B4500 SERIES
TRICKLE-BED APPLICATIONS

THE HIGH THROUGHPUT EXPERIMENTATION COMPANY

Set-up of 2x2-fold test rigs with GC system

APPLICATIONS

- **Hydrocracking**
- **Hydrotreating (HDS, HDN, HDM, HDO, HDA)**
- **Dewaxing and hydrofinishing**
- **Bottom-of-the-barrel upgrading**
- **Bio feedstock conversion**
- **Pyrolysis oil upgrading from plastics recycling**

hte's B4500 is optimized for high-pressure trickle-bed applications in down- or up-flow mode and in-series configuration. Complementary to the X4500 High Throughout Experimentation unit, the bench-scale system allows individual catalyst testing with larger liquid quantities.

BENEFITS

- Top-notch solution - high reproducibility, industrially relevant data and broad variety of on- and offline methods
- Robust - reliable, fully automated, turnkey ready solution with high up-time
- Digitalization - advanced analytics & software solutions enabling fully digitalized workflow solutions
- Global service - readily operational at your site through chemical validation. With our top-rated service professionals operating all over the world, we provide personalized support
- Strong expertise - decades of customized R&D projects, technology, and production know-how
- High flexibility - operational mode and catalyst volume (typically 25-100 mL)

LUBES
WAX

NAPHTHA
KEROSIN
DIESEL

VGO

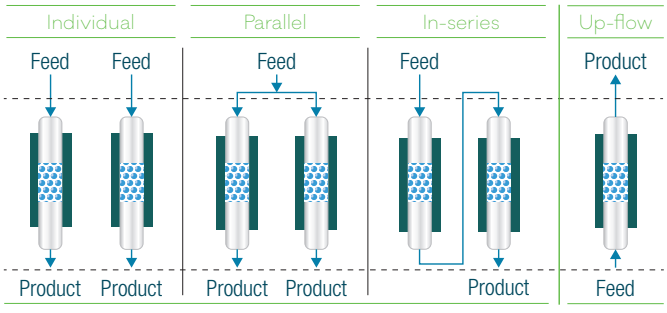
RESID (ATMOSPHERIC & VACUUM)

BIO FEEDSTOCKS
PYROLYSIS OIL

TECHNICAL FEATURES I B4500

Operation mode

- Available for individual, parallel, or in-series operation in down- or up-flow



- Multiple reactors in one unit (typically 2 or 4) addressing customer's requirements
- Interstage sampling

Feed

- Mass-flow controlled dosing of feed gases. Total number of feed gases adjustable to customer requirement
- Dosing of demanding feedstock at up to 130 °C for highly viscous feeds, e.g. vacuum residue
- Weighed feed container for accurate mass balancing
- Stirred liquid feed to enhance heating and prevent segregation
- Inbuilt catalyst activation using e.g. DMDS
- Equal feed distribution in between several reactors

Reactor

- Reactor temperature up to 500 °C
- Temperature variance within catalyst bed better than +/- 1 °C
- Reactor pressure up to 200 barg
- Pressure variance better than +/- 0.2 bar
- High flexibility of reactor dimensions with various inner diameters suitable for catalyst volumes up to 100 mL; larger volumes upon request

Gas-Liquid Separation and Sampling

- Built-in oven to avoid cold spots, time-consuming and erroneous usage of heat tapes, allowing easy access, e.g. during service and maintenance
- Gas-liquid separation adjustable in the range of 0 - 10 barg
- Automated gas sampling
- Inbuilt online stripping of the liquid to bring volatile components into gas phase, preventing clogging through by-products, e.g. ammonium polysulfide
- Integrated liquid product sampling with multiple positions per reactor allowing unattended liquid sampling over several days

Online Analytics

- Active reactor off-gas flow measurement for mass balancing
- Online gas analysis, e.g. GC or IR for determination of hydrocarbons and permanent gases
- Highly efficient analytical methods optimized for measurement of high throughput experiments, e.g. according to PIONA method

Automation

- hteControl™ for flexible and fully automated experiment set-up and control
- myhte™ for storage and processing of all data generated within the catalyst-testing workflow

Safety

- Abiding to international standards
- Designed for unattended, automated 24/7 operation with controlled shutdown
- Fully enclosed unit fitted with sensors (LEL, TOX, Smoke, Exhaust Flow, etc.)

Engineering Services

- All engineering services under one roof from design, assembly, validation up to delivery of the test unit to the customer site
- Global one-year warranty and further customer care through our dedicated service group

Validation

- Fully validated readily operational solution
- Usage of high-quality parts from well-known manufacturers, e.g. Swagelok, Bronkhorst, Brooks, VICI, WIKA, Emmerson, etc.
- Chemical validation at hte and at customer's site for FAT and SAT
- Dedicated training concept for unit operation

ENHANCEMENTS I B4500

- Advanced workflows and tools for faster and improved operation of the test unit
- Multi-purpose configuration in one unit (parallel, individual, and in-series)
- Feed filtration workflow
- Reactor loading workflow
- Gas recycling
- Liquid recycling
- Online cutting and fractionation
- Caustic scrubber or H_2S absorber technology available
- Integration of offline analysis, e.g. S/N, density SIMDIST, MOC, metal components, etc.
- Status notification of test unit operation via mobile network
- Compliance with UL, NACE, Japanese High-Pressure Gas Safety Act, and many other certifications available

INFRASTRUCTURE REQUIREMENTS

Laboratory:

- Air-conditioned laboratory environment
- Floor loading capacity 500 kg/m²
- Footprint of test unit and electrical cabinet depending on configuration

Ventilation:

- Approx. 1,000 m³/h

Gas Supply (recommended):

- Feed gas with constant primary pressure (30 barg above reactor pressure)
- Analytical gas supply of 8 barg
- Instrument air of 6.5 barg

Power Supply:

- 230/400 VAC; 3-phase/ neutral/PE; 5-wire system; other power, e.g. 110/208 VAC available upon request
- UPS available

FOR BASIC TEST SYSTEM. FIGURES CAN VARY DEPENDING ON CUSTOMER REQUIREMENTS

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