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**Agriculture,
Food and the Marine**
An Roinn
**Talmhaíochta,
Bia agus Mara**



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Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

TECHNICAL BACKGROUND PAPER: EMPTY PESTICIDE CONTAINERS (PPP)



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1. BACKGROUND

In Ireland there is a lack of clarity and guidance in relation to the classification of triple rinsed plant protection product containers i.e., hazardous or non-hazardous waste and their subsequent management. This lack of clarity and guidance is resulting in significant difficulties for waste recovery initiatives trying to ensure that their recovery and/or disposal is undertaken in line with best practicable environmental option (BPEO). There are various national estimates of the quantities of plant protection product (PPP) containers placed on the Irish market. The Pesticide Registration and Control Division (PRCD) of the Department of Agriculture, Food and the Marine (DAFM) has estimated that approximately 365 tonnes of PPP containers were placed on the market in 2006.

From background research undertaken it appears that many European countries and also other OECD countries including the USA and Canada classify triple rinsed PPP containers as non-hazardous waste. In Europe at present, the European Waste Catalogue links the classification of hazardous wastes to concentrations of dangerous substances within the waste and threshold concentrations derived from the Dangerous Substances Directive¹ and the Dangerous Preparations Directive² however this 'link' will be subject to amendments that will enter into force in 2015 (see section 1.1.1). Many plant protection products particularly insecticides, contain active substances which depending on the residual concentration remaining in the PPP container could be classified as hazardous waste. However, recent trial work undertaken by DAFM where the mass of the pesticide residue left in the container after triple rinsing was estimated and extrapolated and compared against the most stringent concentration limits for hazardous waste under the Dangerous Preparations Directive appear to indicate that triple rinsed PPP containers should be classified as non-hazardous waste. This technical document provides information on the following:

- ▼ Relevant waste and plant protection product legislation;
- ▼ Practices in other countries in relation the classification and management of PPP containers;
- ▼ National legislation in relation to triple rinsing PPP containers;
- ▼ Current National policy in relation to triple rinsed PPP containers;
- ▼ Triple rinse data results from the Pesticide Registration and Control Division (PRCD) of the Department of Agriculture, Food and the Marine (DAFM); and
- ▼ The 7-STEPS: Good Practice Guide for triple rinsing and management of PPP containers based on best practicable environmental option (BPEO) and developed in conjunction with this technical background document.

1.1 RELEVANT LEGISLATION

1.1.1 Waste and chemical

The revised Waste Framework Directive (WsFD)³, which replaces both the Waste Framework Directive⁴ and the Hazardous Waste Directive⁵ defines hazardous waste as waste possessing one or more of the 15 hazardous properties set out in Annex III of the WsFD from H1 for explosive substances and preparations to H15 waste capable of yielding another substance. The WsFD indicates that the classification of waste as hazardous should be based on European legislation on chemicals. Annex III in the WsFD attributes the 15 hazardous properties by reference to the Dangerous Substances Directive and the Dangerous Preparations Directive.

The WsFD provides for a list of waste, the European Waste Catalogue (EWC) to classify wastes and identify those which are considered to be hazardous because of the hazardous properties in Annex III of the WsFD.

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1. Council Directive 67/548/EEC of the 27 June 1967 on the approximation of laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.
 2. Directive 1999/45/EC of the European Parliament and of the Council of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the member states relating to the classification, packaging and labelling of dangerous preparations.
 3. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (WsFD).
 4. Council Directive of 15 July 1975 on Waste (75/442/EEC).
 5. Council Directive of 12 December 1991 on Hazardous Waste (91/689/EEC).

In the European Waste Catalogue (EWC), wastes are grouped according to generic industry, process or waste type. It differentiates between non-hazardous and hazardous waste by identifying hazardous waste entries with an asterisk (*). In relation to used PPP containers, the likely EWC codes that could apply are given in Table 1 below.

Table 1: EWC codes which apply to used PPP containers

EWC Code	Description
02 01 08*	Agrochemical waste containing dangerous substances
02 01 09	Agrochemical waste other than those mentioned in 020108

The EWC links the classification of certain hazardous wastes to the concentration of dangerous substances within the waste and threshold concentrations derived from both the Dangerous Substances and Dangerous Preparations Directives. Both the Dangerous Substances and Dangerous Preparations Directive shall be repealed with effect from 1st June 2015 by Regulation (EC) No 1272/2008⁶ on classification, labelling and packaging of substances and mixtures (CLP Regulation).

The Dangerous Preparations Directive provides procedures and concentration limits for the evaluation of the properties of wastes which renders them hazardous to human health (e.g. harmful, toxic, carcinogenic), and the environment. The concentration limits given are expressed as a weight/weight percentage. The most **stringent limits** that are specified in the Dangerous Preparations Directive that would be applicable to the active substances remaining in triple rinsed PPP containers are given in Table 2.

Table 2: Relevant concentration limits and hazardous properties

Properties of waste which render it hazardous	R-phrases	Concentration limit
H6 Toxic: Toxic substances and preparations (including very toxic) if inhaled, ingested or penetrate skin, may involve serious, acute or chronic health risks and even death	T+ with R26,R27, R28	Very toxic at a total concentration of $\geq 0.1\%$
H14 Ecotoxic: Ecotoxic waste which presents or may present immediate or delayed risks for one or more sectors of the environment	N R50-53	Acute aquatic toxicity and long-term effects at concentrations $\geq 0.25\%$

Under the CLP Regulation, wastes are considered to be mixtures and therefore will continue to be classified according to the Dangerous Preparations Directive until 1st June 2015. After which the CLP Regulation will be used. Appendix 1 provides a summary of the relevant requirements of the CLP Regulation in relation to the classification of PPP containers as either hazardous or non-hazardous waste. The CLP Regulation provide generic cut-off values for hazard class and categories and also specific concentrations limits and M-factors⁷ for an extensive list of chemicals (see Annex 5, Table 3.1), including many PPP.

6. Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on the classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

7. M factor = means a multiplying factor. It is applied to the concentration of a substance classified as hazardous to the aquatic environment acute category 1 or chronic category 1, and is used to derive by the summation method the classification of a mixture in which the substance is present (Regulation 1272/2008).

1.1.2 Plant Protection Product Legislation

EU and National legislation on the authorisation, placing on the market and use of plant protection products is linked in various ways to legislation on waste, the Dangerous Substances and Dangerous Preparations Directives and the CLP Regulation. The Department of Agriculture, Food and the Marine (DAFM) is the competent authority for implementing legislation relating to Plant Protection Products (PPP) and Biocidal Products. The legislation controls various aspects of PPP including its authorisation for marketing and use, labelling and the principles of good plant protection practice (GPPP), and the requirement for triple rinsing plant protection product containers. Legislation relating directly to plant protection products includes:

- ▼ Regulation (EC) No 1107/2009⁸ of the European Parliament and Council concerning the placing of plant protection products on the market. This Regulation came into force from 14th June 2011, and lays down rules for PPP placement on the market, use and control. It sets down rules for the approval of active substances, safeners, synergists and adjuvants contained in PPP. The purpose of the Regulation is to ensure a high level of protection of both human and animal health and the environment, harmonise rules relating to placing these products on the market and improving agricultural production. Article 65 links the requirements of classification, labelling and packaging of PPP to the Dangerous Preparations Directive.
- ▼ Directive 2009/128/EC of the European Parliament and the Council establishing a framework for Community Action to achieve sustainable use of pesticides. This Directive came into force in October 2009 and Member States are required to bring into law by 26th November 2011. It established a framework to achieve sustainable use of pesticides by reducing the risks and impacts of pesticides on human health and the environment and by promoting the use of integrated pest management. This Directive applies to pesticides that are plant protection products. It is expected that the scope of the Directive will be widened in the future to cover biocidal products. Article 13 refers to the handling and storage of pesticides and treatment of their

packaging and remnants in order that they do not endanger human health or the environment. Article 13 (e) refers to the recovery or disposal of pesticide remnants and their packaging and that this should be done in accordance with EU legislation on waste.

- ▼ SI No. 83 of 2003 – European Communities (Authorisation, Placing on the market, Use and Control of Plant Protection Products) Regulations 2003. SI No 83 is being substantially overhauled in the coming months by DAFM to ensure compliance with Regulation EC No. 1107/2009.
- ▼ DAFM is also finalising a new Statutory Instrument which will implement the provisions detailed in Directive 2009/128/EC.

1.1.3 European Communities (Authorisation, Placing on the market, Use and Control of Plant Protection Products) Regulations 2003 (SI no.83 of 2003)

SI no.83 of 2003 (as amended) is the principal national piece of legislation for plant protection products. This controls the authorisation, placing on the market and use and control of PPP. The DAFM is the competent authority for its implementation in Ireland. Regulation 6(a)(d) requires that the use of plant protection products should be done in accordance with the principles of good plant protection practice (GPPP) which are detailed in Appendix 13 to the Regulation. GPPP provide a practical standard for assessing individual practices in relation to human health, animal health and environmental safety. Rinsing of PPP packaging is covered in section 9 of Appendix 13. It states that PPP packaging should be triple rinsed and punctured to prevent re-use.

8. Regulation (EC) No. 1107 of 2009 of the European Parliament and the Council of 21 October 2009 concerning the placing of plant protection products on the market and repealing Council Directive 79/117/EEC (of 21st December 1978 prohibiting the placing on the market and use of plant protection products containing active substances) and Council Directive 91/414/EEC (of 15th July 1991 concerning the placing of plant protection products on the market).

2. INTERNATIONAL PRACTICES IN RELATION TO CLASSIFICATION OF PPP CONTAINERS

2.1 EUROPEAN CROP PROTECTION ASSOCIATION

The European Crop Protection Association (ECPA), which is a pan-European representative organisation of the crop protection industry, carried out a survey of the waste classification of PPP containers across Europe in 2006. ECPA estimates that approximately 34,000 tonnes of PPP containers are placed on the European market each year (ECPA, 2007). At least 80% of PPP containers are plastic with the majority being high density polyethylene (HDPE), followed by polyethylene terephthalate (PET), the remaining packaging being mostly film or paper based. Continuous work is being undertaken by industry in collaboration with farmers to improve packaging design of PPP containers. The aim of this work is to simplify procedures for farmers, improve handling safety, reduce waste and protect the environment. The main features of the PPP container design includes smooth internal surfaces, large centrally located necks, isolated handles and no foil seals.



The 2006 survey carried out by ECPA shows an inconsistent approach to the waste classification of triple rinsed PPP containers across Europe. A summary is provided below in Table 3.

Table 3: Waste classification of triple rinsed PPP containers across Europe (2006)

Country	Waste Classification of triple rinsed PPP containers
Belgium	Non-hazardous (NH)
Croatia	Hazardous (H)
Denmark	Non-hazardous
Estonia	Non-hazardous

Country	Waste Classification of triple rinsed PPP containers
Finland	Hazardous
France	Within collection scheme NH, outside H
Germany	Non-hazardous
Greece	Non-hazardous
Hungary	Within scheme NH, outside H
Ireland	Local variation
Lithuania	Non-hazardous
Luxembourg	Non-hazardous
Netherlands	Non-hazardous except contains Very toxic (T+)
Poland	Hazardous
Portugal	Hazardous
Romania	Hazardous
Slovak Republic	Hazardous
Spain	Non-hazardous but toxic
Turkey	Hazardous
UK	Non-hazardous

(H = hazardous; NH = non-hazardous)

There is obviously an inconsistent approach to the classification of triple rinsed PPP containers. Seven countries were unable to respond as the information was not available. Eleven collection and recovery schemes have been established by ECPA members, while ten countries have national industrial schemes that collect PPP containers as part of a wider packaging scheme. In many countries it would appear that provided there is an approved collection and recovery scheme for triple rinsed PPP containers, this waste is deemed to be non-hazardous.

2.2 UNITED STATES OF AMERICA

In 1990 the United States Environmental Protection Agency (USEPA) assessed over 10 pesticide residue removal studies conducted between 1972 and 1990. The findings of this assessment were reported in a *Container Study – report to Congress Report (1992)*. The USEPA found that, regardless of the formulation used in the test, triple rinsing generally removed 99.9999% of the residue in 1, 2.5 and 5 gallon plastic containers. The USEPA defines percent removal⁹ in

9. Percent removal = $\left\{ 1.0 - \left[\frac{\text{Rinsate concentration of a.i. (mg/litre)}}{\text{Original concentration of a.i. (mg/litre)}} \right] \right\} \times 100$

terms of the concentration of active ingredient in a given rinse compared to the original concentration of active ingredient in the formulation. They found triple rinsing to be more effective than pressure rinsing. Based on this report and other collaborative research, triple rinsed containers were designated as non-hazardous material.

The American Society of Agricultural and Biological Engineers (ASABE) developed an American National Standard for recycling pesticide containers (ANSI/ASABE, 2006). This was adopted by the American National Standard in 2006 and reaffirmed in 2011. The standard specifies management practices for effectiveness and safety in the handling, cleaning and recycling of used non-refillable HDPE containers that originally held pesticides and adjuvants. The standard provides procedures on rinsing containers, inspection of cleaned containers, non-recyclable containers, collection, transport, reprocessing and manufacturing to acceptable end-use products. In relation to acceptable end-uses the standard specifies the following:

- ▼ Acceptable end-use products shall be determined such that they will have no unreasonable adverse effects on the environment, people handling plastic, or users of the end-products manufactured from the recycled plastic;
- ▼ Products with frequent human exposure, such as food or beverage containers, toys, playground equipment and similar products are not acceptable;
- ▼ Acceptable end-use products include marine pilings, bridge pilings, field drain pipe, fence posts, construction site mats, speed bumps, parking stops, hazardous waste drums, scaffold nailing strips, commercial truck sub-floor support members and commercial truck/manure spreader decker boards.
- ▼ Other acceptable end-use products shall be identified by carrying out a risk assessment that takes into account the following factors:
 - Physical, chemical and toxicological properties of pesticides;
 - The probable concentration of pesticides in or on the surface of the end-use product;
 - The general characteristics of the end-use product, including the potential human and environmental exposure; and
 - The inputs used in the risk assessment for determining acceptable end-use products should be based on statistically valid sampling and analytical data.

The USEPA policy judgement allowed for the establishment of an industry led pesticide container recycling programme in 1992 called Ag Container Recycling Council (www.acrecycle.org). This programme collects and recycles over 5,000 tonnes of HDPE plastic per annum. End-uses for the recycled plastic are specified. Currently approved end-uses include: plastic pesticide containers; industrial pallets; agricultural drain pipes; speed bumps; parking stops; drums to store hazardous waste; dock and sea wall pilings; commercial truck sub-floor supports; and scaffold nailing strips.

In 2008, the USEPA proposed that agricultural retailers of pesticide containers (HDPE, non-refillable) must participate in a statutory recycling programme. This proposal made under an executive order was rejected by the Office of Management and Budget (OMB) on the grounds that it remains unclear whether providing a proposed recycling programme will result in a reduction in the improper disposal of PPP containers and the costs of such a scheme would exceed the benefits by more than two orders of magnitude. The USEPA has suspended work on the proposed statutory recycling programme.

2.3 WORLD HEALTH ORGANISATION AND FOOD AND AGRICULTURAL ORGANISATION OF THE UN

In May 2008, the WHO and the FAO prepared and published an *International Code of Conduct on the distribution and use of pesticides* (WHO/FAO, 2008). It provides guidelines on the management options for empty pesticide containers in order to minimise the potential health and environmental impacts associated with their disposal. It recommends the establishment of a container management scheme to minimise the risks and contribute to resource use efficiencies. It emphasises that successful container management schemes around the world are only achieved with full stakeholder participation along the supply chain including governments, manufacturers, users, distributors, suppliers, recyclers and waste disposal companies, NGOs and trade unions. The guidelines provide recommendations on container design and labelling; cleaning including triple rinsing; and waste classification for triple rinsed PPP containers. The report recommends that Countries should address the issue of waste classification for emptied, cleaned PPP containers. The decision to classify as either hazardous or non-hazardous waste has significant implications for costs and administrative burdens. For example, in Germany the cost differential between managing empty triple rinsed PPP containers as hazardous and non-hazardous has been estimated at €0.60 per kilogramme of empty container. The report also refers to studies undertaken in Canada. One of the main recommendations in this report is that countries should classify properly rinsed containers that have been inspected as non-hazardous waste.

2.4 UK ENVIRONMENT AGENCY

The Environment Agency (EA) in the UK made a policy decision that triple rinsed, or pressure rinsed agricultural pesticide containers are non-hazardous waste. It is unclear how this decision was made but it appears that it was probably based on research information and practices from the USA. The EA has published specific guidance for farm wastes including hazardous waste. In this guidance, waste descriptions, classification and EWC codes are provided for many waste streams, e.g., packaging waste, animal health wastes, C&D waste, oil and machinery waste. The guidance states that “plastic and metal pesticide containers are only non-hazardous if they are emptied and triple rinsed”. Guidance is available on the EA web site on farm waste at <http://publications.environment-agency.gov.uk/PDF/GEHO0309BQCW-E-E.pdf> and <http://publications.environment-agency.gov.uk/PDF/GEHO0309BQGK-E-E.pdf>. Guidance on triple and pressure rinsing is available in the UK from the Voluntary Initiative and Crop Protection Association at <http://www.voluntaryinitiative.org.uk/content/water.aspx>.

Table 4: Current EA Guidance on classification of triple rinsed PPP containers

Packaging waste	Possibly hazardous	Non-hazardous
Plastic and metal pesticide containers	These may be hazardous if they are not emptied and triple rinsed and drained EWC – 02 01 08*	These are only non-hazardous if they are emptied and triple rinsed. EWC Plastic – 15 01 02 EWC Metal – 15 01 04

2.5 AUSTRALIA

The main recycling programme in Australia for the recycling of plant protection products and animal health products is drumMUSTER, which was established in November 1998 under an industry led waste reduction scheme agreed between industry, the National Farmers Federation and the Australian Government. drumMUSTER is Australia’s largest environmental programme and is funded via a levy on the purchase price of crop protection and animal health chemical products sold in eligible non-returnable rigid plastic and steel containers over 1kg or 1L in size. The levy is paid by manufactures into a fund administered by Agstewardship Australia and then passed onto the consumer via the distribution and retail trade.

drumMUSTER collects and recycles clean triple rinsed crop production and on-farm animal health chemical

containers. Guidance is provided on triple rinsing, and once the containers are cleaned farmers can deliver these containers to over 750 collection sites across Australia. The recycled plastics and metals are used in the manufacture of a whole range of products such as outdoor furniture, wheelie bins, road signs and posts, irrigation pipes etc. The requirement for cleaning and triple rinsing the chemical containers is an extremely important part of the drumMUSTER recycling process. Containers not properly cleaned are not accepted into the programme. Under current Regulations in most states within Australia, containers that have not been properly rinsed are classified as hazardous waste. Since inception, over 18 million containers have been collected under the drumMUSTER programme which represents over 23,000 tonnes of recyclable materials. Further information on drumMUSTER is available at <http://www.drummuster.com.au/>.

Another programme in Australia was established to provide a reliable and responsible collection and disposal service for users of agricultural and veterinary chemicals. The programme is called ChemClear and it aims to reduce the quantity of obsolete agvet chemicals stored on farms and in small businesses. ChemClear is an extended producer responsibility programme and an industry stewardship initiative of the Industry Waste Reduction Scheme (IWRS). This includes industry associations such as Croplife Australia Ltd., AgSafe Ltd., Animal Health Alliance, Veterinary Manufacturers Distribution Association, the National Farmers Federation of Australia and the Local Government Association. A fee applies to the collection and disposal of agvet products in this scheme where the chemical contained in the products are unidentifiable, i.e., labels missing or no identifiable features. The ChemClear Programme commenced in 2003, and has collected and disposed of in excess of 234 tonnes of agricultural chemicals and veterinary wastes. Further information is available at <http://www.chemclear.com.au/>.



3. PRACTICE IN IRELAND

3.1 RECYCLING COMPLIANCE SCHEME

The Irish Farm Film Producers Group (IFFPG) was established by means of ministerial approval granted under the Waste Management (Farm Plastics) Regulations, SI. No. 341 of 2001. IFFPG is a not-for-profit organisation made up of manufacturers, importers and suppliers of farm film plastics used in forage conservation. Currently Farm Plastics Recycling Ltd. in partnership with IFFPG is the sole approved body in Ireland for the purposes of operating a compliance scheme for the recovery of farm plastic waste. IFFPG collects both at the farmyard and at bring centres. Over 20,000 tonnes of farm film plastics are collected and recycled annually. In 2010, Farm Plastics Recycling Ltd. was established. This company was formed by agri-supply and farming sectors to recycle fertiliser bags, feed bags, PPP and other chemical containers, netting and twine. While some PPP containers are collected there is no clear guidance to farmers or industry in relation to the classification of triple rinsed PPP containers as hazardous or non-hazardous waste.



IFFPG has estimated that approximately 350 tonnes of HDPE PPP containers are placed on the market annually. IFFPG in partnership with Farm Plastic Recycling Ltd. operates approximately 200 bring centres annually. The bring centres operate once or twice annually typically located in marts, co-operative stores, civic amenity sites and community centres and are registered with the Local Authority in accordance with Department of Environment, Community and Local Government (DECLG) Circular (Circular No. WPRR 02/09 – see section 3.2). In relation to PPP containers, farmers are requested to purchase recycling bags at their local co-operative and to place triple rinsed containers and washed caps into the recycling bags. At the bring centre the recycling bags are inspected by the Farm Plastics Recycling Ltd. contractor and the farmers contact details are attached to each bag. The recycling bags are taken back by the contractor operating on behalf of Farm Plastics Recycling Ltd. to an authorised facility

where it is again inspected, bulked and baled. Bales of containers are delivered onwards to a facility for recycling and reprocessing. The recycled plastic regrind is used in the manufacture of plastic products such as wheelie bins and piping.

3.2 NATIONAL POLICY

The Department of Environment, Community and Local Government has issued guidance to Local Authorities in the form of Circulars to assist and improve the collection and recovery of all farm plastics. In March 2009 the DECLG issued *Circular No. WPRR 02/09 Re: Authorisation of Bring Centres for Farm Plastics* allowing for less onerous authorisation requirements for bring centres, such as marts where farm plastics could be brought for recycling. Local authorities were advised that they could issue an authorisation letter with appropriate conditions to such an activity rather than the activity requiring a Certificate of Registration under the Waste Management (Facility Permit and Registration) Regulations 2007 (S.I. No. 821 of 2007 as amended).

Further guidance was issued by DECLG in May 2010, in the form of a *Circular No. WP16.10 Re: National Hazardous Waste Management Plan – collection of other farm plastics*. This Circular allows for the expansion of the collection and recovery scheme operated by IFFPG for silage sheeting and bale wrap to other farm plastics subject to certain conditions. The Circular addresses the growing concern for a more holistic approach to the collection of all farm plastics indicating that the scheme can be expanded to include the collection of LDPE fertiliser bags (500 and 50kg) and feed bags (25kg); polypropylene (PP) fertiliser bags (500kg); and HDPE pesticide containers. In the Circular, certain conditions are specified in relation to acceptance criteria and inspection of the farm plastics on the day of operation which include the requirement for inspection of the plastics and triple rinsing PPP containers. However, the Circular states that triple rinsing where conducted effectively should reduce the hazard associated with the containers (particularly where the original cap is refitted) to enable the bags to be handled safely (while not necessarily rendering them non-hazardous). While this guidance allows for the expansion of the collection scheme to other farm plastics, the issue in relation to the classification of PPP containers as hazardous or non-hazardous was not within the scope of the Circular. In addition, this Circular was issued before information on triple rinsed PPP containers undertaken by the DAFM became available. The results from this work are detailed in section 4.

4. TRIPLE RINSE DATA AND EVALUATION

4.1 INTRODUCTION

DAFM has carried out triple rinsing work on PPP containers in their laboratory. The container sizes varied from 1L, 2L and 5L. The pesticides included insecticides, fungicides and herbicides. The active ingredient concentrations and the type of formulations varied to try to get a broad coverage of the range of pesticides available for use. Triple rinsing was carried out in accordance with the requirements of section 9

of Appendix 13 of SI No. 83 of 2003. Further details on triple rinsing are given in the accompanying 7-STEPS: Good Practice Guide for Empty Pesticide Containers. A further 4th rinse was carried out using solvent to approximate the quantity of active ingredient which may ingress into the HDPE container. The results are given Table 5. The results for the four rinses are given as the % active substance remaining in the analysed rinsate.

Table 5: Analytical Results from triple rinse PPP containers carried out by the PRCD, DAFM

PRCD Triple Rinse Data			**RESULTS %			
Active Ingredient	Pesticide Type	Classification	Rinse 1	Rinse 2	Rinse 3	Rinse 4
Prothioconazole	Fungicide	N, R50/53	0.0026	0.00004	0.00003	0.0005
Deltamethrin	Insecticide	Xn, N, R10, R20/22, R37/38, R41, R50/53, R65	0.0121	0.0003	0.0002	0.0022
Cypermethrin	Insecticide	Xn, N, R22, R38, R43, R50/53	0.038	0.0002	0.0001	0.0003
Chlorothalonil	Fungicide	Xn, N, R20, R36/37, R40, R43, R50/53	0.0079	0.009	0.0018	0.0091
Epoxiconazole	Fungicide	Xn, N, R40, R62, R63, R50/53	0.0772	0.0004	0.0003	0.0015
Chlorpyrifos	Insecticide	Xn, N, R10, R20/22, R36/37/38, R65, R50/53	0.104	0.0074	0.0011	0.0148
Tebuconazole	Fungicide	Xn, N, R41, R63, R51/53	0.0141	0.0005	0.0005	0.0026
Cypermethrin	Insecticide	Xi, N, R10, R37, R51/53, R66, R67	0.03	0.004	0.003	0.001
Dimethoate	Insecticide	Xn, R10, R20/21/22	0.198	0.004	0.004	0.011
Azoxystrobin	Fungicide	N, R50/53	0.012	0.001	0.0001	0.001
Propiconazole	Fungicide	Xn, N, R50/53, R63, R65	0.26	0.004	0.002	0.003
Napropamide	Herbicide	Xi, N, R36/38, R51/53	0.017	0.004	0.0005	0.003
Clopyralid	Herbicide	R52/53	0.025	0.0005	0.0004	0.0008
Propyzamide	Herbicide	Xn, N, R40, R50/53	N/A*	0.003	0.0004	0.001
Quinoxifen	Fungicide	Xi, N, R43, R50/53	N/A*	0.03	0.003	0.013
Triclopyr	Herbicide	Xn, N, R22, R65, R38, R43, R50/53	0.07	0.001	0.0003	0.005
Chlorpyrifos	Insecticide	Xn, N, R10, R36/37/38, R23/25, R65, R50/53	0.008	0.0003	0.00001	0.003
Cypermethrin	Insecticide	Xn, N, R37, R65, R50/53, R66, R67	0.016	0.001	0.0005	0.0035
Fenpropimorph	Fungicide	Xi, R38, R42, R50	0.14	0.003	0.002	0.065
* sample formed an emulsion and could not be analysed						
** % of active substance in the rinsate						
Container sizes varied from 1, 2 and 5 litres: two analyses for the same chemical indicates differing container sizes.						

4.2 ANALYSIS AND RECOMMENDATIONS

4.2.1 Current position under Dangerous Preparations Directive

The waste mixture to be assessed under the Dangerous Preparations Directive is the empty pesticide container plus the residues remaining after triple rinsing. Based on the results obtained in the DAFM trial, the mass of the pesticide residues left in the containers after triple rinsing was estimated and these extrapolated amounts were then calculated as a percentage of the combined mass of the container and the pesticide residue in order that the appropriate comparison could be made with relevant human and ecotoxicity limits in the Dangerous Preparations Directive. The most stringent concentration limits for hazardous waste under human health criteria (i.e., H6 toxic and very toxic) is $\geq 0.1\%$ and the ecotoxicity concentration limit (i.e., H14 acute aquatic toxicity and long term effects) $\geq 0.25\%$. The analysis indicated that relevant percentage concentration limits for human and ecotoxicity are not exceeded for all the pesticide containers tested therefore the emptied triple rinsed PPP can be classified as non-hazardous waste. This classification will need to be reviewed in 2015 when the Dangerous Preparation Directive is revoked and replaced with the Classification, Labelling and Packaging Regulation (1272/2008).

The results of the DAFM trial also demonstrate the efficacy of triple rinsing with water. It is clear that the decline in concentrations from rinse 1 to rinse 3 is of such a magnitude that a fourth water rinse would not result in a significant extra effect on the efficiency of washing.

4.2.2 Future considerations under CLP Regulation 1272/2008

Waste is considered a mixture for the purposes of the CLP Regulation (1272/2008) and therefore this Regulation will apply to the classification of hazardous waste from the 1st June 2015 under Annex III to Directive 2008/98/EC on Waste. Under the CLP Regulation the ecotoxicity concentration limits are considerably more stringent. The procedure for determining if a waste mixture containing a pesticide should be classified as hazardous or non-hazardous involves estimating the amount of pesticide in the mixture as a percentage by weight and comparing this level with the relevant ecotoxicity percentage limit under Regulation 1272/2008. An additional factor called an M factor (multiplication factor – see footnote 7) is used to adjust the estimated level of certain substances that are classified as “hazardous to

the aquatic environment acute category 1 or chronic category 1”, in order that low concentrations of such highly toxic components are given an increased weight in the mixture classification calculation, since very low levels could contribute to the toxicity of a mixture but might not otherwise be accounted for. Further information on CLP Regulation is given in Appendix 1.

Based on the results obtained in the DAFM trial, the mass of pesticide residues left in the containers after triple rinsing was estimated and these extrapolated amounts were then calculated as a percentage of the combined mass of the container and the pesticide residue, and multiplied with M factors where necessary, in order that the appropriate comparison could be made with the relevant ecotoxicity percentage limits under Regulation 1272/2008. This analysis indicated that for most of the pesticides in the trial the relevant ecotoxicity percentage limits under Regulation 1272/2008 would not be exceeded if the triple-rinsing procedure was followed but for a small number of pesticides with very high M factors (e.g. chlorpyrifos (M = 10,000) and deltamethrin (M = 1,000,000)) the possibility of exceedances could not be excluded. The number of triple-rinsed pesticide containers potentially liable to classification as hazardous waste on an individual basis would constitute only a small percentage of the overall waste stream of triple-rinsed pesticide containers.

The PRCD of the DAFM has provided a list of all insecticides and molluscicide active ingredients currently approved for use in Ireland and placed on the market in 2008. Insecticides are most likely to contain active substances which are particularly toxic to the aquatic environment. The PRCD has estimated the number of containers likely to have been placed on the market, based on the container(s) sizes available and also an estimate of the weight of plastic for each set of products. Of the total 350 tonnes of PPP containers placed on the market, approximately 35 tonnes will have contained insecticide or molluscicides which represent 10% of the total quantity of PPP containers sold. An examination of the active substances shows that under the CLP Regulations, approximately 5.5 tonnes of the PPP containers have M-factors assigned (10, 100, 1000, 10,000 or 1,000,000), therefore it is likely that some of these containers will be deemed hazardous under the CLP Regulations. The worst case scenario is that from June 2015 based on the current 350 tonnes of PPP containers placed on the market in Ireland, 5.5 tonnes may be classified at end-of-life as hazardous waste, representing 1.5% of the total tonnages of PPP waste containers.

4.2.3 Recommendations

- ▼ Triple rinsed PPP containers are non-hazardous waste provided they are managed in accordance with the EPA and the DAFM 7-STEPS: Good Practice Guide for Empty Pesticide Containers (PPP).
- ▼ Recycled plastic regrind shall not be used in human or animal food chain processes, products and packaging.
- ▼ During 2012 the EPA and DAFM will collect and carryout triple rinsing and analysis of empty PPP containers as part of the collection scheme offered by Farm Plastics Recycling Ltd. at various bring centres around the country.
- ▼ The DAFM will require triple rinse data to be provided by companies applying for a licence to place plant protection products on the market and this data will be used in any review/update of the 7-STEPS: Good Practice Guide and this technical background document on PPP containers.
- ▼ Any recommendations and guidance contained in this technical document and the 7-STEPS: Good Practice Guide for empty PPP containers will be reviewed and updated as required, e.g., changes in legislation, best practice, results from analytical work etc.

5. REFERENCES AND INFORMATION SOURCES

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- ▼ <http://www.drummuster.com.au/>
- ▼ <http://www.environment.gov.au/settlements/publications/chemicals/scheduled-waste/review.html>
- ▼ <http://www.pcs.agriculture.gov.ie/>
- ▼ <http://www.epa.ie/>
- ▼ <http://www.environment-agency.gov.uk/>

APPENDIX 1. ADDITIONAL BACKGROUND INFORMATION ON THE CLP REGULATION

REGULATION (EC) NO 1272 OF 2008 (CLP REGULATION)

Until 1 June 2015, mixtures such as PPP container waste shall be classified, labelled and packaged in accordance with Dangerous Preparations Directive 1999/45/EEC. From that date the classification of triple rinsed PPP containers as hazardous or non-hazardous waste will be determined by reference to Regulation 1272/2008 to determine whether the waste contains substances or mixtures at a concentration above a generic or specific concentration limit detailed in the Regulation. Article 10 (1) states that *Specific concentration limits and generic concentration limits are limits assigned to a substance indicating a threshold at or above which the presence of that substance or in a mixture as an identified impurity, additive or individual constituent leads to the classification of the substance or mixture as hazardous.*

Annex VI of Regulation No. 1272/2008 has revised the nomenclature and has harmonised the classification and labelling of hazardous substances (Hazard class and Category codes). Annex VII provides a Translation Table to assist translation of a classification made for a substance or mixture under Directive 67/548/EEC or Directive 1999/45/EC into the corresponding classification under Regulation 1272/2008. Annex I Part 1.1.2 provides specific concentration limits, M-factors and generic cut-off values. Specific concentration limits and generic concentration limits are limits assigned to a substance indicating a threshold at or above which the presence of that substance in another substance or in a mixture as an identified impurity, additive or individual constituent leads to the classification of the substance or mixture as hazardous. Table 6 provides a summary of the Classification, Risk Phrases, Hazard Class and category, and hazard class generic cut-off values which could be applicable to PPP containers under Regulation 1272/2008.

Table 6: Summary of Classification, Risk Phrases, Hazard Class and Category, and Generic cut-off values under CLP

Category of danger	Risk phrase	Properties of wastes which renders them hazardous	Hazard class and category under CLP Reg.	Hazard class generic cut off-values under CLP Reg.
Toxic (T)¹⁰	R23	H6	Acute Tox.3 (gas) Acute Tox.2 (vapour) Acute Tox.3 (dust/mist)	Acute Toxicity Category 1 to 3 = 0.1% Acute Category 4 = 1.0%
	R24	H6	Acute Tox.3	
	R25		Acute Tox.3	
Very Toxic (T+)¹¹	R26	H6	Acute Tox.2 (gas) Acute Tox.1 (vapour) Acute Tox.2 (dust/mist)	Acute Toxicity Category 1 to 3 = 0.1% Acute Category 4 = 1.0%
	R27	H6	Acute Tox.1	
	R28	H6	Acute tox.2	
Ecotoxic(N)¹²	R50	H14	Aquatic Acute 1	Hazardous to the aquatic environment Aquatic Acute Category 1 = 0.1% Aquatic Chronic Category 1 = 0.1% Aquatic Chronic Category 2 to 4 = 1%
	R50 – R53	H14	Aquatic Acute 1 Aquatic Chronic 1	
	R51 – R53	H14	Aquatic Chronic 2	
	R52	H14	Aquatic Chronic 3	
	R53	H14	Aquatic Chronic 4	

10. Under Directive 91/689/EEC wastes containing toxic substances where total concentration of the substance in the waste $\geq 3\%$ is classified as hazardous waste.

11. Under Directive 91/689/EEC wastes containing very toxic substances where total concentration of the substance in the waste $\geq 0.1\%$ is classified as hazardous waste.

12. Council Regulation 1272/2008 Annex VI Table 3.2 provides specific concentration limits, where different from generic concentration limits for the list of harmonised classification and labelling of dangerous substances from Annex I of Directive 65/548/EEC.

Annex VI of Regulation 1272/2008 provides specific concentration limits for various hazard classes and categories for substances. Where no specific concentration limits are given in this Annex for a certain category, the generic concentration limits given in Annex I must be applied. Annex VI, Table 3.1 provides a list of harmonised classification and labelling of hazardous substances and provides some concentration limits and M-factors for specific substances. Annex VI, Table 3.2 provides the list of harmonised classification and labelling of hazardous substances Annex I to Directive 67/548/EEC. Further information on Regulation 1272/2008 can be found at: <http://echa.europa.eu>.