Low POP content value for pentachlorophenol and its salts and esters (PCP)

1. Background

Pentachlorophenol and its salts and esters (hereinafter PCP) was listed as a POP by Decision SC-7/13 of the Conference of the Parties to the Stockholm Convention held in May 2015. To comply with its obligations as a Party to the Convention, the EU has to amend Annexes IV and V to Regulation (EC) No 850/2004 by including PCP with its corresponding limit values for PCP in waste. Setting a limit value in Annex IV is particularly relevant as this threshold (so-called 'low POP content') is applied to establish whether a waste containing a given POP has to be classified as a POP and is subject to the requirements laid down in Article 7 of the POP Regulation[1].

The aim of this technical note is to provide the basis for proposing a low POP content value for PCP. The methodology for establishing the low POP content is explained in the annex (see [ESWI 2011][2]).

The present analysis is based on the findings of two studies: a study conducted on behalf of the Commission (ESWI 2011), covering the EU, and a more recent study conducted on behalf of the German Federal Environment Agency (UBA 2015), covering only Germany[3].

2. Rationale for proposing a new low POP content value for PCP

2.1 Use of PCP in the past

The main use of PCP in the EU was as chemical for impregnation of wood (used in construction products) and in textiles. Use of PCP was forbidden in some MS in the 80s/90s (e.g. Germany in 1989). Production and import of PCP containing products ceased in the EU in 2002, long before the official ban of production, placing on the market and use of PCP at EU level in 2008.

The amount of the products containing PCP that are still in use is estimated at approx. 1.5 million t in 2017. Given the long lifespan of products containing PCP, products containing PCP will continue to reach the end of their useful life and enter the waste phase for a number of years. 99.7% of the remaining products are impregnated wood (mostly wood for outdoor use) and the remaining 0.3% are textiles for specific (outdoor) applications. According to [ESWI 2011], textiles containing PCP are believed to have been used only in few Member States (notably the United Kingdom, mostly in military applications, and France and some imports to Portugal and Spain) [UBA 2015].

The following average PCP concentrations are used to calculate the substance and mass flows:

- For impregnated wood products 0.0625 % (= 625 mg/kg)
- For textile products 2.5% (= 25000 mg/kg)

Assumed lifetimes for the different products (in years) are:

- PCP treated wood 15 - 30
- Textiles 15 - 20

2.2 Waste fractions containing PCP

The major waste sources of PCP are [ESWI 2011]:

[1] Annex I on restriction of production, placing on the market and use shall be amended by a separate piece of legislation as it is governed by a different Committee under EU legislation.

[2] http://scp.eionet.europa.eu/publications/wp2014_8/wp/wp2014_8

[3] http://www.umweltbundesamt.de/publikationen/identification-of-potentially-pop-containing-wastes

- Impregnated wood: PCP was used to impregnate wood in construction applications (Interior and exterior wooden constructions and window frames). It is estimated [ESWI 2011] that this waste stream accounts for 99.7% of the total amount of wastes contaminated with PCP that are currently being disposed of (2017: 276,000 t/y waste containing 172 t of pure PCP). This waste stream is usually incinerated (in most cases with energy recovery).
- Textiles: PCP esters were used for preservation of textiles, such as wool, cotton, flax and jute fabrics and yarns used in covers, tarpaulins, awnings, tents, webbing and netting and sisal and manila ropes. It is estimated that these textiles represent 0.3 % of all PCP containing waste that is currently disposed of (2017: 681 t/y waste containing 17 t of pure PCP). Its technical properties render it unsuitable for recycling (it would be difficult to obtain long fibres for production). In most cases this waste is incinerated (with or without energy recovery) or landfilled.

2.3 Management of the waste fractions containing PCP

Waste wood is usually collected separately as a fraction; however, PCP containing wood waste may be mixed with other wood waste fractions that are not intended to be recycled. Presence of PCP in textile waste is almost insignificant and limited to few specific waste streams (outdoor textiles used mainly by the army). Separate collection of waste suspected to contain PCP seems thus to be feasible, but there is no evidence whether this is always done.

Wood waste is in most cases incinerated as it exceeds the limit value of total organic carbon (TOC) of 5-6 % set in Decision 2003/33/EC on waste acceptance criteria for landfills. In addition, PCP treated wood waste is in general considered to be hazardous waste and is not allowed to be disposed of in hazardous waste landfills due to the high TOC content.

[ESWI 2011] and [UBA 2015] estimate that more than 95 % of the wastes containing PCP are incinerated (in biomass power plants, incinerators for municipal waste and in incinerators for hazardous waste), and the remaining fraction is either used for the production of synthesis gas and activated carbon or landfilled. Moreover, [UBA 2015] indicates that incineration in biomass power plants, municipal waste incinerators and hazardous waste incinerators in Germany is done under conditions (in particular, temperature) that allow destroying PCP. According to [BIPRO 2011], incineration temperatures at or above 800°C suffice to achieve destruction rates above 99.9%. Under controlled incineration conditions, the generation of new POPs can be excluded[4].

2.4 Options and impacts of low POP content level

Based on the two main studies covering PCP wastes, two alternative low POP content values of 1000 mg/kg and 100 mg/kg are analysed[5].

2.4.1 Option 1: Low POP content level = 1,000 mg/kg

According to [UBA 2015], the average concentration of PCP in treated and air-dried wood amounts to approx. 625 mg/kg (however contamination can range from 150 mg/kg to over 50,000 mg/kg).

[4] A minor environmental and health risk remains, in case PCP-containing waste wood has to be broken down mechanically before incineration, as dust can be generated in the handling of contaminated waste wood. In order to minimise environmental and especially health risks, dust generation should be avoided and it might be reasonable to apply personal protection measures (breathing masks), in order to avoid potential inhalation of PCP-containing dust.

[5] In [UBA 2015], a range of values between 3 mg/kg and 100 mg/kg is proposed. In principle, both limit values should cover the same wastes, given that PCP was applied in products in concentrations that are well above 3 mg/kg and 100 mg/kg. Discussions with competent authorities of Member States have showed that limit values below 50 mg/kg could be difficult to implement in practice as it would increase the amount of analytical tests to be performed (detection with gas chromatography/mass spectroscopy analysis).

Therefore, a low POP content level of 1,000 mg/kg would mean that the majority of PCP containing wood waste (which constitutes the majority of PCP containing waste) would not be captured by this low POP content value, whereas all contaminated textile waste would be affected. This option has to be discarded as it would not contribute to reaching the main objective of the POP Regulation: ensure that POP containing wastes are destroyed and do not pose a risk to human health and the environment.

2.4.2 Option 2: Low POP content level = 100 mg/kg

Considering the average PCP concentration in impregnated wood, at a low POP content level of 100 mg/kg, approx. 276,000 t/y of impregnated wood are expected to be classified as POP wastes and subject to the destruction requirement according to Art. 7 of the POP Regulation. The impact of this low POP content value is expected to be limited: Wood waste impregnated with PCP is a small fraction within construction and demolition waste (which is estimated at approx. 800 million tonnes) and incineration is already the main disposal option for this waste stream. Moreover, the amounts of wastes containing PCP are rapidly declining as the use of PCP in products was phased out some years ago.

All waste textiles containing PCP (681 t/y) would exceed the low POP content value and would have to be destroyed in line with Art. 7 of the POP Regulation. It is to be noted that these contaminated textiles represent an insignificant fraction of the total textile waste. According to the studies mentioned before, PCP has been used only in specific outdoor applications in few Member States. Therefore, application of this limit value should not have a significant relevant impact on the management of textile waste. However, Member States may consider assessing textile wastes that may potentially contain PCP.

3. Conclusion

We intend to establish a low POP content level of 100 mg/kg for PCP in the POP Regulation. This low POP content value should cover all PCP containing wood waste and textile waste, ensuring a sufficient level of environmental protection.

Given that most wood wastes containing PCP are currently being incinerated, the proposed low POP content value is not expected to affect significantly the costs of managing this waste stream.

As regards the textile industry, where PCP concentration in products reaches up to 25,000 mg/kg, the proposed low POP content level will mean that additional amounts of PCP containing textile waste, will have to be treated as POPs waste. The cost of incinerating this textile waste is considered insignificant as it would affect less than 700 t in the EU. The main challenge may be to identify textile waste fractions that contain PCP.

According to the analysis, the available incineration capacity (in biomass power plants, municipal and hazardous waste incinerators complying with the Industrial Emissions Directive reaching temperatures above 800°C) suffices to safely destroy the PCP contained in these waste streams. The total amount of waste containing PCP is relatively small (276,000 t in 2017) and more than 95% is already incinerated. Moreover, the amount of waste containing PCP is projected to decrease rapidly given that its use in products ceased more than a decade ago.

Annex: Methodology for establishing the low POP content

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0. General Principles

The general methodology that has been applied in the EU to establish the low POP content is described in chapter 9 of [ESWI 2011] .

The approach is based on the identification of the lower and upper boundaries listed below. Ideally, the low POP content should be in the interval of the highest value among the lower boundaries AND the lowest value among the upper boundaries, i.e. :

MAX (A, B, C, D) <= Low POP Content <= min (X, Y, Z), with:

Lower limitation criteria

A: Analytical potential

B: Environmental background contamination

C: Disposal/recovery capacities

D: Economic feasibility

Upper limitation criteria:

X: Precautionary principle

Y: Worst case scenario for human health risks

Z: Existing limit values already agreed by the European Union

Based on [ESWI 2011] and [UBA 2015], the results of the assessment of the boundaries are as follows:

1. Lower limitation criteria

A: Analytical potential: 0.1 mg/kg

[UBA 2015] states that for common waste matrices like wood and textiles a detection limit of 0.1 mg/kg should be achievable. However, it is to be noted that this analytical potential can only be achieved by applying gas chromatography/mass spectroscopy analysis.

B: Environmental background contamination: 1 mg/kg

According to [ESWI 2011], the background contamination levels in sediment vary between 0.005 to 0.030 mg/kg (values obtained from sediment monitoring in the North Sea and of rivers flowing into the North Sea). Highest reported background contamination is equal to 4 mg/kg.

C: Disposal/recovery capacities: 100 mg/kg – 1,000 mg/kg

Concerning the PCP containing wood waste, neither of the proposed definition of the low POP content is expected to cause a significant change in treatment of this type of waste. According to [ESWI 2011], the overwhelming majority of PCP impregnated wood is currently incinerated (in biomass power plants, municipal waste incinerators, hazardous waste incinerators) or . Therefore, no significant change in the incineration rate is foreseen for the low POP content level of 100 mg/kg.

As regards the waste generated in textile industry, additional 681 t/y of waste is foreseen to require incineration for the low POP content level of 100 mg/kg. The foreseen change would require a negligible increase in waste incineration and a phase out landfilling.

D: Economic feasibility: 100 mg/kg and 1,000 mg/kg

The proposed low POP content level of 100 mg/kg is not expected to impact the costs of incineration of PCP containing wood waste. A low POP content level of 100 mg/kg could affect additional amounts of wood waste as they would be classified as POPs wastes. However, given that incineration is already the main disposal option for impregnated wood, no additional costs are foreseen.

At the low POP content level of 100 mg/kg, it is expected that additional 681 t/y of specific textile waste would have to be incinerated (additional costs of 100-200 EUR/t). This cost however is considered insignificant in view of the slow amounts of waste [ESWI 2011].

2. Upper limitation criteria:

Z: Existing limit values already agreed by the European Union: No limit values for waste. A limit value for new products containing PCP and its salts and esters is established at 1,000 mg/kg. It would be inconsistent to establish a low POP content above this value.

Y: Worst case scenario for human health risks: Inhalation, oral and dermal exposure: most likely in areas situated close to hazardous waste sites and through inhalation of contaminated air, ingestion of contaminated groundwater used as a source of drinking water, ingestion of contaminated food and soils, and dermal contact with contaminated soils or products treated with the compound

According to [ESWI 2011], the critical levels in waste prone to direct application to soil (e.g. sewage sludge), to unregulated evaporation/precipitation or release to ground and/or surface water is established at 5,000 mg/kg.

X: Precautionary principle: The precautionary principle is to be applied in addition to criteria Y and Z requesting to choose the lowest feasible level. In this case, it would be 1,000 mg/kg.