

Advanced catalytic upgrading at VTT

Bench-scale reactors for catalyst research and process development at VTT Bioruukki, Espoo, Finland

Applications

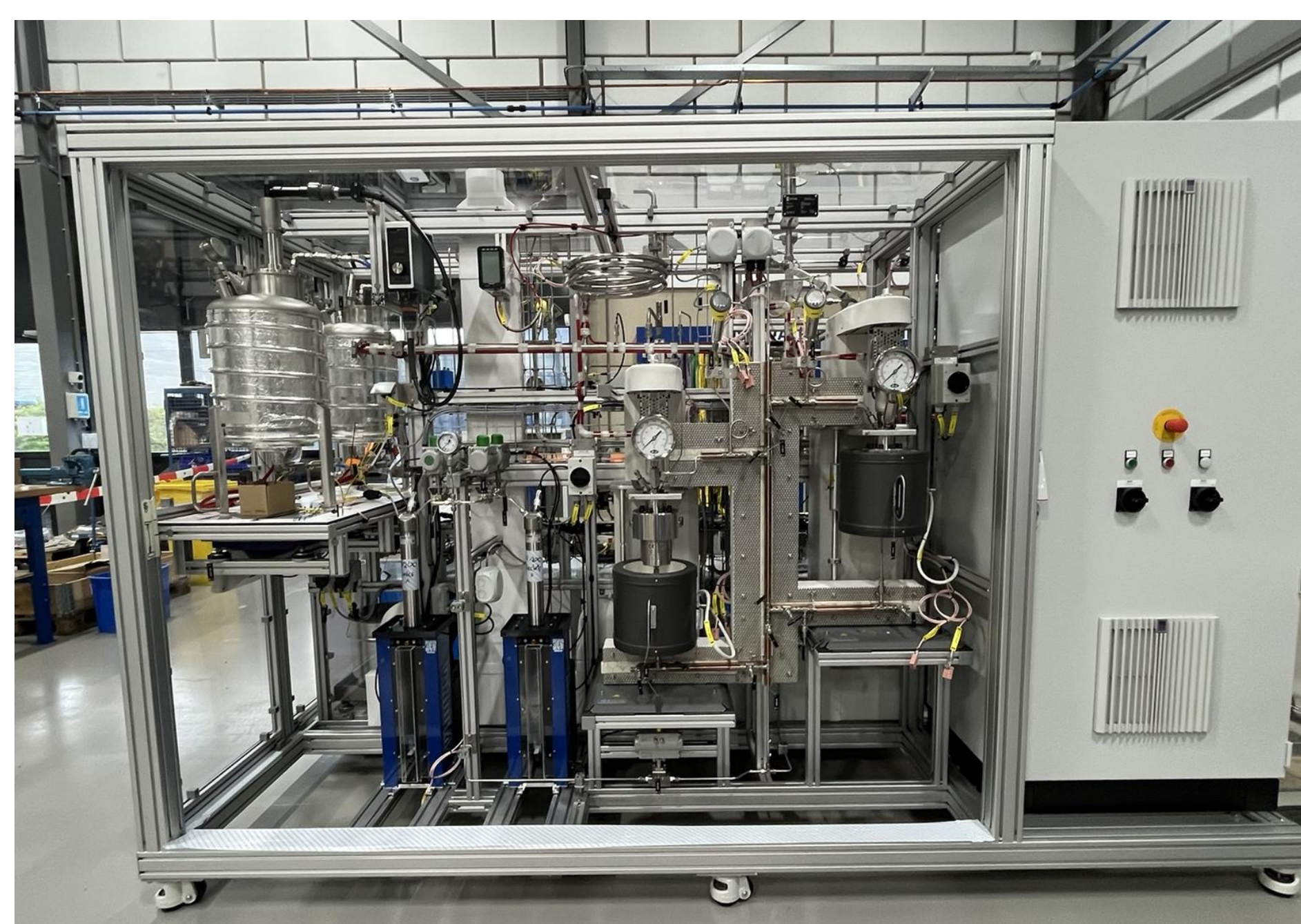
VTT has several reactors suitable for catalyst testing and optimization, feedstock screening, benchmarking, deactivation studies, hydrotreatment, hydrocracking, isomerization and sample manufacturing. Our expertise includes upgrading complex, waste- and residues-based feeds, such as plant-based oils, animal fats, gas oils, plastic and residue-derived pyrolysis oils and Fischer-Tropsch crude.

Depending on the application and feed quantity, a typical test run duration can vary from one hour with a single fixed-bed pipe reactor unit up to 3 months with the high-throughput (HTR) reactor system.

VTT experts will support the customer in selecting optimal catalyst, reactor and upgrading conditions. We develop stand-alone and co-processing upgrading strategies for a broad range of feedstocks.



High-throughput test unit with 4 parallel fixed-bed reactors.



CSTR slurry miniplant for highly challenging feedstocks.

Equipment specifications

High-throughput fixed-bed reactor (HTR)

- Four parallel fixed-bed reactors or two in series
- Individual operation with two separate feed pumps
- 24/7 continuous operation
- Automated data collection and sampling
- Max. reactor pressure 180 bar
- Max. reactor temperature 450 °C
- Feed lines can be heated up to 120 °C
- Max. continuous feed rate 4 ml/min
- Internal diameter of the reactors 15.5 or 18.9 mm
- Catalyst bed volume (isothermal area) up to 130 ml/per reactor

Other fixed-bed reactors

- 4 individual lab-scale reactor units
- Manual operation and sampling
- Operation max. T 450 °C, pressure max. 100 bar
- Catalyst bed volume 10-180 ml
- Automated data collection incl. gas flow, pressure, temperature

CSTR slurry miniplant

- Two 250 mL CSTR reactors in series
- Up to 20% solid content in feedstock
- 24/7 continuous operation
- Automated data collection and sampling
- Max. reactor pressure 180 bar
- Max. reactor temperature 470 °C
- Treating highly reactive, unstable, solid-containing feeds

Supporting analytics

Online GC for HTR and CSTR systems

- C1-C14 hydrocarbons, H₂, O₂, N₂, H₂S, CO, CO₂ and H₂S

Offline liquid analytics

- CHNSO
- Density, pour and cloud points
- Bromine index/number
- KF water titration
- Metals, halogens
- etc.

Contact:

Eveliina Mäkelä
Senior Scientist
+358 504662328
eveliina.makela@vtt.fi

Antero Laitinen
Manager Process Chemistry Development
+358 505634109
antero.laitinen@vtt.fi