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GREENPEACE

A Greenpeace brief on the report

Mechanical Recycling of PVC Wastes[1]

published by the European Commission

> ***"However, notwithstanding which improvement measures are taken, an important conclusion is that mechanical recycling is not qualified to contribute significantly to the management of PVC post-consumer wastes in the next decades, reaching at most 18% of total PVC waste arising."***

Key findings:

- Total PVC waste will increase by 80% over the next 20 years
- Today only 3% of post-consumer PVC waste is recycled, producing mainly low-quality recyclates
- Mechanical recycling is not qualified to contribute significantly to the management of PVC post-consumer waste in the next decades, reaching at most 18% of total PVC waste in 2020
- In an "ecological risk minimisation scenario" which does not allow the recycling of PVC waste containing lead, cadmium or PCBs, "high-quality" PVC recycling rates would reach only 5% by 2020
- Low-quality recycling has no environmental advantages
- Much more than other commodity plastics, PVC requires the addition of a variety of different additives (2-15% for rigid PVC applications, 25-65% for flexible PVC applications), making it difficult to recycle
- PVC disturbs other plastic recycling more than other plastics disturb PVC recycling
- PVC can contribute to the formation of dioxins in thermal waste treatment processes
- Recycling of PVC-containing hazardous substances will disperse these substances into products made of recyclates

Waste amounts increase

About 7.1 million tonnes of PVC compound are used to make products in the EU each year. The amount of compounded PVC entering the waste streams in EU is about 4.1 million tonnes per year. The reason for this difference is that due to their long life span, a large share of the PVC products will not enter the waste stream for several years. The projected PVC waste for 2020 is 7.2 million tonnes per year, that is 80% more than today. How can this flood wave of PVC that is now increasingly entering our waste streams be managed? Is recycling the answer?

The reality of PVC post-consumer waste recycling

For over a decade the PVC industry has made promises[2] about PVC recycling. They have maintained that PVC is recyclable and that in a couple of years we will have European-wide large scale recycling

[1] Eckhard Plinke (Prognos), Niklaus Wenk (Prognos), Gunther Wolff (Prognos), Diana Castiglione (Plastic Consult), Mogens Palmark (COWI), January 2000

of PVC. Now, after more than ten years of putting vast resources into trying to establish PVC recycling schemes, the result is that only 3% of post-consumer PVC waste is recycled, producing mainly low-quality recyclates (down-cycling).

The future of PVC post-consumer waste recycling
And the future does not look promising. The report concludes that mechanical recycling will reach at most 18% of the total PVC waste in 2020 (see top quote).

The predicted recycling rate will be significantly lower still when the recycling of PVC wastes containing heavy metals and PCBs is excluded so as to avoid the transfer of toxic additives into new products and when a distinction between high-quality and low-quality recycling is made. High-quality recycling in the ecological risk minimisation scenario is predicted to reach only 5%.

The table below summarises the report's projections on future recycling rates. It is divided into three scenarios:

- Trend scenario: This is the result if planned measures are taken to raise the recycling rates.
- Ecological Risk Minimisation Scenario: In this scenario lead, cadmium and PCBs are not allowed to enter the recycling system and extraordinary measures are taken to raise the recycling rates.
- Selective Improvements Scenario: Toxic risks are considered as of limited importance and extraordinary measures are taken to raise the recycling rates.

Scenario	**Total waste arising**	**Total post-consumer recycling rate (high + low quality)**	**Post-consumer recycling rate high-quality**	**Post-consumer recycling rate low-quality**	**Additional Costs/year In Euro**
Today	3,600,000 t	3% (100,000 t)	1% (35,000) t	2% (65,000) t	
Trend, Year 2020	6,200,000 t	9% (540,000 t)	3% (180,000 t)	6% (360,000) t	90-110 million
Ecological risk minimisation, Year 2020	6,200,000 t	7% (410,000 t)	5% (280,000 t)	2% (130,000) t	180-190 million
Selective-improvements, Year 2020	6,200,000 t	18% (1,100,000 t)	12% (760,000 t)	6% (340,000 t)	230-290 million

Furthermore, the authors see a *"tendency towards a deterioration of the conditions for mechanical PVC recycling for the decades to come after 2020"*.

Why is it so difficult to recycle PVC?
After reading this report, it is hard to imagine anything more unfit for recycling than PVC.

- *PVC disturbing PVC recycling*: A PVC product is a compound of the PVC polymer and several different additives, which not only differ between product groups but also between producers within the same product group. To obtain the desired properties for a PVC product, it is very important to strike the right balance for all the different additives. If that balance is not achieved, a PVC material with a lower quality is produced which cannot be used for that product. This is what happens when

[2] For a description of one of the PVC industry's failed promises, see the Danish Ministry of Energy and Environment report on the Voluntary Agreement between the PVC industry and the Danish Government in "PVC Strategy, Status Report and Future Initiatives", June 1999, at www.miljostyrelsen.dk

different PVC products are recycled together. A material of low quality is produced, as it consists of an unknown mix of additives. This degrading of quality during recycling is called downcycling. Downcycling is common in plastics recycling in general because of difficulties in separating fractions, but the highly diverse composition of PVC products makes this problem worse. That is why mainly low-quality recyclates are produced from PVC waste. Such low-quality recyclates do not replace virgin PVC or even other plastics, but instead tend to replace products made of other materials, like wood or concrete. The authors state that "*the environmental benefits of low-quality mechanical plastics recycling must be regarded as low*".

- *PVC disturbing other plastic recycling*: Furthermore, the chlorine content in PVC creates problems for the recycling of other plastics. Pure PVC consists of 57% chlorine. To avoid this the chlorine from PVC is removed before or during the recycling process. The problems are best explained by the authors themselves: *"As a conclusion it can be maintained that the processing of PVC together with other plastics is generally possible. However, normally this co-processing will lead to a lower quality. In mixed plastics fractions with low PVC contents PVC disturbs the co-processing, requiring additional measures where PVC or chlorine is removed from the process. Due to this fact it seems to be questionable to speak of „PVC recycling" for this case. However, the related PVC quantities (e.g. PVC in packaging) are usually included in the recycling balances for PVC."* And this is also the case in this report. When "recycling" of PVC packaging waste is deducted, the current recycling rate drops to little more than 2%.

- *PVC disturbing other recycling operations*: Apart from disturbing other plastic recycling, PVC also disturbs the treatment and recycling of other wastes too. The authors point out that "*PVC can contribute to the formation of dioxins in thermal waste treatment processes, especially in the presence of metals. An example is the recycling of metal scraps e.g. from car shredder plants which can result in dioxin formation if the metal is coated with PVC (e.g. undercoating of cars)*."

On top of all this, the recycling of PVC, given that most PVC products contain e.g. toxic heavy metals, PCBs, chlorinated paraffins, phthalates, etc., will disperse these substances into products made of recyclates.

Clearly, PVC recycling creates more problems than it solves and can certainly not solve the problems of the PVC waste mountain yet to come.