



Petcore Annual Conference 2022
14th-15th June 2022

PET Depolymerisation and Food contact

The Need for Chemical Depolymerisation

Definitions

PET Chemical Depolymerisation is a form of recycling and is abbreviated as:

RMonomer - monomers that are the product of the depolymerisation of PET.

ie rPTA, rMEG, rBHET

Typical production processes - hydrolysis, methanolysis, glycolysis, enzymatic et. al.

CRPET - PET which has rPET content and is processed in a PET manufacturing plant

Known as Flake Injection or Flake to Resin™

rPET - the product of Mechanical Recycling processes.

Typical production routes - Erema, Starlinger, Polymetrix et. al.



The Need for Chemical Depolymerisation

The Single Use Packaging Directive:

(Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment.)

SUPD Requirement on PET:

A separate collection target for plastic bottles of 77% by 2025 and 90% by 2029; and, a target to incorporate 25% of recycled plastic in PET beverage bottles as from 2025 and 30% in all plastic bottles as from 2030.

The Collection Target - which country has or is implementing separate collection of PET bottles? This is an issue for Member States to address?

The 2025, 25% recycle content for PET bottles target. This is an industry target and needs discipline?

The 2030, 30% recycle content for all bottles target. The PET industry leads?

The Need for Chemical Depolymerisation

The 2025, 25% recycle content for PET bottles target. This is an industry target.

The Problem (2021)

- There were 2.7million tes PET sales into bottles.
- There was 2.5million tes PET collected
- Of the above 2.5million, 0.7million tes was recovered as rPET bottle polymer

- Depending on how you do the maths you get either 20% or 26% rPET for new bottles. This is a problem for Europe as there is barely enough food grade to hit the 2025 target.

- SUP accounting takes into consideration the caps and labels none of which (currently) has recycle content, and they constitute a significant weight to the bottle (8-10%), in practice there will be a need to add around 27-33% rPET in the bottle body to hit the 25% bottle target.

- There are many companies who claim 100% rPET and this is either wrong (because they do not know how the accounting works) or greenwashing, and is arguably damaging to SUP targets.

The Recast Plastics Recycling Regulation - Effects

When published:

- Finally (has taken 14years) authorises Mechanical Recycling processes.
- Includes Chemical Recycling of polymers and lays down certain requirements on Chemical Recycler's.
- Pyrolysis processes and depolymerisation to monomers listed in 10/2011 - excluded.
- Essentially, the recast regulation is the mechanical regulation with certain types of PET depolymerisation tacked on, no other polymers currently fit the recast regulation requirements.
- It now regulates processes that have been operating safely under 10/2011 for more than 10 years
- It is confusing and burdensome for industry, and does not affect consumers

The Recast Plastics Recycling Regulation - Effects

Chemical Recycling - Confusion and Burdensome?

- Food contact regulation is based on known inputs (10/2011 listing), and measures migrational outputs. Today what is important is studying the polymer science and understanding that it is the output that is important. The science of PET today is very well understood. Is it is time the FC regulations were technically scrutinised to check they are still appropriate, can be improved, be more efficient?
- Recycle approvals are based on “old” science, There is no need for input measures/challenge tests and public reporting requirements for CR inputs. These processes are designed and do work to remove contamination to a level where there is no threat to consumer safety.
- Measuring the output (via NIAS) is the very important control measure we should all use and should be carried by all parts of the value chain.

The Recast Plastics Recycling Regulation - Effects

Chemical Recycling - Confusion and Burdensome?

- It accepts recycled monomers but refuses to accept recycled prepolymers yet both products go through similar processes to become monomers for PET. Both processes produce similar products to the same high purity which is need for PET manufacture.
- It forces Industry to form Consortia, to produce extensive dossiers, to publish confidential business information, possibly lead to antitrust issues, to analyse excessively, with no time line to completion with no definite end point and as such threatens the very large investments need to construct chemical recycling plants (*if EU is to go fully circular by 2030 there will be a need to build plants to recycle 3-5 million tes PET/year*).
- It is not clear on how the EU will handle imports of recycled products.
- FI processes have operated safely for more than 10 years in the EU. The US, for longer and are well understood and safe for consumers. In fact the US F&DA no longer ask for data on these processes.
- All new processes are “novel” for an undefined time before they become “Suitable”

The Recast Plastics Recycling Regulation - Effects

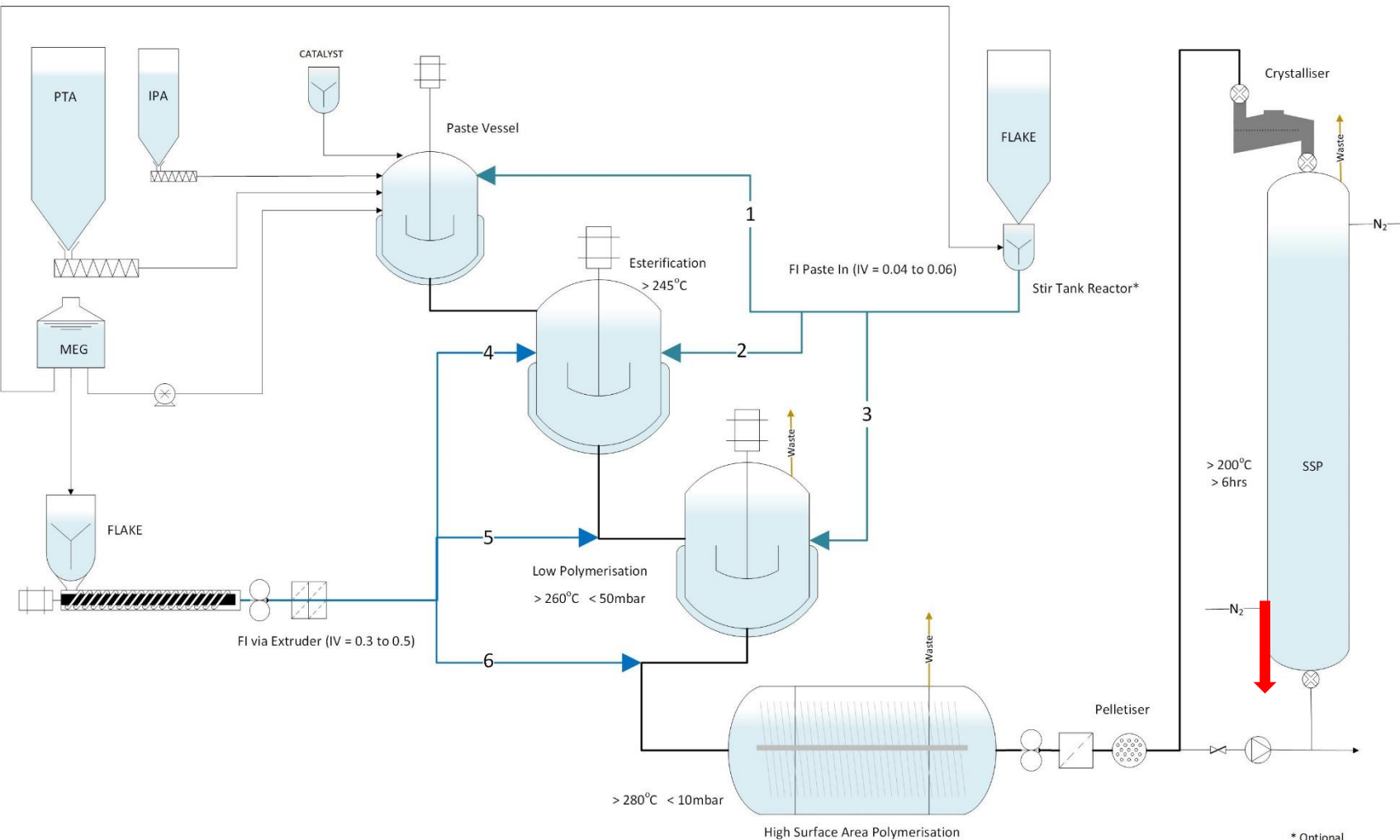
Chemical Recycling - we are stuck with a Regulation - what now?

There are two main PET Chemical Recycling processes which fall under the regulation, what are the options?

- 1) Flake Injection - uses clean washed PET flakes and add them directly into a PET plant, they are depolymerised to 3-12 ru's (prepolymers) then repolymerised under high temperature and high vacuum to produce virgin quality CRPET.
- 2) Depolymerisation to BHET. Uses a range of chemical techniques, which can use a range of variable purity PET feedstock (packaging-> clothing -> carpets), to produce pure BHET suitable for virgin quality PET manufacture .

The Recast Plastics Recycling Regulation - Effects

FLAKE INJECTION – PET Production Process



The Recast Plastics Recycling Regulation - Effects

Chemical Recycling - we are stuck with a Regulation - what now?

Flake Injection.

Novel? The technology not well understood ? or very data rich?

The Flake Injection process has multiple injection points. By the time the polymer gets to the **Red Arrow** the polymer has become virgin quality.

Will the regulation allow all FI processes to be covered under one simple light “Authorisation” given the large amount of world wide data?

The Recast Plastics Recycling Regulation - Effects

Chemical Recycling - we are stuck with a Regulation - what now?

BHET - 2 Options

- The PET manufacturing process requires very high purity monomers. It is not possible to make PET with low purity monomers.

Option 1

- There are a number of process to make BHET to a purity suitable for PET manufacture. Will the regulation force each process to be approved to move from Novel to Suitable? What data will be required? How much data will be required? How long will it take? Why not a very light approval process as BHET is chemically “pure” and undergoes a further very rigorous chemical process to make PET.

Option 2

- Apply for an EFSA approval under 10/2011. Why when the BHET is allowed anyway? If an approval is absolutely required it should be a “light” requirement, possibly just a purity requirement as both the monomers used to make BHET are listed and BHET is an intermediate product in PET manufacture.

Final Comments

- All outputs from CR are subject to 10/2011 and to the recast - is possibly/probably unnecessary regulation?
- The recast puts unnecessary technical, financial and investment uncertainty burdens on industry.
- The recast will almost certainly hinder our requirement (we are all citizens) of the SUP and other regulations on sustainability and circularity.
- The “recast”, a “technical” regulation, was written without technical input from industry, and does not seem to understand or take into consideration the science of manufacturing polymers.
- The recast makes no difference at all to the outputs of CR, the citizen requirement to ensure consumer safety could, and should have, been dealt with far more effectively and efficiently.

This comments in this presentation are my own opinion and do not represent those of any Company or Association.



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