General Notice

Influence of EVOH on recycling of HDPE packaging

CONTEXT

Ethylene vinyl alcohol copolymer, or EVOH, is a polymer commonly used in packaging manufacture. Its superior gas, aroma and flavour barrier properties protect and conserve products. To have the full benefit of these barriers, EVOH must be combined with another humidity-resistant material, and is therefore generally combined with polyolefins (PE and PP) in multi-layered packaging.

COTREP has studied the recycling properties of EVOH in specific packaging (Technical Notices 04-03 and 09-03). The study findings showed no impact on the HDPE/PP bottle recycling stream, since this packaging contains a low proportion of EVOH at < 3%.

As the sorting guidelines in France are being extended to all household plastic packaging, new types of packaging in addition to bottles (namely pots, trays, film and flexible packaging) are being added to the plastic recycling streams, which will potentially increase the proportion of EVOH in these streams.

In light of the potential increased EVOH content in recycling feedstock and the fact that it has thus far only been included in partial studies, COTREP wished to examine the influence of EVOH on recycling of HDPE and PP[1].

STUDY RESULTS

In MRFs, packaging containing EVOH is primarily channelled into the recycling stream for the main resin in the packaging, in this case, the HDPE stream.

The behaviour of EVOH was studied during recyclability tests in the lab, based on a protocol that is representative of the procedures used in the HDPE household packaging recycling industry in Europe.

During this test, EVOH was added in varying proportions to a batch of recycled HDPE (the "standard" material) representative of the HDPE recycling stream. EVOH was introduced in the following proportions: 1% (batch one) and 5% (batch 2), which are higher than the estimated proportions of EVOH in this type of packaging in the French market[2].

The analysis of the physico-chemical and mechanical characteristics of EVOH was conducted on injection moulded samples obtained from batches 1 and 2. These properties were then compared with the samples produced from a batch of 100% recycled HDPE. Both batches were also used in an extrusion blow moulding process to produce bottles with a view to confirming the resin's potential for use in the market outlets available to HDPE packaging recyclers.

The results were as follows:

[1] General Notice 53: Influence of EVOH on PP streams.
[2] With respect to the maximum quantity of EVOH in a packaging and the proportion of HDPE packaging containing EVOH in the stream, the estimated EVOH concentration in the HDPE stream is currently less than 1%.

With regard to the injection moulded products, the results showed no marked difference between the standard material and recycled HDPE with 1% EVOH. Only a slight reduction in the elongation properties of the material was found, which does not produce a significant impact on the use of the recycled material. On the other hand, from a level of 5% EVOH, the mechanical properties deteriorate significantly, especially the impact resistance of the material. The material is also harder to stretch: this finding calls its implementation and inclusion in new products into question.

With regard to the extruded blow moulded products, the properties of the standard material and recycled HDPE with 1% EVOH were more or less identical. From 5% EVOH, the parts produced showed significant surface defects. With this EVOH content, the decline in mechanical properties and surface defects make the material incompatible with this type of application.

CONCLUSION

The test results described above show that EVOH has no impact on the recycling process at a concentration of 1% in the HDPE household packaging stream. However, from 5% EVOH, recycling of HDPE packaging is disrupted.

In conclusion, with the equipment and techniques currently available and used in Europe and given the estimated proportion of EVOH in HDPE streams (less than 1%), EVOH does not disrupt recycling of HDPE packaging. However, if the quantity of EVOH on the market were to increase substantially, COTREP reserves the right to revise its opinion.

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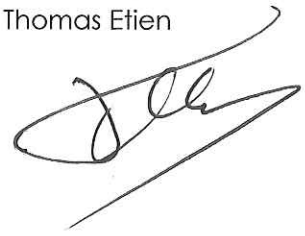

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