Pre-assessment of PVC for RoHS2

Summary

- The hazard classification of PVC is open to challenge, and appears to have been interpreted with unjustified emphasis on worst cases.
- The PVC industry is confident that PVC used in E&E applications does not meet any of the hazard criteria
- The generation of residues from the neutralisation of incineration gases is a characteristic shared with all materials and substances containing nitrogen, sulphur or halogens. The hazardous character of such residues results from the presence of heteroatoms and toxic elements in most of the waste components. PVC is only one of many contributors and its absence would not change the hazardousness of these residues.
- Dioxin emissions by EU incinerators are strictly regulated and there are proven technologies to meet those requirements
- Dioxins would be generated during waste incineration, whether PVC is present or not. Absence of PVC would not reduce the amount generated either.

Information in documents issued by Environment Agency Austria (EAA)

According to the "second interim report" of September 2013, the results of the prioritisation of substances identified 11 substances in Priority I, 4 in priority II. PVC is the only substance in Priority III. Five substances were assessed as Priority IV.

In addition to the report, EAA posted two Excel spreadsheets on the project's Web site.

- The largest of these ("2013-EEE-substance_inventory_Sept_2013) shows PVC under the name "Ethene, chloro-, homopolymerpolyvinyl chloridechloroethylene", CAS 992-86-2. The hazard class attributed to PVC in this document is "STOT-RE (cat 1 or 2)" corresponding to the hazard phrases H 372-373. On the ECHA Website, there is no PVC notification of H 372 ("Causes damage to organs through prolonged or repeated exposure") and only one of H 373 ("May cause damage to organs through prolonged or repeated exposure"), among a total of more than 220 notifications for PVC. The result of column BG ("fulfils any hazard criteria?") in the said Excel sheet is FALSE.
- The smaller spreadsheet ("Prioritization Results") mentions PVC on row 67. Its hazard properties are coloured yellow, both for human health and the environment. All waste categories are coloured red. The explanation under Criterion (a) of waste relevance is "*PVC-recycling is limited; in (co-) incineration processes PVC has a negative impact on the process*" Criterion (b) ("*could give rise to uncontrolled or diffuse release into the environment of the substance, or could give rise to hazardous residues*"), is supported by the comment "*formation of PCDD/Fs during combustion very likely*" and Criterion (c) ("*could lead to unacceptable exposure of workers*

involved in the waste EEE collection or treatment processesò), by the comment ñ*common knowledge on effects of PCDD/F*ò

ECVM comments on this information

1) Hazard classification

PVC, like most polymers, is not subject to registration under the REACH Regulation. Hence manufacturers or importers of polymers must notify the hazard classification to ECHA, as this information is not provided by registration. The members of the Substance Identification Exchange Forum set up for registering PVC, which included all EU PVC producers, were advised to notify PVC without any hazard classification. 144 companies followed this advice.

It appears however that some other companies notified PVC with various hazard classifications. This may be because:

- Some emulsion PVC resins may contain emulsifiers above 1 %, and some of these emulsifiers may be classified as irritant, or possibly causing eye damage.
- Some companies may have considered that fine PVC particles constitute a hazard
- Last but not least, some companies may have misunderstood the regulation and may have notified the hazardousness of PVC compounds resulting from the presence of additives carrying some hazard classification which are added in the compounding step downstream of resin production.

PVC is not the only case of a substance being notified with different hazard classifications. Indeed, ECHA is aware of the situation and has taken preliminary steps to solve the problem, but it will take time. For the time being one has to work with circumstantial evidence:

- PVC (CAS 9002-86-2) is not mentioned in the ñ*List of harmonised classification and labelling of hazardous substances*òof the CLP Regulation.
- The relative number of notifications (144 versus 78). Unfortunately, the ECHA inventory does not provide any information about the volumes put on the market by the notifying entities, nor about their identity. It is known for example that some suppliers of laboratory chemicals tend to classify any substance they sell as hazardous in order to prevent potential litigation.

With respect to RoHS relevance, PVC used in E&E applications is almost exclusively used to manufacture electric cables. The cable insulation and sheathing is extruded from suspension grades, which contain neither emulsifiers, nor very fine particles (median size typically 120 ï 150 µ). **One can therefore be confident that the hazard classifications notified to ECHA, even if genuine, do not apply to PVC used in E&E applications**.

2) Waste relevance

a) PVC recycling

The allegation ñ*PVC recycling is limited*ò does not reflect reality. In 2012, 362 kt of PVC waste were recycled, including 88 kt of cable sheathing[1]. PVC recycling has grown steadily since 2000 thanks to the efforts on the PVC industry grouped in Vinyl 2010 and later in VinylPlus.

b) Neutralisation residues

Incineration of PVC waste generates HCl which has to be neutralised. Depending on the type of neutralisation agent, the mass of neutralisation residues can be close to the mass of incinerated PVC. All waste streams containing halogens, nitrogen or sulphur generate acid gases which have to be neutralised, thereby impacting the operation of incinerators. Due to the presence of other halogen sources, nitrogen and sulphur, compliance with EU regulations require all incinerators to be suitably equipped with neutralisation equipment. PVC is not the main source of chlorine in municipal waste[i] and hence is not the key factor determining the size of the neutralisation equipment. **So the only impact of PVC waste is on the operating costs of incinerators, resulting from the cost of the neutralisation materials and of disposing the neutralisation residues.**

Regarding WEEE, as mentioned in the report ñROHS ANNEX II DOSSIER DEHP - Proposal for restriction of a substance in electrical and electronic substances under RoHSò of October 2013, ñ*the predominantly electrical and electronic equipment (EEE) relevant application of flexible PVC are insulation for cables and wires*.ò (Section 2.2, page 10) and ñ*From WEEE, which are separately collected, cables are in many cases manually removed as a first treatment step*ò (Section 5.2.1, page 24). Close to 90 kt of PVC cable waste was recycled in 2012 Although part of this stream stems from non WEEE sources, this large and increasing recycling means that the amount of PVC waste in WEEE is lower than in municipal solid waste, and hence even less disrupting.

c) Generation of dioxins

Incineration of PVC in improper conditions can indeed generate dioxins. However EU Directive 2000/76/EC ñon the incineration of wasteò sets a 0.1 ng/m3 TEQ limit on dioxin and furan emissions in the exhaust gas from incineration and co-incineration plants. To comply with this emission limit incinerators operate in conditions minimising dioxin formation and are equipped with pollution control devices catching the low amounts produced.

Regarding the alleged role of PVC, one must bear in mind that plastics in general and hence PVC are not the main source of chlorine in municipal solid waste. For instance, a study commissioned by the E.U. authorities[2] includes an elemental composition table for MSW across the European Community in 1996. The table shows that the putrescible fraction contributes 35 % of the total chlorine whereas the plastics contribute 25 %.

The amount of dioxins generated during waste incineration is not proportional to the amount of chlorine present. Several studies (e.g.[3]) have shown that if the chlorine level exceeds a

[1] See http://www.vinylplus.eu/publications/70/42/Progress-Report-2013

[2] J. Bernard and al. "The Influence of PVC on the quality and hazardousness of flue gas from incineration, Bertin Technologies, April 2000

[3] Vehlow, J. *et al*, Co-combustion of electric and electronic wastes in the Karlsruhe test incinerator TAMARA. Paper presented at Recycle 97, Geneva, (February 1997)

(low, possibly below 0.1 %) threshold, there is no statistically significant correlation between the chlorine level in waste and the amount of dioxins produced.

Indeed, the European Commission stated[4] ñ*it has been suggested that the reduction of the chlorine content in the waste can contribute to the reduction of dioxin formation, even though the actual mechanism is not fully understood. The influence on the reduction is also expected to be a second or third order relationship. It is most likely that the main incineration parameters, such as the temperature and the oxygen concentration, have a major influence on the dioxin formation*ò. It stated further that ñ*at the current levels of chlorine in municipal waste, there does not seem to be a direct quantitative relationship between chlorine content and dioxin formation*ò.

d) Exposure of workers

Workers involved in collection activities and in recycling plants are not exposed to dioxins, because the temperatures at which such activities are carried out are too low for dioxin formation.

There is, as far as we know, no documented evidence that workers in incineration plants are exposed to higher levels of dioxins than the general population. Even if this would be the case, dioxins are due to the presence of all sources of halogen in waste, not uniquely PVC as explained above. Hence the explanation for criterion (c) ñ*common knowledge on effects of PCDD/F*ò is irrelevant.

[4] Green Paper "Environmental Issues of PVC" COM(2000) 469, July 2000