

RECYCLING MARKERS & CHALLENGE TEST

SAFE SUSTAINABLE SOLUTIONS



WE HELP COMPANIES TO PERFORM THE CHALLENGE TEST

The decontamination yield of a recycling process is measured by performing specially designed tests called "**challenge tests**", which mimic the real technology as closely as possible. In these challenge tests, the plastics to be recycled are added with a series of surrogate contaminants and they are subjected to the recycling process afterwards, either in a recycling plant or in a pilot plant. The surrogates used should have a molecular weight and polarity range that should be representative of the possible contaminants of concern, of their diffusion and their absorption behavior. The yield or decontamination efficiency of a recycling process is determined by analyzing the residual concentration of substitutes in the plastic when subjected to all stages of the actual recycling process.

It has not been published a dedicated list of substitutes for all polymers; for PET, the EFSA (European Food Safety Authority) has published a specific guideline with a list of substitutes that can be used, which should be re-evaluated for other materials.



OUR SOLUTION

Usually, the abundant data available for recycled polyethylene terephthalate – PET is also used in polyolefin clothing. But many articles explore the differences in the basic properties and contaminants typical of polyolefins compared to PET.

Most studies extrapolate the results obtained for PET to polyolefins, which may not be scientifically based. PET is a vitreous polymer at room temperature and usable in the vast majority of cases. In contrast, polyolefins are rubbery; they show poor functional barrier properties. The diffusion coefficient of a given substance is orders of magnitude lower in PET than in polyolefins, so that the possible migration of absorbed contaminants is much lower for PET.

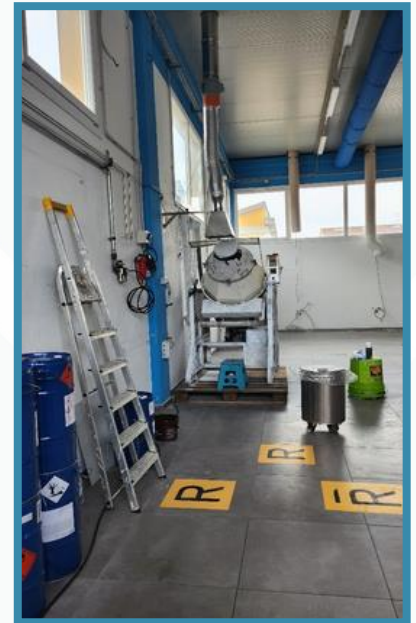
We select specific markers for each type of polymer

In the R&D plant of Food Contact Center, a machine and a process have been set up, in order to operate the contamination of plastic products that will then be subjected to the recycling process by the customer who will have to validate his plant, verifying its efficiency, evaluating the residual presence of contaminants after the recycling phase.

Within the R&D plant, challenge tests are carried out on PET and other polymers such as Polyolefins, which involve the addition of volatile and semi-volatile contaminants detectable with GC MS technique and non-volatile contaminants that can be washed with the LC Q TOF technique (Vera, Canellas and Nerín, 2018).

- Contamination of flakes with known quantities of substitutes with the set-up inside the tumbler
- Daily operation of the tumbler to allow homogeneous contamination of the flakes
- Continuous sampling during the contamination period to verify the progress of the challenge test.

Food Contact Center also participated in the collaborative study of recycled polyethylene articles and granules, organized by the Italian Packaging Institute, and works actively with the [KOR GROUP](#), the testing platform developed in synergy with [PetCore](#). Food Contact Center also participates in some Challenge tests conducted in collaboration with the University of Bangkok (Faculty of Agro-Industry Kasetsart University).



The Management's Laboratory

