

Brochures:
viscoSTAR technical data



deCON technical data



recoSTAR PET technical data



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viscotec
Solid State Polycondensation



Food grade PCR PET produced with viscotec decontamination technology exceeds the requirements of national and multinational food authorities. Long term material monitoring shows no difference between R-PET decontaminated by viscotec and virgin material.



deCON

viscoSTAR

- EFSA and FDA compliance
- iV increase of flakes and pellets
- AA reduction to less than 1 ppm
- Output moisture less than 50 ppm
- Approval in cooperation with Fraunhofer Institute for Process Engineering and Packaging (IVV)



Consumer safety and sustainability is no longer a “maybe” for PCR PET in food grade applications.

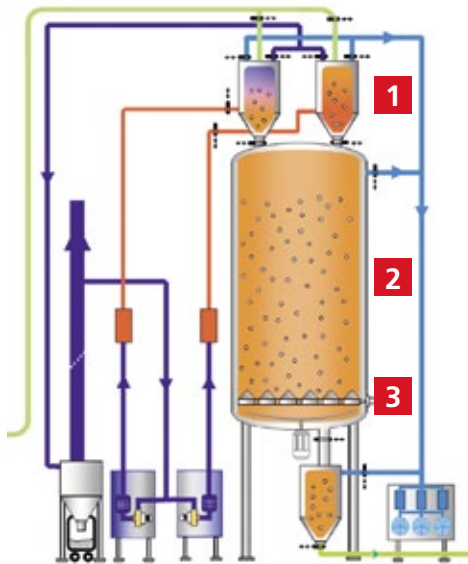
The US FDA and the European EFSA have set standards for the recycling process of PCR plastics for food applications (e.g. trays and bottles) by establishing migration limits for undefined or harmful PCR substances. Though, even if these PCR substances are well below the specified limits they cause high consumer concern.

Paying highest attention to customers’ and brand owners’ food safety interests, viscotec’s philosophy is to provide a recycling process with maximum cleaning efficiency where hazardous PCR substances are no longer detectable.

viscotec petitions for FDA and EFSA are made in close cooperation with Fraunhofer IVV, Germany, the leading laboratory for packaging.

Designed for food safety without compromise

The decontamination of R-PET is based on diffusion, the physical principle that a contaminant always moves from a region of higher concentration to a region of lower concentration. This is influenced by time, temperature, and the surface to volume ratio of the particle to be decontaminated.



- 1

Preheater
Heating of the material to reaction temperature before the reactor guarantees constant processing temperatures during reaction time.

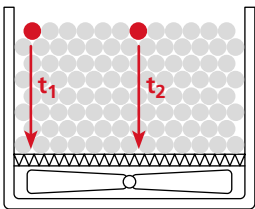
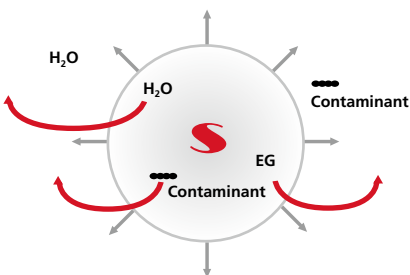
- 2

Dynamic vacuum treatment
Due to the reduction of the boiling temperature, all contaminants evaporate when reaching the PET surface. As a result, shorter residence times at lower temperatures with an outstanding decontamination performance are achieved with viscotec technology.

- 3

First in first out principle
The design of the viscoSTAR and deCON outlet ensures a constant treatment time of the material in the reactor.

viscotec: constant temperatures, treatment times, and phase change of the contaminants result in an outstanding decontamination performance at lower processing temperatures and shorter residence times.



$t_1 = t_2$

The proof

viscotec's technology is verified by challenge tests under worst case conditions and by frequent long term gas chromatographies at customers' installations worldwide.

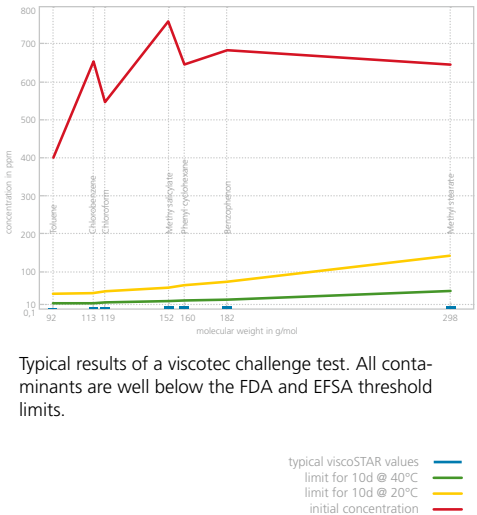
Challenge tests

PCR chemicals can migrate into PET and its packed food. The FDA and EFSA have concluded that a challenge test has to prove that a recycling process is able to remove chemical substances to a point where:

- human health is not endangered
- no unacceptable change in the composition of the food occurs
- no unacceptable smell or taste of the food appears

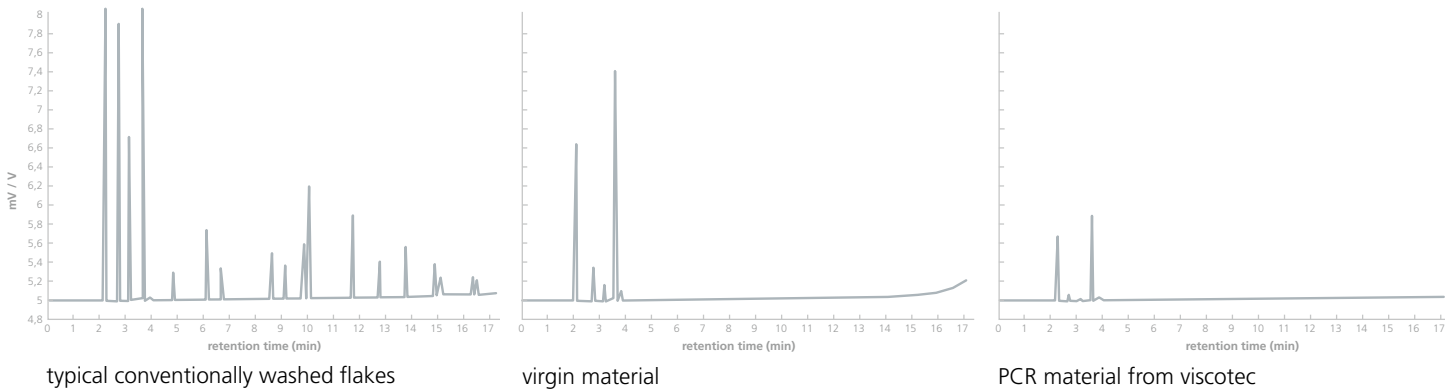
The max. accepted level of undefined chemicals in the final product is 10 ppb. This results in a max. allowed concentration of these contaminants in PET packaging intended for food contact, depending on their respective molecular weight.

viscotec challenge tests are based on worst case conditions: The artificial contaminated flakes are enriched with defined chemicals to levels from 500 to 1000 ppm and subsequently - **unwashed and without mixing** of the contaminated material with uncontaminated material - processed in the reactor.



Gas chromatographies

Gas chromatographies, used for testing the purity of PET and frequently performed at customers' plant sites for quality reasons, always show the same excellent performance of viscotec's decontamination: **no differences to virgin material**.



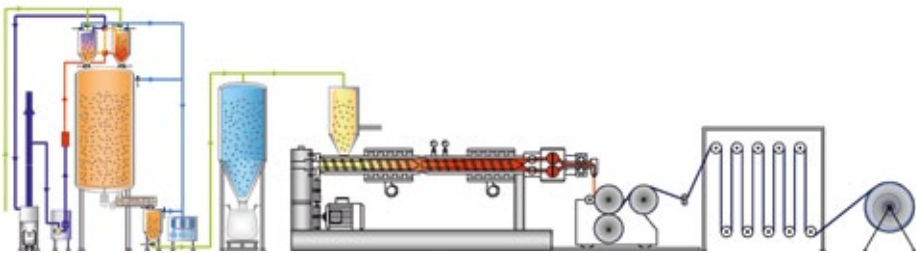
Inline decontamination

of flakes in front of a production extruder or injection molding generally has the following advantages:

- **better color** due to only one heating step and thermal treatment under vacuum
- **reduced production costs** resulting from lower energy consumption and less investment due to one heating step only



Flakes to food grade sheet

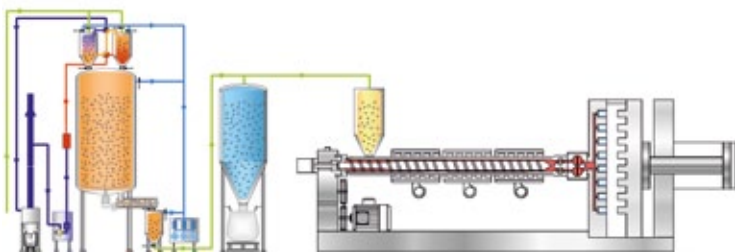


The deCON or viscoSTAR reactor converts each sheet line into a full PCR PET sheet line without compromises.



- **higher iV** of the final sheet leads to better and faster processing of the material in thermoforming machines with fewer brittle cups or trays

Flakes to preforms



Due to the latest developments, preform injection molding machines are capable of processing flakes with an included screen changer.

- **supercleaning** of the flakes instead of the conventional drier allows the processor to use conventionally washed flakes



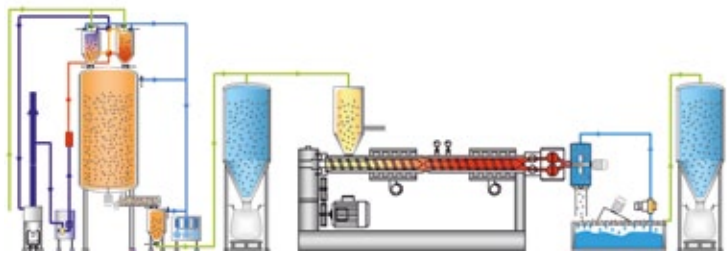
The pelletizing route

Decontamination in front of the recycling extruder and optional additional decontamination of the final pellets in the viscoSTAR lead to higher productivity on the production extruder in case of quality variation of the input flakes. This is due to the fact that the production extruder is then fed with

- **melt filtrated pellets** with
- **same bulk densities** and
- **flow properties as virgin material**



Flakes to food grade pellets/recoSTAR PET FG+



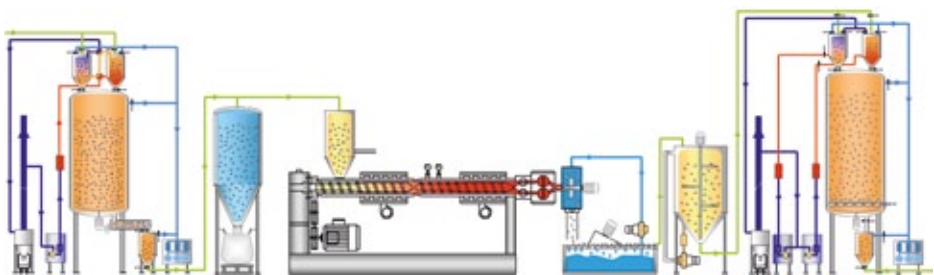
The deCON in front of the Starlinger recycling technology pelletizing extruder dries, preheats and decontaminates the material. It is subsequently melted, filtrated, and pelletized, ideally with inline crystallisation, in the recycling extruder. The line has an excellent cost-benefit efficiency in terms of investment and production costs.

The final pellets have

- **the same or a slightly increased iV** compared to the input flakes
- full food compliance acc. to **FDA** and **EFSA** incl. hot fill



Flakes to food grade pellets, FDA²/recoSTAR PET iV+ Superior



The additional viscoSTAR reactor after the Starlinger recycling technology pelletizing

- **multiplies the decontamination efficiency** of the R-PET to non detectable levels after the challenge test
- the **iV can be raised to virgin levels or above**
- **unwanted substances**, which are formed during extrusion due to chemical reactions, such as AA, **are removed** from the final pellets again

FDA², the ultimate solution for PCR PET recycling. Not only clean, but also pure PET like virgin material.

