Application of plant protection products

Operator and worker safety, spray application sheets, sprayer management and cleaning

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18/11/2025

WHAT I WILL COVER

- Operator safety
- Worker safety
- Spray application sheets
- Sprayer management and cleaning
- Summary

Operator safety

Hazardous substances

- Looks at Personal Protective Equipment (PPE)
- Approvals often contain **standard phrases** for the approved situation
- Refers to two separate activities – **mixing/handling concentrate** and **application**
- Unless otherwise specified/instructed by the company. Relevant to managers as well as operators:

1. Refer to **label approval** (MAPP №)
2. Refer to **EAMU approval** for MAPP № and **situation** (XXXX-XXXX)
3. **Method of application** – label first then EAMU
4. **COSHH Assessment** (latest up to date version) – can overrule all the above if engineering controls or other mitigation measures provide equal to or higher protection than those state on the label or the approvals

Operator safety

PPE - coveralls

- ✓ Often a balance of more than one type
- ✓ Type 5/6 is the most common
- ✓ Disposable but not single use
- ✓ Categories

Type	Standard(s)	Typical Materials & Construction	Use Cases	Pros	Cons
Type 1 (Gas-tight)	EN 943-1	Fully sealed one-piece, welded seams, airtight closures	High hazard chemical plants, spill response	Highest barrier protection	Expensive, heavy, heat stress
Type 2 (Non gas-tight)	EN 943	Less stringent sealing, some ventilation	Chemical environments without full gas risk	Good chemical protection	Less protective than Type 1
Type 3 (Liquid-jet-tight)	EN 14605	Taped/welded seams, sealed connections	High-pressure liquid chemical exposure	Strong liquid protection	Costly, less comfortable
Type 4 (Liquid-spray-tight)	EN 14605	Spray-resistant fabric/seams	Chemical spray/ mist areas	Balanced protection vs cost	Not for high-pressure jets
Type 5 (Solid-particle)	EN ISO 13982-1	Non-woven/ microporous, dust barrier	Asbestos, fibers, pharmaceuticals	Lightweight, good for particles	Limited liquid protection
Type 6 (Limited splash)	EN 13034	Light liquid splash barrier	Low-risk chemical splash	Cost-effective, light	Limited protection

Operator safety

PPE - coveralls

Table of Protective Clothing CE Types

Chemical Protection

The pictogram for chemical protective clothing. Legally required on all CE certified clothing

Type 1	Type 3	Type 4	Type 5	Type 6
				
EN 943-1&2	EN 14605	EN 14605	EN 13982	EN 14605
Gas & Vapour Protection	Liquid Jet-Spray Protection	Liquid Spray Protection	Dry Particle Protection	Liquid Aerosol Protection

The above pictograms, whilst not required in any standard have become accepted by convention to denote the individual protective clothing types

7 TYVEK TYPE 5 & 6 COVERALLS

DESCRIPTION:

Tyvek Type 5 & 6 coveralls are manufactured from breathable liquid resistant Dupont material. The material allows the skin to breathe whilst resisting the penetration of many different non-hazardous liquids and particles. Typical applications include laboratory, clean room, pharmaceutical, food processing, forensic science, medical and paint spray.

FEATURES:

- Type 5 & 6 Certified Category III
- Anti-Static to EN 1149-5
- Barrier to Radioactive Particles - Class 1
- Barrier to Infectious Agents - EN 14126
- Self-Adhesive Storm Flap Over Zip

SUITABLE APPLICATIONS:

- Pharmaceutical
- Laboratory
- Cleanroom
- Forensic Science
- Medical

SERGED SEAMS:

A serged seam joins two pieces of material with a thread that interlocks. This is an economical stitching method for general applications. This stitching method is generally used for chemicals protective clothing. It is more commonly found on disposable clothing where dry particulates are a concern.

Size	Chest (cm)	Height (cm)
S	84-92	164-170
M	92-100	170-176
L	100-108	176-182
XL	108-116	182-188
XXL	116-124	188-194
XXXL	124-132	194-200

Operator safety

Gloves

- ✓ EN374
- ✓ Type A
- ✓ Same categories
- ✓ Gloves within overall sleeves not outside sleeves

EN 374 Protective Gloves Against Dangerous Chemicals

In each case, the chemicals tested will be stated under the fuming conical flask pictogram using their code letter, as listed in the official list of test chemicals.

If other chemicals, not present in the list, have also been tested information about the performance levels will be provided in the user instructions.

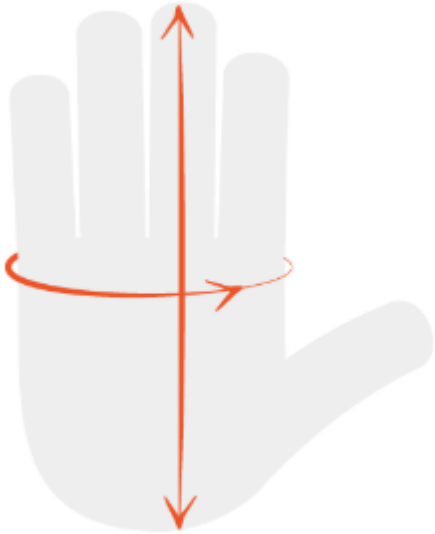
MICRO ORGANISM HAZARDS EN374

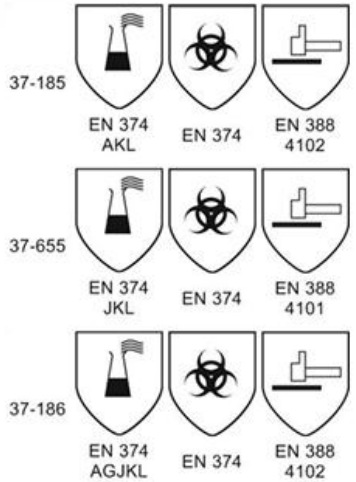
Operator safety

Gloves

- ✓ Size and length of glove
- ✓ Standards for other purposes
- ✓ Not disposable
- ✓ Can be costly

- **BS EN 388:2016+A1:2018**
  Protective gloves against mechanical risks
- **BS EN ISO 374-1:2016+A1:2018**
  Protective gloves against dangerous chemicals and micro-organisms
- **BS EN 407:2020**
  Protective gloves and other hand protective equipments against thermal risks (heat and/or fire)
- **BS EN 12477:2001**
  Protective gloves for welders
- **BS EN 511:2006**
  Protective gloves against cold
- **BS EN ISO 10819:2013+A2:2022**
  Mechanical vibration and shock - Hand-arm vibration
- **BS EN 421:2010**
  Protection from ionising radiation and radioactive contamination
- **EN 16350**
  Protective gloves with electrostatic properties
- **EN 60903**
  Gloves of insulating material for live working
- **BS EN 1186**
  Materials and articles in contact with foodstuffs





CATEGORY III

Operator safety

Footwear

- ✓ Classified in two classes
- ✓ S4 or S5 most suitable
- ✓ Crucial during handling the concentrate
- ✓ Look for ergonomic rating and lightweight
- ✓ Care and maintenance is very important

BS EN ISO 20345: Personal protective equipment - Safety Footwear

CLASS I FOOTWEAR: **Footwear made from leather and other materials excluding all-rubber or all-polymeric footwear**	
S1	Safety basic + Closed seat region + Antistatic + Energy absorption of the seat region + Fuel oil resistant outsoles
S2	As S1 plus: Water resistance of the upper
S3	As S2 plus: Penetration resistance of the outsole + Cleated outsoles

CLASS II FOOTWEAR: **All-rubber (i.e. entirely vulcanized) or all-polymeric (i.e. entirely moulded) footwear**	
S4	Safety Basic + Closed seat region + Antistatic properties + Energy absorption of seat region + Resistance to fuel oil
S5	As S4, plus: Penetration resistance + Cleated outsole

Operator safety

Footwear

- ✓ Steel toe cap is desirable
- ✓ Easily washed off and visually checked
- ✓ Durable
- ✓ Slip rating desirable
- ✓ Coveralls over the boot, not in the boot!

Operator safety

Respiratory Protective Equipment (RPE)

- ✓ Lots of confusion around RPE
- ✓ Often seen as need for extra precaution
- ✓ Objective is to stop inhaling the pesticide fume, mist fluid etc
- ✓ Many of the bioprotectant products also require this during application
- ✓ Perception of nursery staff

SAFETY PRECAUTIONS

Operator Protection

Engineering control of operator exposure must be used where reasonably practicable in addition to the following personal protective equipment:

WEAR SUITABLE PROTECTIVE GLOVES when handling the concentrate.

WEAR SUITABLE PROTECTIVE GLOVES when applying by broadcast air-assisted equipment.

However, engineering controls may replace personal protective equipment if a COSHH assessment shows they provide an equal or higher standard of protection.

WASH HANDS AND EXPOSED SKIN before meals and after use.

(2) Vehicle mounted or trailed horizontal or vertical boom sprayers must only be used where the operator's normal working position is within a closed cab with a suitable in-cab filtration system* or suitable respiratory protective equipment** must be worn during application in protected situations. *Closed cabin meeting at least EN 15695 category 3. **Disposable filtering facepiece respirator to at least EN149 FFP3 or equivalent.

Operator safety

Respiratory Protective Equipment (RPE)

Table 2 RPE types

Adequacy/suitability	**Respirators**						
RPE type							
	Disposable half mask – particle filter*	**Reusable half mask – particle filter**	**Reusable half mask – gas/ vapour filter**	**Full face mask – particle filter**	**Full face mask – gas/vapour filter**	**Powered mask**	**Powered hoods/helmets**
Effective for particles	✔	✔	✘	✔	✘	✔ **	✔ **
Effective for gas/vapour	✘	✘	✔	✘	✔	✔ **	✔ **
Continuous wear time	Less than 1 hr	Less than 1 hr	Less than 1 hr	Less than 1 hr	Less than 1 hr	More than 1 hr	More than 1 hr
APF4 types	✔	✔	✘	✔	✘	✘	✘
APF10 types	✔	✔	✔	✔	✘	✔	✔
APF20 types	✔	✔	✘	✘	✔	✔	✔
APF40 types	✘	✘	✘	✔	✘	✔	✔
APF200 types	✘	✘	✘	✘	✘	✘	✘
APF2000 types	✘	✘	✘	✘	✘	✘	✘
Page reference	29	30	31	32	33	34	35

* Sometimes referred to as a filtering facepiece or orinasal respirator.

** Only protects against particle or gas/vapour when the appropriate filter is fitted.

Operator safety

Respiratory Protective Equipment (RPE)

- ✓ This is the minimum requirement on most approvals where RPE is stated
- ✓ Lower cost but few uses – 1-5 times max
- ✓ Longevity of spray job and environment is important
- ✓ More comfortable than half or full mask
- ✓ Low or no maintenance required
- ✓ Fit test REQUIRED (especially with facial hair)

Figure 8 Disposable half mask respirators

Classification of RPE	Protection factor
FFP1	4
FFP2	10
FFP3	20

Work rate	Medium (all classes)	
Continuous wear time	Less than 1 hour	
Effective against	Solid or liquid particles	
Fit testing required	Yes	
Fit testing options	**Qualitative**	**Quantitative**
	✔	✔
Applicable standards	BS EN 149	

Important information, which applies to all these types.

Dispose of masks marked NR (not reusable) after a single shift (8 hours).
P1 and P2 filters are not recommended for fumes unless stated. (See general dos and don'ts Tables 4–6.)

Operator safety

Respiratory Protective Equipment (RPE)

Filter Guidance (for gases & vapours)

Filter markings explained for combination filters

For particulate filters, P2 & P3 indicate the level of filter protection, whereby the higher the number, the higher level of protection, but for gas filters, 1 & 2 refers to the duration the filter will last: 1 = standard and 2 = extended duration.

Depending on the area of application and the length of time workers are required to wear RPE will determine the most appropriate filter.

Did you know that a gas filter continues to absorb the hazardous substances from the air even if it is not in use? Correctly storing your RPE and filters in a sealed container is important to ensure the maximum usage from your filters.

Below are just some examples of combination filters available:

Combination Filters	Particulates	Organic Substances	In-organic Substances	Acid Gases	Ammonia & Amines	Low Boiling Organic Substances	Mercury
	P3	A	B	E	K	AX	Hg
A2P3	•	•					
A2AX		•				•	
ABE1P3	•	•	•	•			
AE1HgP3	•	•		•			•
A1BE2K1P3	•	•	•	•	•		
A1BE2K1HgP3	•	•	•	•	•		•

Operator safety

Respiratory Protective Equipment (RPE)

Operator safety

Eye protection

OPTICAL CLASS

There are three different types of optical class, each level detailing how often the glasses should be used. The three levels are

- Class 1: Permanent wear (distortion free)
- Class 2: Occasional wear
- Class 3: Brief wear

STRENGTH RATING

The strength rating describes at which point the glasses will break upon impact and an additional rating regarding how the glasses relate to temperature.

- S: Minimal impact resistance - Impact with a small object travelling at 12 meters per second
- F: Low energy impact - Impact with a small object travelling at 45 meters per second
- B: Medium energy impact - Impact with a small object travelling at 120 meters per second
- A: High energy impact - Impact with a small object travelling at 190 meters per second
- T: Impact test at extreme temperatures - -5°C/ +55°C (optional)

Operator safety

Eye protection – EN166

CHEMICAL RISKS

- 3: Liquid splash protection
- 3: Liquid droplet protection
- 4: Resistance to large dust particles over 5 microns
- 5: Resistance to gases and dust particles under 5 microns

ELECTRICAL RISKS

- 8: Resistance to short circuit ARCs

THERMAL RISKS

- 9: Resistance to molten metal splashes and hot solids projections

LENS TREATMENTS

- K: Resistance to damage by small particles (anti-scratch)
- N: Resistance to fogging (anti-fog)

These four categories are not mandatory, and will only appear if relevant to the goggles. Any other number or code which follows or precedes these will relate to a different standard.

Operator safety

Eye protection – EN166

EN 166:2001 1F
EN 170:2002

EN 166:2001 1AT 389
EN 170

Operator safety

PPE storage

- Storage usually in an upright metal locker with shelves, but it could be a dedicated secure area with hooks on walls, to store PPE and allow it to dry
- Need to separate PPE from everyday work wear
- Need to avoid cross contamination of PPE. Any deposits on overalls must not be allowed to contaminate PPE stored directly below (e.g. insides of footwear, gloves or even respirators)
- Segregate respirators from other clothing to avoid contaminating the inside of them
- Don’t store PPE with application equipment or PPPs

Operator safety

PPE disposal

- DO NOT
  - ☒ Burn used PPE
  - ☒ Throw PPE in normal rubbish bins
  - ☒ Wash PPE where runoff can enter drains or water courses
  - ☒ Reuse disposable PPE

PPE Type	Action
Reusable gloves, boots, visors	Wash and reuse if safe
Disposable gloves, coveralls, masks	Hazardous waste – bag & store for collection
Damaged or heavily contaminated PPE	Hazardous waste – do not reuse

- DO
  - Check if PPE is reusable or disposable.
  - Wash reusable PPE (gloves, boots, goggles) with detergent and water if only lightly contaminated.
  - Treat wash water as pesticide waste – dispose via biobed, biofilter, or lined area (never down drains).
  - Store contaminated PPE in a clearly labelled, secure container: “Hazardous Waste – Contaminated PPE”.
  - Arrange collection by a licensed hazardous waste carrier.
  - Keep waste notes or consignment records for 3 years.

Worker safety

SRSU gloves

- ✓ Invaluable information from AHDB factsheet
- ✓ Most nurseries are still not aware or not ‘willing’ to accept the need to implement
- ✓ Key challenge is how to conform with timelines of handling periods
- ✓ Additional cost
- ✓ More waste
- ✓ Often untidy nursery

FACTSHEET 09/15

Cross Sector

AHDB HORTICULTURE

Richard Glass,
Eurofins Agroscience Services

Selection and use of ‘splash-resistant single use’ (SRSU) protective gloves for workers handling treated plants and contaminated surfaces

This factsheet provides information to those responsible for workers (ie the duty holder) about the selection and use of protective gloves (Figure 1) when carrying out tasks that may result in exposure of the hands to plant protection products (PPPs). Such tasks include taking and inserting cutting material, pinching, pruning, harvesting and packing following application of a PPP. The Chemicals Regulation Directorate (CRD) now allows the protective factor of gloves to be taken into account during the PPP authorisation process. This could allow new approvals of PPPs that might otherwise not be approved without the restrictions associated with having a time delay between treatment and handling by workers.

Worker safety

Re-entry into crop or structure

- Complete non-handling period
- Re-entry with protective clothing
- Handling period with protective clothing and gloves
- Sales window restriction

(b) Workers must wear suitable protective clothing in which arms, body and legs are fully covered when re-entering treated areas or handling treated crops or contaminated surfaces within 39 days after treatment. (See 'Other Specific Restrictions')

Crops/situations:	Maximum individual dose: (litres product / ha)	Maximum total dose:	Maximum number of treatments: (per crop)	Latest time of application:
Protected and outdoor ornamental plant production - container grown crops	0.4	-	1	3 days prior to removal for sale

Worker safety

Protective clothing

Protective clothing (including the legs)

Types of protection

97 Protective clothing must offer some specific protection – if it does not, it is classified as 'workwear'. There are three main types of protective clothing:

(a) **separates** – jackets, trousers etc that cover only part of the body;
(b) **aprons** – that cover only part of the body;
(c) **overalls, coveralls and body suits** – which cover the whole body.

98 As well as trousers for leg protection, there are also knee pads and gaiters. Hard fibre or metal guards will help protect against some impacts.

Examples of hazards which could require protective clothing

99 The main hazards are as follows:

(a) **working with chemicals** – handling small quantities of low-risk chemicals may only require aprons to protect against accidental splashes. Larger quantities of chemicals or risks of contact with sprays or jets of chemicals are likely to require protective coats/ trousers or coveralls. Potential exposures to large quantities of chemicals or very hazardous materials will often require the use of gas or liquid-tight suits and appropriate RPE;

SAFETY PRECAUTIONS

(a) Operator protection

Engineering control of operator exposure must be used where reasonably practicable in addition to the following personal protective equipment:
WEAR SUITABLE PROTECTIVE GLOVES when handling the concentrate.
WORKERS MUST WEAR SUITABLE PROTECTIVE CLOTHING (in which arms, body and legs are fully covered) AND SUITABLE GLOVES* when re-entering treated areas, handling treated crops or contaminated surfaces within 11 weeks of treatment.
*Meeting at least glove safety standard EN374-2:2014, Level 2 and CE category III. Such gloves can be identified by a CE Mark with four digits below, and the EN374 pictogram for micro-organisms.
However, engineering controls may replace personal protective equipment if a COSHH assessment shows they provide an equal or higher standard of protection.
WASH SPLASHES from skin or eyes immediately.
DO NOT BREATHE SPRAY.
WASH HANDS AND EXPOSED SKIN before meals and after work.

Worker safety

Protective clothing

- ✓ Even though the HSE have formally replied and confirmed that ‘as long as the arms legs and body is covered’ the clothing doesn’t matter
- ✓ Yet in L25 PPE guidance document suggests Protective clothing and workwear are two different things

Worker safety

Spray application sheets

Spray task worksheet							
DATE			*Equipment*	Lance			
Authorised by			*Spray Quality*	medium, heav			
Department			*Nozzle type*	brown ff, cone			
Location			PPE - Mixing	Faceshield, Nitrile gloves, Coverall, Wboots,			
Indoor / Outdoor			PPE - Application	Nitrile gloves, Coverall, safety glasses /goggles, Wboots, faceshield			
Operator			*Hazard Label*	Harmful, toxic etc			
Washings							
List/ Area	Bed	Crop	Problem	Treatment	Rate	LERAP Buffer	Risk
E2	409	photinia rr	Powdery Mildew	Nimrod	1.0L/ha	0	0
		Always read the label. Use pesticides safely					

Worker safety

Spray application sheets

zest Sustainable ICM

Spray Plan Report - Season 2025

Advisor: SELCHUK KURTEV
Mobile:
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BASIS No.: 20042290
FACTS No.: 20042290
Generated on: 05 Nov 2025 11:42

Tip Tree, Tiptree,, Colchester, Essex, CO5 0RF, United Kingdom
Primary Contact: Andrey Ivanov **Tel:** +441621815407 **Mob:** 07739615240

Plan No.: 474 **Plan Date:** 11/09/2025 **Plan Name:** NGS 1+2 ROUND 1

Field	Crop	Variety	Area (ha)	Treat Area (ha)	Growth Stage	Water Courses
NGS1	Strawberries	Karima	1.00	1.00		Dry
NGS 2	Strawberries	Karima	1.00	1.00		Dry
			Total	2.00		

Proposed App Date: 13/09/2025 **EHD:** No Restriction

Product	Precautions	Rate	Total	% Rate	Total Used	Reasons	Full	Part
Potassium Bicarbonate (MBS166) Potassium hydrogen carbonate (99 % w/w)		450 g/100L	9000 g	23%		Powdery Mildew		
Headland Sulphur (MBS798) Sulphur (800 g/l)		2 lts/ha	4 lts			Powdery Mildew		
SW7 (ADJ0875) alkoxylated alcohols (EAC 2) (8 %); alkoxylated alcohols (EAC 1) (18 %)		50 ml/100L	1000 ml			spreader		
Water (lts)		1000 lts/ha	2,000 lts					

Water Vol. (lts/ha): 1000 lts **Spray Quality:** Medium

Plan No.: 474 **Operator:**

Field	Date	Start	Finish	W. Spd.	W. Dir.	Temp.	H%	Buffer	Nozzle
NGS1									
NGS 2									

Protective Equipment Worn: ☐ Coveralls ☐ Apron ☐ Face Shield/Goggles ☐ Gauntlets ☐ Boots ☐ Respirator

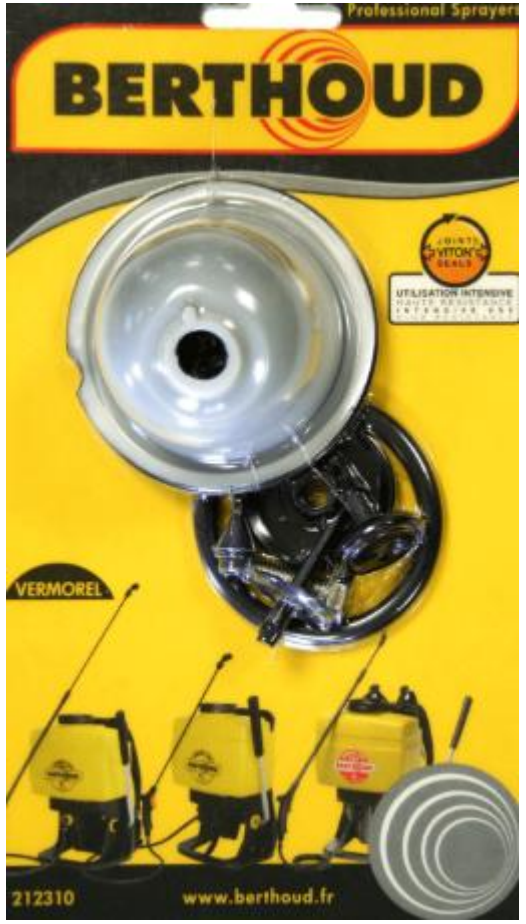
Operator Name: _____ **Signed:** _____

Key to Precautions: pr: protected crop. **D**:Special Disposal Procedure, refer to label. **F**: Following crop restriction, **B**:Apply Buffer Zone. **HI**: Harvest Interval (in Days), **REI**: Re-Entry Interval (hours), **GP**: Grazing period, **MAI**: Minimum Application Interval (in days), **EHD**: Earliest Harvest Date. Always read product label before use and follow manufactures' tank cleaning procedures. # indicates farmer plan. An EAMU is applied at the grower's own risk.

Sprayer maintenance and cleaning

Maintenance

- ✓ Same principles as with PPE
- ✓ Monthly maintenance and repairs
- ✓ Records
- ✓ NSTS testing
- ✓ Leaks, wear and tear, mechanical parts, ergonomics, straps, pumps, hose pipes and reels, gun lance, boom, nozzles
- ✓ Calibration after each change of nozzle and repair to hydraulic pump and pressure lines



Sprayer maintenance and cleaning

Maintenance

- ✓ Boom sprayers all need testing
- ✓ Canon sprayer, air assisted etc annually, but legally every 3 years
- ✓ Hand-held equipment only inspection by competent person
- ✓ Some grey areas here as to which equipment needs testing every 6 years or not at all

Sprayer maintenance and cleaning

Cleaning

- ✓ How clean is your tank?
- ✓ Each equipment MUST be washed at the end of each day
- ✓ Particularly filters
- ✓ Some active substances can be very persistent – clopyralid, MCPA, 2,4-D, florasulam, SU herbicides
- ✓ Outside of spray equipment as well
- ✓ Tools and spares could all be contaminated

Analyte in µl/l	Level Found
MRPS by GC (SOP611)	
2,4,6-Trichlorophenol	1.9
Azoxystrobin	8.3
Boscalid	**33**
Bupirimate	**26**
Carfentrazone Ethyl	**32**
Cyflufenamid	0.5
Cyprodinil	**29**
Difenoconazole	0.4
Fenamidone	4.1
Fludioxonil	**31**
Flusilazole	0.3
Iprodione	7.9
Kresoxim Methyl	0.3
Lenacil	0.1
Metalaxyl	1.0
Myclobutanil	**47**
Napropamide	7.3
Oxadiazon	5.9
Piperonyl Butoxide	**11**
Propiconazole	**11**
Pyraclostrobin	**20**
Pyrimethanil	**100**
Tebuconazole	0.6
Tebufenpyrad	0.4
Terbuthylazine	0.1
MRPS by LC (SOP603)	
Acetamiprid	0.2
Diflubenzuron	0.2
Ethirimol	0.2
Indoxacarb	0.8
Isoxaben	2.5
Pirimicarb	0.7
Prochloraz	**35**
Thiacloprid	4.0

Sprayer maintenance and cleaning

Maintenance

Weekly Sprayer maintenance checks

Cooper Pegler /Berthoud Knapsack

The following form is designed to help us to maintain our equipment to a high standard of safety.
Please Date the column and tick or cross against the checklist below.
If an action is required please give details of this and report to DT/SM

Description of Equipment:

	Action / Comments									
Date										
Nozzle condition										
Leaks & Location?										
Are filters clean?										
Straps -twisted/ damaged?										
Clean tank- In & Out?										
Pipes / Hoses - Splits?										
Are Jubilee clips tight ?										
Pressure check										
Calibration carried out										

SUMMARY

- Challenges are mainly with approvals and worker protection
- Many approvals not practical
- Conformity with each specific safety standard is important
- Record keeping and training is crucial for auditing
- Maintenance for PPE spray equipment must be carried out
- NSTS schemes are more important now and need to be adhered to
- Agronomist recommendations are not sufficient for HSE audits