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Material Value Chains

# Plastic pyrolysis to liquids (PTL)

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## Plastic waste recycling via thermal conversion

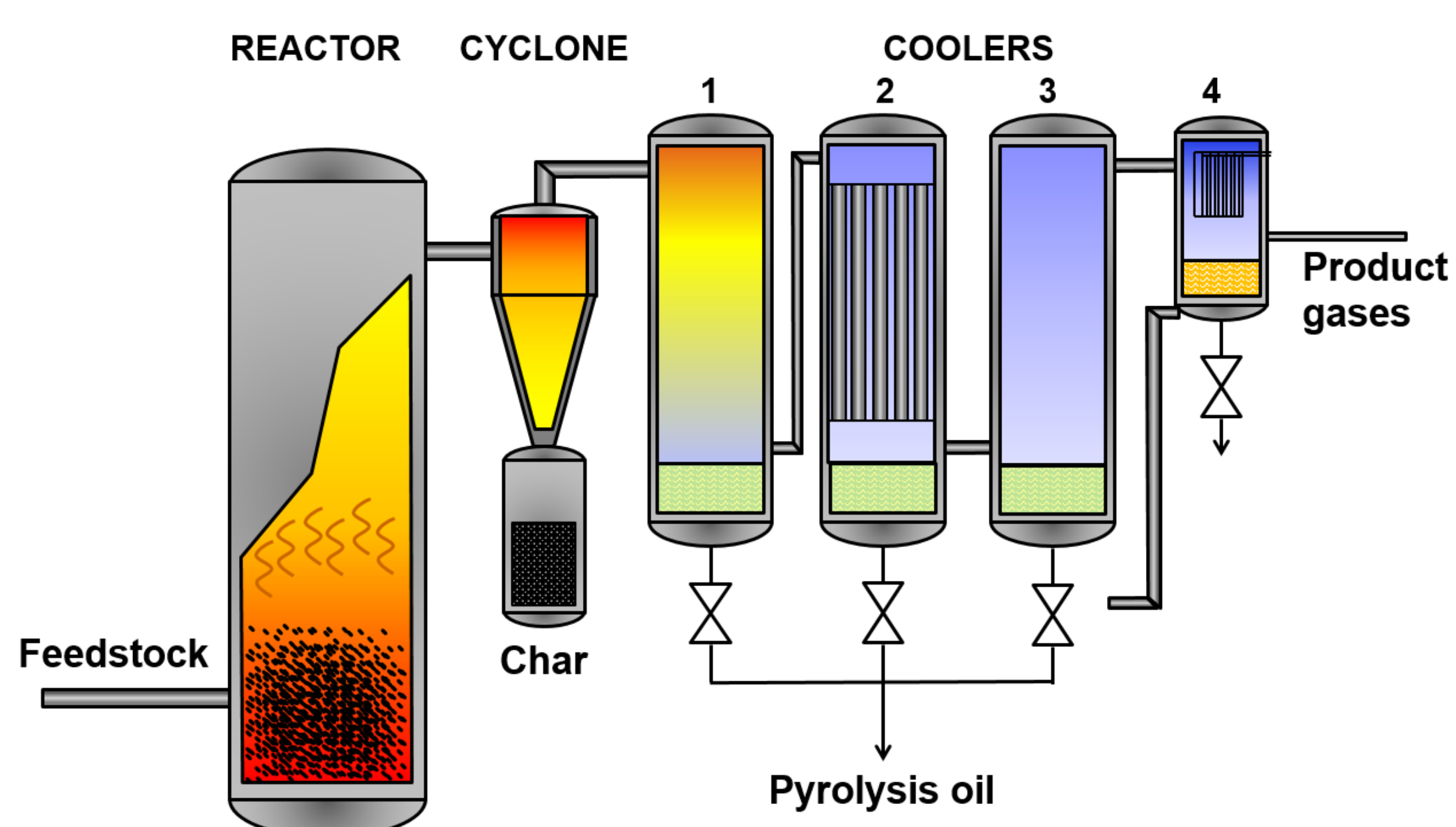
Plastics form a complex and heterogeneous waste stream that is currently poorly exploited. Annually, 26 Mt of post-consumer plastic waste is generated in Europe, of which less than a third is collected as suitable for mechanical recycling. An answer to this challenge is to apply thermal conversion to boost the plastic waste recycling. Thermal conversion methods such as pyrolysis are designed to accept heterogeneous feedstocks and can tolerate many forms of contamination. With pyrolysis, plastic waste can be converted into monomers, other chemical raw materials, or fuels. Although these methods are not commonly used in plastic waste recycling yet, their recent technical developments create an interesting starting point for the final commercialization.

Together with industrial partners VTT has started a research on thermochemical recycling of plastic-containing wastes. The aim of the first bench scale trials was to study the suitability of fast pyrolysis for heterogeneous waste-derived feedstock.

## Experimental work

Extensive literature study was conducted prior to design of experiments. The aim was to convert plastic-containing samples into liquid products using a bench scale bubbling fluidized bed reactor.

### VTT Bench-Scale (1 kg/h Feed) Fast Pyrolysis

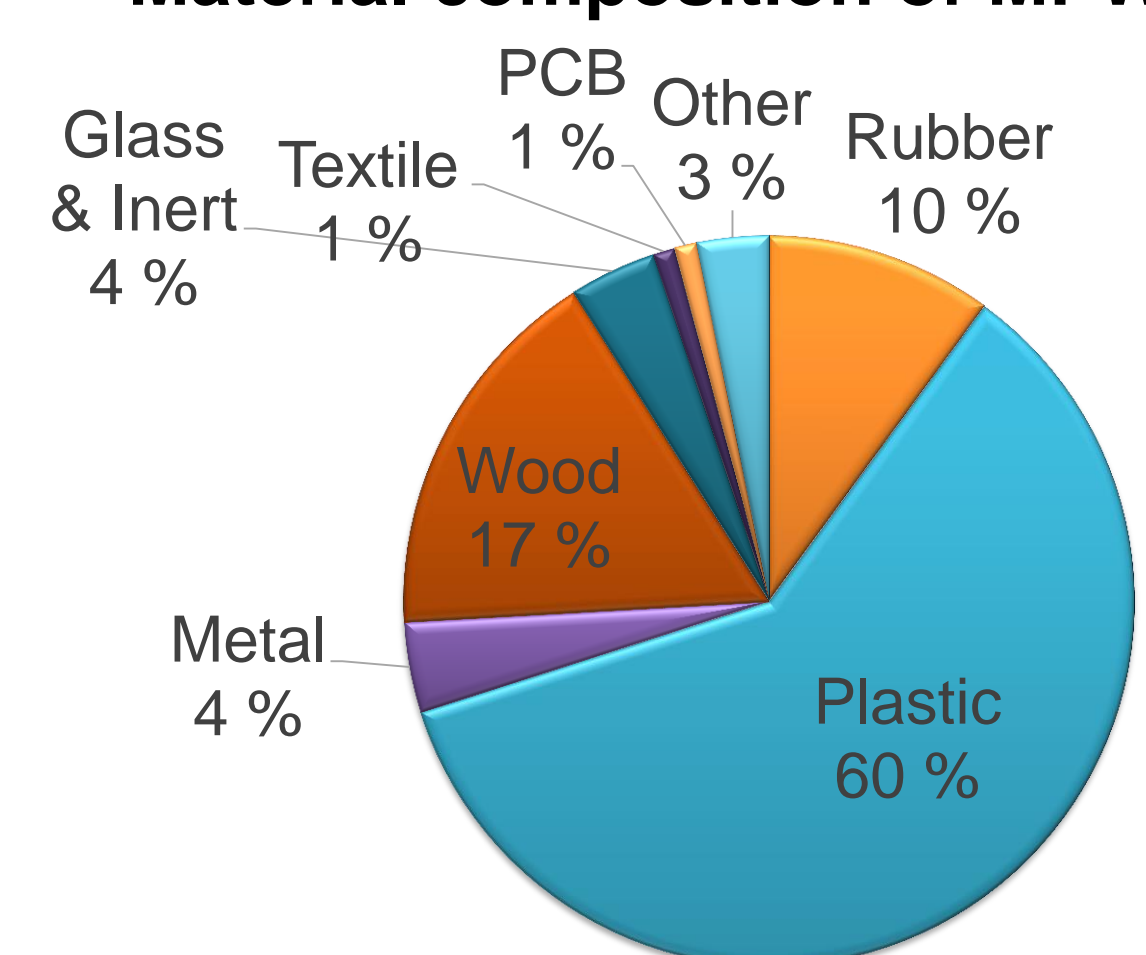


The trials were conducted to two characterized samples:

- **Mixed plastic waste sample (MPW)** contained miscellaneous plastics from WEEE treatment, currently no utilization in Finland
- **Polypropylene (PP) granulate** was used as a reference

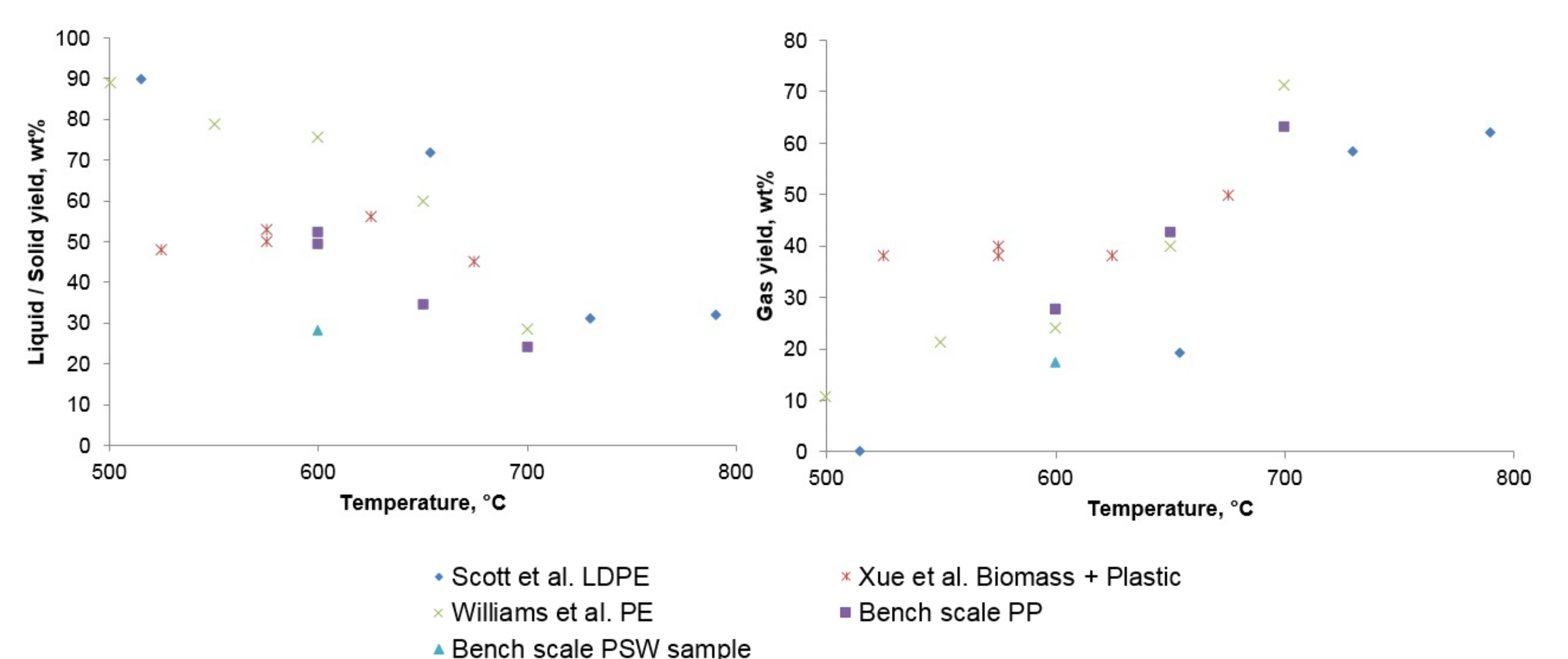


Material composition of MPW sample



## Results

- Pyrolysis was successfully applied for both samples, and yields were promising. As expected, the liquid yield for waste sample was slightly lower than with PP
- Temperature affected both the yield and the composition of liquid product
- Liquid product composition depends on feedstock quality and processing conditions
- No feeding or fluidization problems were observed
- It is important that feedstock is well characterized in order to find suitable pyrolysis conditions
- A techno-economic analysis was carried out



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