1] <u>Cleaning area in the field</u>: If the sprayer is equipped with "in-field" cleaning device, clean in the field of use. Plan suitable cleaning sites in advance following similar scheme as in statement 3350 – "DO NOT mix or load sprayer near a water course or well". Do not repeat the cleaning activity always on the same location. Special attention to catching any spillages should be taken when cleaning on highly permeable surfaces or sites near watercourses or where surface water will directly drain to watercourses, storm or sewer drains. Follow manufacturers instructions, label guidance and that of any cleaning products used. Use personal protective equipment if manual cleaning tools like pressure gun is used.</p> <p>[2] <u>Cleaning area on the farm</u>: ensure hard surfaces are bunded and impermeable; collect PPP containing waste water for immediate use in spray operation or for further treatment; avoid leaving spills on the hard surface after cleaning.</p> <p>Purposely made, regulatory approved drive-over systems with a biologically active matrix can also be used for washing. Keep unauthorised persons such as children out of the area.</p>	3350	3250 5126

MAIN PROCESS: After spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
5115	cleaning sprayers	DO use remaining tank solutions (= surplus or spray left over)	<p>[A] Where possible, use any left over spray tank solution up within the just treated area - using a zone that has not been sprayed, or is under dosed respecting during spraying statements and specs. Plan such a zone in advance. Do not use the same area as that used previously.</p> <p>In case of changed spray parameters, avoid high volume rates to avoid wash off, of the previously sprayed PPP</p> <p>[B] For considerable left overs beyond over spraying capacity, reuse, remnant solution preferably within 24 hours. Follow manufacturers instructions and label guidance:</p> <p>[1] leave excess spray liquid in the sprayer tank after the spray treatment has been finished, if PPP left over night in spray tank does not pose a risk on clogging of nozzles and filters or other spray operation problems.</p> <p>[2] store left overs in secured dedicated containers per crop on the farm.</p> <p>Cleaning activities must not cause PPPs to be applied - or lost to - areas for which they are not approved or at localised dose rates that exceed the permitted maximum.</p>		3250 5125 5151
5125	cleaning sprayers	DO internal cleaning as appropriate	<p>Excess internal cleaning of the sprayer may cause excessive waste water volumes; lack of cleaning might cause equipment failure, nozzle blocking, other malfunctioning and localised residual problems. Organise your overall farm spray scheme to keep sprayer cleaning to a minimum to minimize the volume of PPP contaminated remnant water. Follow manufacturers and PPP label for instructions on how to clean. See also statement 5140 – “USE repeated rinsing method” on specifications how to clean.</p> <p>Internal cleaning must be done</p> <ul style="list-style-type: none"> - when switching between various crops and/or if PPP used in previous crop is (1) not registered in the crop to be sprayed; (2) if it imposes a risk on crop damage - if PPP solution left over night in spray tank poses a risk on clogging of nozzles and filters or other spray operation problems.(see also stat 5115) <p>Always clean the sprayer at the end of the last spray operation if long periods of inactivity are planned / expected.</p>	5140 5115	5126

MAIN PROCESS: After spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
5126	cleaning sprayers	DO use minimum necessary amount of rinse water	<p>Excessive cleaning and poor cleaning protocols might result in high amounts of remnant water (see statements 5110 – “DO clean sprayer externally”, 5125 – “DO internal cleaning as appropriate”).</p> <p><u>For internal cleaning:</u> limitation should be done by selecting a sprayer with minimal non-sprayable solution (statement 3140) NOT by adopting poor rinsing procedures.</p> <p><u>For external cleaning:</u> Prefer coarse nozzles during spraying. A pressure gun generally gives a better result than brushes. Avoid removing grease from hinch points or nipples during hosing down.</p> <p><u>For internal & external cleaning:</u> Use approved and / or recommended biodegradable cleaning agents to facilitate cleaning.</p>	3140 5110 5125	
5130	cleaning sprayers	NEVER clean a sprayer near surface water	<p>Cleaning area should be planned in advance.</p> <p>In field spraying of diluted rinse fractions should follow “during spraying” BMP recommendations, with special reference to statement 4250 – “DO NOT spray PPP mixture when the sprayer is stationary”. External and stationary cleaning should follow specifications given in statement 3350 – “DO NOT mix or load sprayer near a water course or well”. Spraying the diluted fractions while stationary is not advised on a banded place. If done, coarsest nozzles, preferentially liquid fertilizer nozzles should be used.</p>	4250 3350	3250
5140	cleaning sprayers	USE repeated rinsing method	<p>Repeated rinsing with low volumes of water is a more effective rinse technique than one single high volume rinse; Use <u>at least</u> triple rinse method.</p> <p>An <u>example</u> of such an effective rinse protocol:</p> <ol style="list-style-type: none"> 1 – Do spray to the pump unprime 2 – Do dilute the residual spray solution with at least 5x the volume of this residue, with clear water 3 – Make this diluted residue circulate in all the system (incorporation, timing system, tank back, pump back, mixing system) in order to dilute all the dead volumes. 5 – Do spray in the field the diluted solution to pump unprime (avoiding to surpass allowed dosage) 6 – Repeat the operation; two or more times as required 7 – Clean the filters 8 – Drain the final diluted tank bottom RESPECTING REGULATION or reuse it for the next spraying operations 		3160 3250 5125 5151

MAIN PROCESS: After spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
5150	cleaning sprayers	DO NOT drain the spray liquid remnant on the ground or any other area	<p>Keep away from all sensitive zones for water. Never drain for surplus or left over spray solutions. Never drain on hard surfaces unless banded.</p> <p><u>in the field:</u> [1] If dilutable residual spray is effectively rinsed under approved rinse protocols, draining tank bottom of final rinse solution while driving might in some areas be supported. [2] Draining the last rinsate in the tank bottom while sprayer is stationary, is only allowed if tank concentration is diluted at least 1/100 and at 50 m distance from water. Rinse protocol followed should indicate that this can be achieved in a practical way.</p>		
5151	storage & maintenance	USE diluted spray liquid remnants	<p>Use of "spray surplus" or "spray left over" is specified in statement 5115. Use of spray liquid remnant generated in a rinsing protocol (statement 5140) <u>in the field of application</u> should be carefully planned not to exceed maximum registered doses. Use of spray liquid remnant after collection and /or treatment on the farm is specified in statement 6460 – "DO reuse diluted liquid disposable fractions"</p> <p>CHECK PPP label for product specific instructions.</p>	5115 5140 6460	
5155	cleaning sprayers	DO direct rinse water to closed system if in-field cleaning is not possible.	<p>If in-field decontamination is not possible, decontaminate at a site that ensures all rinse water is directed to a remnant collection and/or treatment system. Further handling of these remnants are explained in process 6000 - "Remnant Management".</p>		
5320	storage & maintenance	DO store sprayer securely at specified location	<p>Sprayers not being used must be securely located and not present hazards to humans, animals or the environment; Store cleaned sprayers securely under cover, protected from frost damage and away from children, human and animal food; if in open air: on hardened banded surface or secured area. On the filling area, rain water should be separated from contaminated rinsing water. Storage of a sprayer on a filling area that collects all the rain will cause access water, which needs to be treated, (by PPP collection or treatment system),</p>		

MAIN PROCESS: After spraying					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
5330	storage & maintenance	DO ensure no spray liquid can escape during repairs (including emergency repairs).	<p>Check - at purchase - if new sprayers offer the necessary technical means (References: EN13790; EN12761; ISO 4245-6.2) to support safe emergency procedures. For example, when main filters unexpectedly block, it should be possible to shut down suction and other lines coming from/going to the spray tank and clean filter without loss of any spray solution.</p> <p>Do avoid to make repairs in the field but operate in the farmyard, in a properly equipped area. Drain your sprayer (filter and pump) before repair and do it on a secured area or take precautionary measures.</p>		

7. Remnant Management

TOPPS guidelines are intended to be a generic and practical way to prevent water contamination by PPP from point sources. They are an expert view on best practices taking into consideration technical limitations. It is not the intention to overrule any local legislation; on the contrary, importance of local legislation is stressed. Guidelines should be dynamic, and particularly with regard to waste management regulation, regular updating on state of the art and legal situation is recommended.

Main Process: Remnant Management

Sub processes involved:

- Prevention: not repeated in this main process. It is linked to all previous processes and statements.
- Surplus or obsolete stock = original or close to packing concentration, liquid or solid depending on formulation, mainly in original packaging but occasionally with uncertainty in some case such as label loss.
- Container disposal (single trip or reusable): everything that relates to the packaging of PPPs
- Liquid disposable fraction: diluted PPPs, normally of imprecise or unknown concentration
- Solid disposable fraction

OVERALL principle(s):

**AVOID WASTE
COMPLY with local legislation**

General

Remnant disposal and waste management is a general topic, not exclusively linked to agriculture. Hence, legislation is often generic and not strictly targeted on PPP remnant disposal and waste. Waste is extensively regulated all over the EU, either at EU, at Member State (MS) or at regional level (for example “regions” in Belgium, or “Länder” in Germany). There are some generic principles linked to waste:

- **the polluter pays**
- Take necessary precautions to avoid problems from the start
- **do not displace** the problem from one environmental compartment to another
- **prefer source solutions** over and above the end-of pipe solutions

Implementing appropriate measures is in the interest of users, industry and stakeholders alike.

Proper remnant disposal management has many benefits:

- enhanced safety for operator and those living around the farm
- enhanced marketing options for some retail schemes
- reduced pollution risk and reduced assurance fees
- reduced cost for waste disposal
- Reduced risk of prosecution and fines from regulators/enforcers
- Continued sustainable use of essential PPP use in IPM schemes and in anti resistance management schemes
- dramatic reduction in water contamination

Background

Inadequate PPP remnant disposal management is a cause of water contamination with PPPs. Therefore, this section is closely linked to ALL previous processes: the overall remnant disposal and waste management principle is to **NOT PRODUCE WASTE**. And that starts right from the planning phase and is a common theme throughout.

If in any given step remnants are produced, they should, as far as possible be legally reused at once for the intended process. Intermediate storage should be minimised and replaced by recycling. The recycling option is not included here, since it remains part of the operational processes before, during and after spraying.

Despite all precautions some remnants (**solid and/or liquid disposable fractions**) will sometimes be produced as a result of the farming activity. It is important to find appropriate and efficient solutions at affordable cost to manage these remnants and reach the preset goal of maintaining water quality standards.

It will however be difficult to totally exclude the occurrence of PPP waste. In these cases and in many countries there are already structured schemes to discard this type of waste in a secure way at affordable cost, for example through the collection of single trip PPP **packaging material** and obsolete stock after registration withdrawal from the market.

End – of – pipe solutions

Various solutions exist, reflecting the huge difference in potential remnant fractions produced and the acceptance by authorities of the different proposed solutions. Most of these end-of- pipe solutions are rather technical.

Generally these are also rather expensive solutions in comparison with source solutions.

Some examples (but not exhaustive) include:

- Physico-chemical clean up (Sentinel, Zamatec, Funds, ...)
- Bioremediation such as biobed (un-lined, semi-permeable with clay liner, impermeable liner), biofilter, phytoremediation
- Reverse osmosis
- Photocatalysis (Ahlström)
- Electrolytic breakdown

Typically these eventually result in a disposable liquid fraction and / or solid fraction. Depending on environmental legislation and source, either fraction may be considered as re-usable raw material on the farm. If reusable, re-use should not re-introduce a new problem. If re-use is not possible it should be treated as hazardous waste.

Be aware that transport of hazardous waste on public roads is strictly regulated in most countries and only allowed by authorised waste disposal contractors.

MAIN PROCESS: Remnant					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
6100	prevention	PREVENT remnants and waste	<p>Minimize all remnants and wastes associated with PPPs and their use. This should be reflected in all other processes major ones include:</p> <p>2520 – DO store only enough PPP for current uses</p> <p>3010 – ALWAYS pre-plan and organise spraying activities</p> <p>3140 – USE a sprayer which minimizes non sprayable solution</p> <p>3225 – USE data from calibration, label and intended treatment area(s) to calculate the total amount of PPP and water needed</p> <p>3345 – DO minimize surplus spray solutions</p> <p>3410 – Use only approved mixes of PPPs</p> <p>5110 – DO clean sprayer externally</p> <p>5115 – DO use remaining tank solutions (= surplus or spray left over)</p>	2520 3010 3140 3225 3345 3410 5110 5115	
6210	container disposal	READ label instruction concerning package disposal	All PPP containers and their packaging must be disposed in a safe and legal way. Check the PPP label requirements and note that the legal requirements differ for different member states. Be aware also that there may be a time delay between labelling of the PPP container and its use during which, disposal requirements may have changed.		2540
6240	container disposal	NEVER burn or bury hazardous waste	As a general rule contaminated packaging material should NOT be burned or buried. See statement 6210 – “READ label instruction concerning package disposal” for specific cases.	6210	
6310	unwanted stocks	ENSURE PPP included in a withdrawal procedure are preferentially included in your spray scheme	Make sure that PPP affected by a pending registration withdrawal, are preferentially included in your spray scheme to avoid any left overs after the application deadline.		
6320	unwanted stocks	STORE unwanted stock in an identified, secured and sheltered designated area.	Storing waste may be subjected to specific local legislation. If allowed to store PPP disposables in your storage room, provide a clearly labelled and designated area in your PPP storage facility and indicate such as "Non usable phytosanitary products for destruction". Alternatively, a sheltered and designated area nearby such as a bunded lockable metal cage under a roof may be used. Waste storage might also be subject to a limited time frame and a quantity limitation. Segregate the products at once if specific disposal requirements are enforced such as those demanded for very toxic or toxic product containing containers.		

MAIN PROCESS: Remnant					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
6330	unwanted stocks	DISPOSE unwanted stocks of PPP in a legal way	PPP distributors/dealers may take back unused products with complete and up-to-date labels. Contact your dealer, the manufacturers representative, or your countries Crop Protection Association for advice. Consider whether near by farmers /growers may take these PPPs if they still grow crops for which the product is approved. Alternatively, use authorised PPP disposal contractors, Environment Agencies may require consignment note and payment of fee.		
6350	unwanted stocks	NEVER put concentrated PPP in sink, drain or any water body.	Sinks and drains have direct or indirect connection with surface water. It is not only an illegal disposal practice, it also contributes to unnecessary and unacceptable environmental exposure. Comply with Best Practices on prevention and unwanted stocks.		
6355	unwanted stocks	NEVER dump concentrated PPP on or bury in the soil.	Burying and dumping can pose a serious short and long term risk. It is not only an illegal disposal practice, it also contributes to unnecessary and unacceptable environmental exposure. Comply with Best Practices on prevention and unwanted stocks.		
6430	liquid disposables	DO store liquid disposable fractions safely before re-use, disposal or treatment	PPP solutions of unknown content and concentration such as on farm collected PPP containing liquids originating from the drain of the PPP storage room, can be collected for [1] on farm re-use, [2] treatment or [3] collection by an authorised waste disposal contractor. Preferentially retain PPP containing liquid disposables in above ground, bunded containers. Tanks should have double walls if put underground. In the case of slurry tanks, where permitted, use only for minor spills ensuring subsequently dilution to a level beyond that of biological effect and in field diluted spray remnants. Liability remains with the farmer.		
6450	liquid disposables	NEVER dump diluted PPP containing liquid directly, or indirectly via drains, in any water body	This holds for both surface and ground water.		

MAIN PROCESS: Remnant					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
6460	liquid disposables	DO re-use diluted liquid disposable fractions	<p>Liquid disposable fractions are those that could not be avoided in any of the previous main processes and are no longer linked to a specific spray application.</p> <p>If legally supported, diluted liquid disposable fractions can be reused directly in various processes <u>under specific conditions</u>. Such as</p> <p>(1) re-use liquid fraction as carrier liquid for non foliar applications such as drip irrigation / feed (fertigation) or herbicide spraying under orchard trees</p> <p>(2) re-use as carrier water for total herbicide applications in pre-crop-applications</p> <p>(3) re-use along with spreading of slurry (on own farm land and only according to local spreading legislation).</p> <p><u>Conditions:</u> Do not re-use in areas prone to flooding (10 year event), water extraction areas, wells, sloping area towards surface water, erosion sensitive soils. Application should not have any unwanted biological effect for any given crop. If application technology is spraying, respect general spraying practices (BMP before, during and after spraying). The transfer from wash down to storage tank should not generate any risk and the storage tank should be labelled. Plan in advance. Ensure records of quantity and site are kept. Reuse at farmers responsibility.</p>		5151
6510	solid disposables	DISPOSE solid disposables in a legal way	<p>Solid disposables can be generated as a result of processing diluted liquids containing PPP or as a result of cleaning up spills by solid absorbents.</p> <p>Processing diluted PPP containing liquids by means of separation technology eg physico-chemical processes (results in a reduced volume but increased concentration of chemicals in a solid residual fraction), filtering processes, incomplete mineralization.</p> <p>Containment of spills is explained in statement 2630 – “DO retain and safely dispose all spills immediately”</p> <p>- <u>Biodegradable fractions</u> (such as sawdust for cleaning up spills or organic leftover from biopurification systems) can be contained for further microbial breakdown of the contaminants. Prefer re-use if authorised.</p> <p>- <u>NON biodegradable fractions</u> (such as sand) must be collected by authorised waste disposal and recycling contractors.</p>	2630	

MAIN PROCESS: Remnant					
N°	Sub-process	Statement	Specifications	Ref. to	Ref. by
6550	solid disposables	DO recycle solid disposable fractions after treatment	<p>Solid disposable fractions are those that could not be avoided in any of the previous main processes, are a result of spillage management with biodegradable material or liquid/solid conversion treatments. Solid disposable fractions can be reduced or recycled by various means if legally supported. CHECK prior to any investment in treatment systems the legal situation on disposal of the solid disposable fraction.</p> <p>RECYCLING AFTER (BIO)DEGRADATION: conditions same as for direct recycling* except for total residual limitations of sprayer. Recycling is not allowed in case of accidents or emergencies affecting the (bio)degradation process, including oil spillage. (Bio)degradation should be executed banded and under cover in a safe way not imposing new risks. Total initial PPP load during its life time should not exceed specifications so as to meet PPP levels below any crop damage at outlet so that leachate can be reused. Under no conditions this leachate can be drained direct in any open water body. Biodegradation time should be in relation to historical load and at least one year in confined conditions and used according to manufacturers specifications.</p>		
6560	solid disposables	NON biodegraded or recycled solid fractions SHOULD be disposed of as hazardous waste	<p>OTHER CASES: Solid fraction should be treated as hazardous waste. Please look for expert advice in your region to meet specifications of hazardous waste that can be incinerated with energy recuperation. If not it should be disposed off at an official waste site.</p>		

* Definition see Glossary.

III. Glossary

A

ADR = (see also “EU legislation”). The European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) was done at Geneva on 30 September 1957 under the auspices of the United Nations Economic Commission for Europe, and it entered into force on 29 January 1968.

a.i. = active ingredient

B

Bund = Capable of retaining spills and leaks.

C

CE – mark = CE-mark (Conformité Européenne, European Conformity): The CE-label refers to the safety of the product. It indicates that the product marked with this label complies with essential mandatory European health & safety requirements; it does however not refer to quality standards. To get the CE –mark, a product needs to undergo either auto-certification processes, or safety assessments performed by third parties called “Notified Bodies” or “Competent Bodies”. Without the CE label, a product may not be placed on the European market (including Norway, Iceland and Liechtenstein, usually referred to as the European Economical Area EEA) (see also “standards”, and “EU Directives”)

The CE mark is a mandatory European marking for certain product groups to indicate conformity with the essential health and safety requirements set out in European Directives. The letters 'CE' are an abbreviation of “Conformité Européenne”, (European conformity). The CE mark must be affixed to a product if it falls under the scope of the approx. 20 so called 'New Approach' Directives. Without the CE marking, and thus without complying with the provisions of the Directives, the product may not be placed in the market or put into service in the member states of the European Union and Norway, Iceland and Liechtenstein (EEA, European Economical Area). However, if the product meets the provisions of the applicable European Directives, and the CE mark is affixed to a product, these countries may not prohibit, restrict or impede the placing in the market or putting into service of the product. Thus, CE marking can be regarded as the products trade passport for Europe. It generally does not include detailed technical specifications to comply with. These are included in harmonised standards (CEN, CENELEC & ETSI). If no harmonised standards exist, the producer or importer can use national standards. If there are no standards for a specific product, the producer should apply his own interpretation of the minimal requirements. Use of standards is voluntary.

The CE mark is not a quality-mark or a warranty label. First, it refers to the safety rather than to the quality of a product. Second, most quality markings are voluntary opposite to the CE marking, which is mandatory for the products it applies to. CE indicates conformity with mandatory European safety requirements. European conformity is certified by clear and understandable procedures, the so-called ‘conformity assessment procedures’. Depending on the product group, there are different certification schemes ranging from auto certification to assessment performed/verified by a third party. This third party is referred to as 'Notified Body', or 'Competent Body'.

Calibration = “Calibration” in preparing a spray application is often used as a synonym for “Adjustment”: making or becoming suitable; adjusting to circumstances; the act of adjusting something to match a standard; the process of adapting to something (such as environmental conditions). Calibration = valid for nozzle-output. This confusion might be language dependant. In some cases both calibration and adjustment might be involved. This should end in a “TEST” a “VALIDATION”, “VERIFICATION”. Three steps : inspection, calibration, testing or verification.

In terms of standards calibration is defined as : “The process of determining the performance parameters of an artifact, instrument, or system by comparing it with measurement standards. A calibration assures that a device or system will produce results which meet or exceed some defined criteria with a specified degree of confidence. Two

important measurement concepts related to calibration are precision and accuracy. Precision refers to the minimum discernible change in the parameter being measured, while accuracy refers to the actual amount of error that exists in a calibration

CEN = Comité Européen de Normalisation – European Committee for Standardization. (See also “standards”)

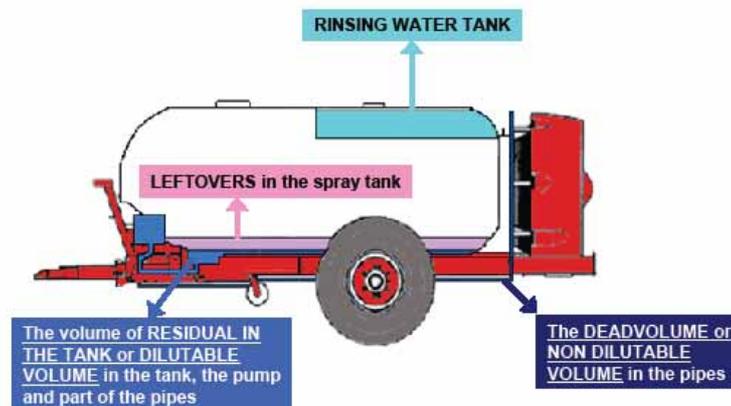
Change level = refers in the TOPPS context to three aspects of change management: *behaviour*, *technology* and *infrastructure*. Behaviour is a (n) (change of) attitude. Technology refers to changes in equipment with a typical depreciation time of maximum 10 years such as spray equipment and add-ons. Infrastructure refers to major investments and can be regarded as the “concrete” part of it such as store facilities, combined mixing & loading sites. It typically includes non mobile structures with depreciation times beyond 10 years.

Check = Make sure of something by examining or investigating it. Examine something in order to make sure that it is correct, safe, satisfactory or in good condition.

Clean water tank = (see “tanks on sprayer”)

D

Dead volume (non dilutable volume) = Part of the total residual volume that can not flow back to the tank during normal operation of the sprayer. (Definition given by ISO 13440:1996(E)). The part of the residual volume that can not be circulated when the hydraulic system is operational. (= typically spray boom lines and its feeder lines if no recirculation system is supplied) (also commonly called “non dilutable volume” or “non dilutable residual”).



Diffuse source = In the context of TOPPS this is mainly related to undesired movement of PPPs in soil, water or air following application on crops and within areas agreed for use according to approved label recommendations.

Examples of diffuse sources may include leaching, drainage, soil erosion and/or run off, following approved field application, due to exceptional weather conditions (see also “Point Source”)

Dilutable residual spray = (also commonly called “dilutable volume”) see “volume of residual in the tank”

Directly fill sprayer from....= To avoid any contamination of any water source it is necessary to cut all direct connection between the water supply and the spray solution, when filling the sprayer.

Direct recycling = undiluted or diluted spray solution, which was not processed in a cleaning treatment system.

E

EEA = European Economical Area

EN = see CEN

EU = European Union

EU Directive: A EU Directive is the establishment of laws, regulations and administrative provisions by the European Union. It covers all Member States of the EU and is binding in its goals, in the content to achieve. It gives the Member States however freedom in HOW to achieve the goals, the so called principle of subsidiarity. This takes into account the natural and socio-economic differences between the regions of the Union. It means that for many directives local, regional or national variation in implementation might occur and member states might add insofar as those differences do not detract from the Directives' framework.

EQS = Environmental Quality Standards, PPP standards in surface water, under debate within the Water Framework Directive and daughter directives, or set at national member state level. Means the concentration of a particular pollutant or group of pollutants in water, sediment or biota which should not be exceeded in order to protect human health and the environment (article 2 of Water Framework Directive).

F

Formulation = The form in which a PPP is sold for use. A mixture of active ingredients with one or more other materials such as carriers and diluents to make it safe to store, dilute and apply. Only those formulations mentioned in the BMP are included in this glossary. For a full list, one is referred to "GCPF Codes - **GIFAP** Technical Monograph No 2, 1989"

G

GAP = Good Agricultural Practices

H

Hand wash tanks = see "Tanks on sprayer"

Hazard classification symbols



I

Inspection = inspection in the TOPPS context is a third party action, voluntary or mandatory; official or non official, but properly recorded and documented. Inspection of sprayers is usually executed in line with EN 13790.

IPM = Integrated Pest Management

ISO = International Organisation for Standardisation (see also “standards”)

J
K
L

Left over = see “spray left over”

Life = Launched in 1992, LIFE (The Financial Instrument for the Environment) is one of the spearheads of Community environment policy. LIFE co-finances environmental initiatives in the European Union and certain third countries bordering on the Mediterranean and the Baltic Sea, and in those EU candidate countries that have decided to participate. To read full details of the history of environmental funding in the EU and further background details about the LIFE programme, <http://ec.europa.eu/environment/life/life/index.htm>

Liquid disposable fractions = PPP solutions with uncertain PPP content and concentration such as on farm collected PPP containing liquids originating from the drain of the PPP storage room.

M

Main process = In the context of TOPPS 6 main critical steps in the use of PPP were identified. These six main processes include “Transport”; “Storage”; “Before spraying”; “During spraying”; “After spraying” and “Remnant disposal management”. Each main process is subdivided in various sub-processes. Statements can be linked to several main processes (see “statement”).

MS = member state of the EU

MSDS = Material Safety Data Sheet

Multiple rinse methodology = If one has a certain quantity of water to rinse a container or tank, the rinsing result will greatly improve if the total amount is fractionated and each fraction used to execute a full rinsing protocol. This is called multiple rinsing.

Example: Triple rinsing means that the total available water is split into three equal fractions. The first fraction is used to apply the rinsing procedure and the container emptied. This procedure is repeated for the second and third fraction. If one has 9 litre of water to rinse a 20 litre PPP container, one rinses the container with 3 litre and pour that in the spray tank and repeat this action 2 times with 3 litre water for each step. The rinsing result will be superior over a single rinse of the container with 9 litre of water.

MUST = Topps statement ranking category, see “statement”

N

Non-dilutable residual volume = (see “dead volume”); non dilutable volume.

Non-sprayable solution = farmer oriented wording for the ISO definition “Total residual volume” which may be more understandable for the farmer.

Not for TOPPS = Topps statement ranking category, see “statement”. The link with water contamination is very weak. Some statements will have strong links with critical control points on other issues such as safety or diffuse sources.



**O
P**

Planning = setting of your mind

Planning & documentation = behaviour & traceable documentation

PPE = Personal Protective Equipment

PPP = plant protection product. This relates to agricultural use. It does not include biocides, though many specific guidelines may remain valid.

PPP formulations = see “Formulation”

Point Source = In the context of TOPPS, includes any spills of concentrated or diluted PPP during transport, storage, filling, spraying, cleaning management of residual spray and maintenance. In particular it includes use or handling in areas not covered by approved label recommendations for spraying or guidance/codes of practice for correct filling, cleaning or disposal.

Furthermore, it also includes uncontrolled release of excessive amount of PPP during treatment (overdosing). Excessive can be in relation to the amount of PPP per unit of area or in relation to the concentration.

(Large scale spills are usually linked to accidents in production plants and distribution centres of PPPs, however these are very rare. On the other hand spills on the farm are more common and may easily impair drinking water resources. A 4 kg spill into a river flowing at 40m³/s (rather important) river can produce a peak of 10 times the drinking water standard.)

Examples of point sources may include spillage of concentrated or dilute spray from container at any time such as while mixing, from inversion of empty containers, from sprayer washings or during remnant disposal or due to poor sprayer/nozzle maintenance, which can also lead to overdosing. Poor field practice eg over-spraying ditches, non compliance with buffer zones to reduce unwanted spray drift, spraying when stationary or when turning causing overdosing, or even poor planning of spray operations leading to tractors driving over sprayed areas before leaving the field and then contaminating road eg via mud on the wheels.

**Q
R**

Ranking of Statements = see “statement”

Remnant = refers to remaining PPP. This can include empty containers, unwanted stock, the surplus and the residual spray after a spray operation and PPP containing liquids or solids as a result of clean up operations such as spills or bio-clean up installations.

Residual spray = (see “volume of total residual”; “non-sprayable solution”)

Non-dilutable residual spray: (see “dead volume”)

Dilutable residual spray: (see also “volume of residual in the tank”)

Rinsing tank = (see “Tanks on Sprayer”)

S

Sensitive zone = the definition of sensitive zones is linked to the TOPPS guidance. The MS approach might override, differ or have numerous variations in classification. It serves the purpose of making the TOPPS specifications coherent.

For water (specifically):

High: (1) Unprotected wells & boreholes; shallow aquifers with overlaying permeable soil; zones around wells for drinking water extraction & supply; (2) surface water bodies upstream and close to drinking water abstraction points including land prone to flooding (<=5y frequency), drains, steep slopes or hard sloping surfaces with direct hydraulic connection towards these surface water bodies.



Medium:(1) Naturally protected wells, springs & boreholes (such as forest); shallow aquifers with overlaying semi-permeable soil; zones around wells & springs; (2) surface water bodies (excluding farm owned isolated ponds for on farm use (fertigation/ irrigation, frost protection)) including land prone to flooding (<=10y frequency), drains, steep slopes or sloping hard surfaces with direct hydraulic connection towards these surface water bodies.

Low: (1) Protected wells & boreholes (such as man made enclosed concrete structure); shallow aquifers with overlaying impermeable soil (typically heavy soil); (2) all other areas with no direct connection towards high or medium sensitive zones. E.g. ditches typically dry in the spray season.

Following topics are not elaborated in the TOPPS context:

For humans and animals

For nature (in general)

Solid disposable fractions = Solid PPP fractions with uncertain PPP content and concentration such as on farm collected PPP containing sawdust originating from the cleaning of spills.

Specifications = clear advice on how to avoid point source problems. Specifications are risk-based and should therefore be tiered, i.e. the higher the risk, the more stringent they should be (see also “sensitive zones”).

Spills = Small spillages of concentrated PPP. Major PPP spillages originating from emergencies such as fire or major load loss during transport is not referred to in spill management.

Spray leftovers = Spray surplus = the fraction of spray liquid in the spray tank that can still be sprayed out in the range of nominal sprayer operating settings at the point where the spray operation is finished. The spray leftovers has a known concentration.

Spray quality = refers to the droplet size spectrum produced by agricultural nozzles. It is an important characteristic of a given nozzle type & size – pressure combination that gives the user an indication on application efficacy and off site spray drift potential. Nozzle categorisation is often a relative ranking based on comparison with a reference nozzle due to the differences in absolute measurements as a result of the various droplet sizing instruments (see also “standards” – “other standards”)

Classification category	Symbol	Colour Code
Very Fine	VF	Red
Fine	F	Orange
Medium	M	Yellow
Coarse	C	Blue
Very coarse	VC	Green
Extremely coarse	XC	White

Spray tank = see “Tanks on sprayer”

Stakeholder = An individual or group with an interest in the success of an organisation in delivering intended results and maintaining the viability of the organisation’s products and services. Stakeholders influence program, products and services.

Stakeholders are an integral part of the TOPPS project. They are the end-users or clients, the people from whom requirements will be drawn, the people who will influence the design and, ultimately, the people who will reap the benefits of the completed project.

The involvement of the stakeholders is extremely important in all phases of the TOPPS project for two reasons: Firstly, experience shows that their involvement in the project significantly increases chances of success by building in a self-correcting feedback loop; Secondly, involving them in the project builds confidence in the deliverables and will greatly ease its acceptance in the target audience.



Standard = A standard is a homologated or registered guideline based on mutual agreement among states and/or international organisations. Among EU Member States it is referred to as “EN”. A standard is in most cases NOT legally binding. A “directive” (see *EU directive*) specifies the aimed result in rather general terms and this is binding. The link between “EU directives” and some harmonised “EU standards” is indirect. Application of EN standards gives presumption of conformity. This means that if equipment fulfils certain standards EU presumes that this is in conformity with the legal requirements on the included aspects.

BSI (<http://www.iso-standards-international.com/what.htm>) describes a standard as "a published specification that establishes a common language, and contains a technical specification or other precise criteria and is designed to be used consistently, as a rule, a guideline, or a definition". By defining common requirements, standards enable a common basis of understanding to exist between different parties. This in turn promotes both efficiency and reliability. In many scenarios it can bring major competitive edge and advantage to businesses. Further, according to ISO, standards "contribute to making life simpler, and to increasing the reliability and effectiveness of the goods and services we use". See also “CEN” and “ISO”.

Statement = within the TOPPS vocabulary description of a critical control point related to point source contamination. The relation might be very strong or secondary such as general safety issues. There is no numerical descriptor used. (see also “specifications”).

Within the Best Management Practice development, a relative ranking was developed based on an expert scoring. The ranking was done in 4 categories:

MUST = the critical control point includes a very crucial risk factor. Good Practice is key to have major impact or achieve sustainable improvement.

Major = the statement includes an important potential risk on water pollution by PPP.

Minor = there is still a link with water contamination risk, but it is generally not considered as a main threat to water quality. Therefore, these minor statements are not included in this document.

Not for TOPPS = the link with water contamination is very weak. Some statements will have strong links with critical control points on other issues such as safety or diffuse sources.

Statements in English are grouped around a limited number of key words or actions expressing already some inherent ranking.

key word	explanation
SHOULD	strongly recommended (might be law in some MS / regions)
AVOID	related to SHOULD in a negative sence
USE	strong recommendation though not necessarily law in all MS, related to technology
BUY/PURCHASE	entails most often generic technological or infrastructural aspects, it does not promote individual or company specific solutions
CHECK	Behavioural attitude to control certain key points for good working
ENSURE	To make certain before proceeding
IN CASE OF	emergency strategy
MUST	imperative to avoid acute problems or major emergency, expected to be law in most MS
DO	related to MUST, but slightly less pressing
NEVER	related to MUST in a negative sense
DO NOT	related to NEVER, but slightly less pressing
KEEP	a kind of DO statement
PROTECT	a kind of DO statement
PROVIDE	a kind of DO statement

T

Tanks on the sprayer:

Spray tank: the tank containing the diluted spray mixture (carrier liquid, PPP(s), additives)

Rinsing tank: the tank containing clean water, usually connected with the hydraulic system of the pump to clean the internal tank surface, to dilute the total or dilutable residual spray and also to supply the external sprayer cleaning device with clean water



Hand wash tank: separate tank, preferably away from spray solution emitting nozzles and over the induction bowl. For sanitary and hygienic purposes.

TOPPS = “Train the Operators to Prevent Pollution from Point Sources”, A three year programme initiated end 2005 by industry with the co-funding from the European Commission DG Environment life programme, to tackle the issue of point source contamination with PPPs. (www.topps-life.org)

Total residual spray = see “volume of total residual”

Tremcards = Transport emergency Cards

U

Under dosed area = if the spraying process is started without priming the sprayer, a certain area will be under dosed, because not all nozzles are fed completely. This area could be used to spray out diluted spray liquid after the rinsing process.

V

Verification = Visual check by the farmer/operator.

Volume of total residual = “volume of the spray mixture remaining in the sprayer which cannot be delivered with the intended application rate and/or pressure, equal to the sum of the volume of residual tank and dead volume” (definition given by ISO 13440:1996(E)). (= the fraction of spray liquid still in the sprayer at the point where air starts to be sucked from the spray tank intake point). Volume of remnant in the tank (dilutable volume)+ Dead volume (non dilutable residual volume) (also commonly called “residual spray”)

Volume of residual in the tank (dilutable residual volume) = Part of the total residual that remains in the tank or that can flow back to the tank during normal sprayer operation (definition given by ISO 13440:1996(E))

W

WG = wettable granule (see “formulations”) A preparation granule consisting of granules to be applied after disintegration and dispersion in water.

X

Y

Z

Other

0,1 µg / l = the current EU legal limit of concentration for a single PPP for treated drinking water at the tap. This is equivalent to one part per ten billion (1 in 10 000 000 000).

Examples:

- = 4 mm on the total equator length of 40 000 km (www.phytopfar.be)
- = 1 heart-beat in 317 years (www.phytopfar.be)
- = 1 g in 10 000 000 litre water (www.phytopfar.be)
- = 1 cent in 100.000.000 EUR



IV . Bibliography & Reference list

EU regulation

Water :

2000/60/EC « Water Framework Directive » :

98/83/EC “Tap Water Directive” (no longer in force = Council Directive 80/778/EEC of 15 July 1980
relating to the quality of water intended for human consumption)

75/440/EEC (Council Directive) of 16 June 1975 concerning the quality required of surface water
intended for the abstraction of drinking water in the Member States.

Safety:

94/55/EC “ADR Framework Directive”, The European Agreement concerning the International
Carriage of Dangerous Goods by Road (ADR, the French abbreviation of “Accord Européen
au transport international des marchandises Dangereuses par Route.) was done at Geneva
on 30 September 1957 under the auspices of the United Nations Economic Commission for
Europe, and it entered into force on 29 January 1968. The Agreement itself was amended by
the Protocol amending article 14 (3) done at New York on 21 August 1975, which entered into
force on 19 April 1985.

Related: Approved Vehicle Requirements [AVR]/Approved Tank requirements [ATR]

PPP:

91/414/EEC “The Authorisations Directive”, The Plant Protection Products Directive,

Various

98/37/EC: “Machinery directive” Directive 98/37/EC of the European Parliament and of the Council of
22 June 1998 on the approximation of the laws of the Member States relating to machinery

Standards

EN – standards (most relevant)

**EN 13790-1 : Agricultural machinery-Sprayers- Inspection of sprayers in use- Part1: Field crop
sprayers**

**EN 13790-2: Agricultural machinery-Sprayers- Inspection of sprayers in use- Part2: Air-assisted
sprayers for bush and tree crops**

EN 907: Agricultural and forestry machinery- Sprayers and liquid fertilizer distributors- Safety

**EN 12761-1: Agricultural and forestry machinery- Sprayers and liquid fertilizer distributors-
environmental protection-Part1: General**

**EN 12761-2: Agricultural and forestry machinery- Sprayers and liquid fertilizer distributors-
environmental protection-Part2: Field crop sprayers**

**EN 12761-3: Agricultural and forestry machinery- Sprayers and liquid fertilizer distributors-
environmental protection-Part3: Air-assisted sprayers for bush and tree crops**

EN/ISO 4254-6rev: Agricultural and forestry machinery-Sprayers and liquid fertilizer



ISO - standards

- ISO 19932-1: Equipment for crop protection-Knapsack sprayers- Part 1: Requirements and test methods
- ISO 22368-1: Crop protection equipment-Test methods for the evaluation of cleaning systems- Part1: Internal cleaning of complete sprayers
- ISO 22368-2: Crop protection equipment-Test methods for the evaluation of cleaning systems- Part2: External cleaning of sprayers
- ISO 22368-3: Crop protection equipment- Test methods for the evaluation of cleaning systems- Part3: Internal cleaning of tank
- ISO/DIS 4254-6: Tractors and machinery for agriculture and forestry- Technical means for ensuring safety- part6: equipment for crop protection.
- ISO 22866: equipment for crop protection- Methods for field measurement of spray drift
- ISO 5682/2: Equipment for crop protection_spraying equipment- Part2: Test methods for agricultural sprayers
- ISO 22369-1.3: Crop protection equipment- Drift classification of spraying equipment. Part1: Classification
- ISO/DIS 9898: Equipment for crop protection- Test method for air assisted sprayers- Air flow rate and power required.
- ISO 13440: Equipment for crop protection-Agricultural sprayers-Determination of the volume of total residual
- ISO 10625:1996: Equipment for crop protection – Sprayer nozzles - colour coding for identification

Other standards (most relevant ones)

ASAE S572 august 99: Spray nozzle classification by Droplet Spectra (USA)

Doble, S.J.; Matthews G.A. ; Rutherford, I; Southcombe E.S.E. A system for classifying hydraulic nozzles and other atomisers into categories of spray quality. Proceedings British Crop Protection Conference – Weeds pp 1125 – 1133 (BCPC nozzle classification (UK))

GCPF Codes - **GIFAP** Technical Monograph No 2, 1989