

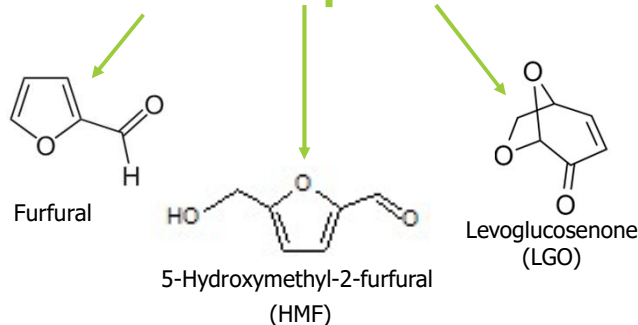


# Scaling up of bio-based monomers and polymers

## Scale-up of bio-based monomers

- ❖ Diamines
- ❖ Diols
- ❖ Precursors for aza-Michael chemistry

## Bio-based platforms



Platform	CHAMPION monomers	Synthesis partners
Furfural	Diamines	Wageningen VTT
HMF	Diol, diamines	AVABIOCHEM VTT
LGO	Diol, diamines	CIRCA VTT

## Reactors for scale-up of bio-based monomers



Dual jacket glass 3.5L reactor at AVABIOCHEM



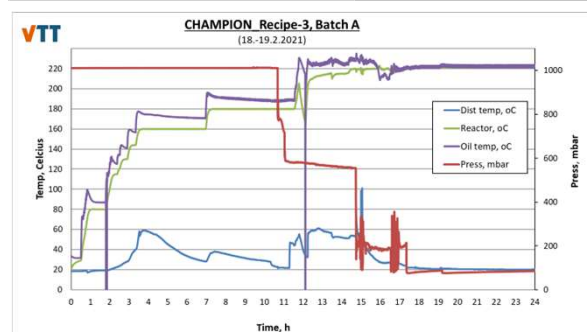
Amar 10L pressure reactor at VTT

## Scale-up of selected polymers

- ❖ Unsaturated polyester precursors for cross-linked aza-Michael polymers production
- ❖ Water soluble polyesters for pendant aza-Michael polymers
- ❖ Applications: thermoset coatings, structural adhesives, home care additives

## Efficient scale-up of CHAMPION polymers

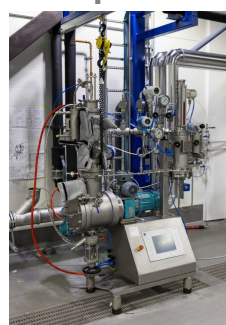
Process data, on-line measurements	Off-line measurements
Reactor temperature	Molecular weight (GPC)
Reactor pressure	Chemical composition (NMR)
Heating jacket temperature	
Mixing speed	



## Reactors for scale-up of selected polymers



Juchheim 2L bench scale reactor at VTT



Lödige 10L reactor with horizontal mixer at VTT



## Conclusions

- Scale-up of furfural- and HMF-based compounds demonstrated at different batch sizes using 3.5L glass reactor and 10L autoclave reactor.
- Scale-up of LGO-based compounds demonstrated at 200-600 g scale, with a lower yield in some cases.
- Scaled up processes for production of unsaturated polyesters and water soluble polymers were successfully implemented. The most suitable polymerisation processes for enhancing the molecular weight, while at the same time avoiding the unwanted crosslinking reactions during polymerisation, were identified.
- The total amount of unsaturated polyesters produced at VTT during the project was 22.8 kg.

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