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A Greenpeace brief on the report

The Influence of PVC on the Quantity and Hazardousness of Flue Gas Residues from Incineration¹

published by the European Commission in April 2000

Key quote from the report:

"PVC is responsible for 38 to 66 % of the chlorine content in MSW [municipal solid waste]"

Key findings:

- Incineration of 1 kg of PVC in the EU creates on average between 0.8 kg and 1.4 kg of hazardous waste in incinerators with non-wet flue gas treatment and between 0.4 and 0.9 kg of residues of liquid effluent in incinerators with wet flue gas treatment
- Incineration of PVC creates additional costs of between 20-335 Euro/tonne
- PVC contribution to cadmium concentration in municipal solid waste is 10%
- A higher chlorine content in waste has low effects on the transfer of heavy metals from bottom ash to gas treatment residues
- Incineration of PVC significantly increases the amount of leachate from, and leachable salts in, the resulting residues

Introduction

Today the PVC industry makes promises about recycling rates and high-tech solutions like chemical recycling, but they know that this will never amount to more than a small fraction of the total PVC waste (see the reports published by the European Commission on mechanical and chemical recycling respectively). What they really aim for is incineration of most of the PVC waste. Out of sight, out of mind - and no producer responsibility.

The incineration of municipal wastes is in itself a very dangerous process - and the addition of PVC makes it far worse. Unfortunately, this study almost exclusively analyses the effects on gas treatment and subsequent generation of residues due to PVC. The generation and emissions of chlorinated organic compounds such as dioxins and furans are excluded, and the effects of a higher chlorine content on equipment and materials (corrosion) and energy recovery (operation at sub-optimised steam pressure) are not fully analysed.

Nevertheless, the analysis of the flue gas treatment of PVC incineration and generation of residues that results hereby reveals an absurd situation.

¹ Jacquinot Bernard (Bertin Technologies Tarnos), Hjelmar Ole (VKI-Water Quality Institute), Vehlow Jürgen (Forschungszentrum Karlsruhe), April 2000

Incinerating PVC increases the amount of waste

The commonly given rationale for incineration is the reduction of the weight, volume and hazardousness of the waste going to landfill. The paradox is that when we burn PVC we are not reducing waste at all - we are instead creating in many cases more hazardous waste than went into the incinerator in the first place. How is this possible?

When PVC is burned hydrochloric acid (HCl) is formed. This HCl has to be neutralised with the help of neutralising agents. The residue which is formed has a weight that equals or exceeds the pre-incineration weight of the PVC. So, instead of fulfilling the landfill weight reduction objective of incineration, incineration of PVC creates even more hazardous waste for the landfill process.

Hazardous waste created when incinerating PVC with different gas treatment processes

Today, about 500,000 tonnes of PVC is incinerated every year. Based on the figures given in the report, this leads to the formation of 339,000 tonnes of hazardous waste and 130,000 tonnes of residues in liquid effluents per year (see table below).

And it will become much worse. The present trend (see Economic Evaluation of PVC Waste Management) is that more than five times as much PVC will be incinerated in 20 years, i.e. about 2.75 million tonnes/year. At the same time there is a move away from the wet process; as *"the regulations in force in several European countries become increasingly severe for liquid effluent release, the semi wet-wet process has been derived from the wet system"*. Based on the figures in this report and projections from the report Economic Evaluation of PVC Waste Management, this leads to a yearly formation of 2.2 million tonnes of hazardous waste and 447,000 tonnes of residues in liquid effluent due to the incineration of PVC in 2020¹.

Process	kg hazardous waste/kg PVC incinerated (average)	Share of total capacity in EU		Waste produced/year in ktonnes	
		2000	2020*	2000 (incineration of 500 ktonnes PVC)	2020 (incineration of 2750 ktonnes PVC)
Dry (lime)	1.4	15%	0%	83**	0
Dry (BICAR)	0.8				
Semi-dry	1.25	25%	25%	156	859
Semi wet-wet	1	20%	50%	100	1375
Total				339	2234

Process	kg solids in liquid effluent/ kg PVC incinerated (average)	Share of total capacity in EU		Waste produced/year in ktonnes	
		2000	2020*	2000 (incineration of 500 ktonnes PVC)	2020 (incineration of 2750 ktonnes PVC)
Wet	0.65	40%	25%	130	447
Total				130	447

* Projected distribution of process type from Economic Evaluation of PVC Waste Management

** The share of the two different dry technologies is not given. The average of 1.1 was used for the calculation.

¹ This estimation is conservative as rigid PVC will amount to a larger share of the PVC waste stream in the future, thus increasing the average waste produced by the incineration of 1 kg of PVC.

Costs of PVC waste incineration

The report also states that another important property of modern incineration is heat recovery, which will make the whole process profitable. According to the report the *profit* of burning waste without PVC is around 15 Euro/tonne (investment and manpower costs are excluded). When PVC is burnt, the cost of the neutralising agent and of the landfilling of the increased amounts of hazardous residues will result instead in a *cost* that is between 20-335 Euro/tonne (investment and manpower costs excluded). So, every time PVC is put into an incinerator, the operator is losing money. This is what the PVC industry wants to promote as "energy recovery".

Heavy metals and chlorine content

It has been argued that chlorine content in incineration could be a good thing as it would transfer heavy metals from bottom ash to gas treatment residues. The findings of this study are that the higher chlorine content has no significant effect on the transfer of heavy metals and trace elements from bottom ash to gas treatment residues.

PVC will however influence the heavy metal content in the residues, as 10% of the cadmium in municipal solid waste is attributable to PVC.

Increase in leachate

The report also calculates that PVC incineration may be responsible for an increase in the amount of leachate generated from the landfilled hazardous air pollution control residues corresponding to:

- 19% for the dry process
- 18% for the semi-dry process
- 4.3% for the wet process
- 15% for the semi wet-wet process

Furthermore, the incineration of PVC increases the content of leachable salts by a factor of 2 for all residues. This means that the incineration of PVC, apart from generating more hazardous waste, also contributes to making this waste more likely to reach the environment. The authors finally state "*there is a theoretical possibility that the leaching of e.g. Cadmium may increase due to increased chloride complexation caused by PVC incineration but no data is available to substantiate this*".

Clearly, incineration makes the PVC waste problem even worse.