

Characteristics of recycle

1. Intrinsic colour recycle

The intrinsic colour of rPET and rHDPE can vary from batch to batch.

Shade variations: grey, brown, green, yellow

Adding brighteners can help improve the impact of the intrinsic colour, but the intrinsic colour of the brightener itself can e. g. make the bottles appear blue

image

Pure rPET with colour variations



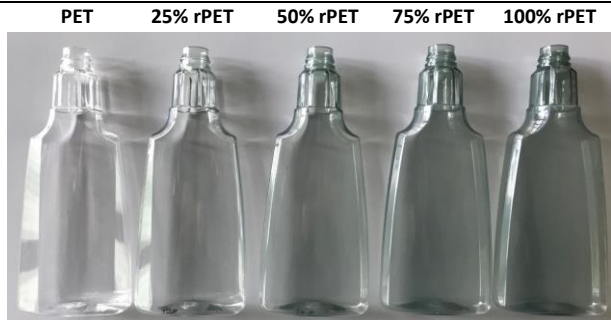
image

Colour variations: one rHDPE material - different batches



image

Different mixing ratios virgin material with rPET



image

rPET with and without brightener



Characteristics of recycle

2. Impact of the intrinsic colour on coloured recycle

The intrinsic colour of a recycled material can also influence coloured plastics. Intrinsic colour is particularly influential where transparent and light colours are used.

image
Colour variations: on the left side rPET and on the right side virgin PET with identical coloration



image
Colour variations: on the left side rHDPE and on the right side virgin HDPE with identical coloration



Characteristics of recycle

3. Black dots and specks in recycle

During the conditioning process of rPET and rHDPE material, the inclusion of foreign bodies or degraded material in small quantities cannot be completely eliminated. This can lead to black dots and specks when the material is used in production.

image
Big black dots and specks in rPET



image
Many small black dots and specks in rPET



Characteristics of recyclate

<p>image Big black dots and specks in rHDPE</p>	
<p>image Many small black dots and specks in rHDPE</p>	

4. Clouding of rPET

Specific material batches can cause a clouding effect (and give rise to a milky appearance).

image
Milky rPET bottle



5. Inherent odor of rHDPE

HDPE tends to absorb substances from its contents (by diffusion). Whenever recycled material is used there is always the possibility that odorous substances from former use can give the material an inherent odor.

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6. Mechanical characteristics and chemical stability of recycle

Different processing techniques and conditioning processes can stress recycled plastic material both mechanically and thermally. This reduces the length of the polymer chains which can, depending on the degree of damage, negatively impact the mechanical characteristics (e. g. drop test results, impact resistance, weld strength, etc.) and the chemical stability (e. g. stress cracking). Depending on the quality loss, recyclates may not meet product requirements. They may not be sufficiently durable or resistant.

image

Neck cracks – low weld strength



image

Stress cracks in the body



7. Quality variations of recycle

The difficulties in using recycles mainly consist of the following points:

a. aging process

Plastics are always subject to aging processes. This results in application limits in terms of mechanical and thermal resilience. Aging starts with processing and continues during the period of use. Recycles go through this cycle several times, which continuously reduces the quality.

b. Additives and fillers

In addition, the added additives and fillers from various waste streams make reprocessing more difficult and prevent use for some applications.

c. Diversity of plastic waste

The very diverse plastic waste is also a major problem. Unlike virgin material production, where identical raw materials can be used, waste streams often differ in composition and degree of contamination.

d. Availability and sorting

If the availability of high quality plastic waste is not constant and/or clean sorting is not perfectly possible, mixed recycles of better and lower quality are produced.

The influence of recyclers on the above-mentioned points during the recycling process is very complex and requires great effort. It is therefore currently not realistic to ensure a consistent quality of the recycles over a longer period of time, similar to that of virgin material.

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Conclusion

By way of summary, it can be asserted that the use of recycled material in the production of plastic packaging can inhibit product quality. It is not generally possible to predict with a great degree of accuracy how recycled material may impact upon product quality, as several factors and process parameters can impact the optical, mechanical and chemical characteristics of the end product.

All parties have to be aware that a constant quality cannot be guaranteed when recycled material is used. The quality is highly dependent on the recycled material available and may even vary significantly within a batch.

As a plastics processor, we have no influence whatsoever on this.

This does not mean, however, that the use of recycled material should be automatically avoided. If the characteristics of the material are considered acceptable, then nothing should prevent the use of sustainable materials for a given project.

However, if recycled material is to be used, careful project planning and diligent control with risk assessment is of paramount importance:

The customer needs to define the full scope of his requirements and to communicate this to all internal and external parties. Here, both the optical and mechanical requirements have to be determined and the long-term compatibility with the contents has to be tested.

The use of recycled material is only advisable when the impact on specific requirements is understood in relation to product quality.

Disclaimer

If a certain percentage of recycled material is used in the manufacture of the product according to the customer's specifications, various characteristics in the sense of deviations from the use of pure virgin material according to this list of characteristics may therefore occur in the finished products. The corresponding deviations are caused by the use of recycled material and both warranty claims and claims for damages in case of occurrence of deviations are excluded.

History

date	modification
17.04.2023	Revision and adding images