General Notice

Use of an additive load with density > 1 in PP packaging

In this notice, COTREP addresses packaging where the majority of the resin is PP with additives made of materials whose density > 1 g/cm³.

When the PP is reprocessed, the material will follow the process shown in the diagram below:

(Optional)

After grinding, the materials are floated in water. With a density of 1 g/cm³, water separates the PP flakes from impurities with a density > 1 g/cm³. The PP flakes float, and the impurities sink. Only those flakes with a density < 1 g/cm³ are conserved by the process.
If the mixture of additives with a density > 1 g/cm³ with the PP is sufficient to alter the total density of the material and increase it above the threshold of 1 g/cm³, it will be prevented from floating and will sink with the other impurities. This eliminated matter **will not be recycled**, and will also result in **a loss of material yield for the recycling operator.**

Determining the maximum proportion of an additive load of known density:
*We can use the formula below to calculate the maximum additive quantity (**A**%) to introduce so that the final density of the packaging does not exceed 1 g/cm³:*

$$[d_1 \times \mathbf{A} + d_2 \times (1-\mathbf{A})] < 1$$

$$\text{therefore } \mathbf{A} < (1-d_2)/(d_1-d_2)$$

Let us take the example of an additive load with a density $d_1 = 3.58$ g/cm³ in a homogeneous mixture with a PP matrix with a density $d_2 = 0.92$ g/cm³.

*In this example, the formula then becomes: $A < (1-0.92)/(3.58 - 0.92)$ therefore **A < 0.03 (3%)**:*

- *Mixing additives in a ratio of up to 3% of the load under consideration, the material will float and will not be lost (density less than 1 g/cm³);*
- *Mixing additives in a ratio of 3% upwards, the material will sink and be lost (density > 1 g/cm³).*

CONCLUSION

With the techniques and equipment currently available and in use in Europe, any additive load with a density > 1 g/cm³ introduced into PP packaging in sufficient proportion to increase the overall density above 1 g/cm³ prevents this packaging from being recycled.

Accordingly, COTREP recommends limiting the use of additive loads with a density > 1 g/cm³ to proportions that do not raise the final density of the PP packaging above the threshold of 1 g/cm³.

Please note: In addition to the impact on density, an additive load could also have impacts on the equipment and on the final properties of the material. This requires more accurate definition, since it will vary according to the type of additive load used and the input ratio.