INDEPENDENT CATALYST TESTING FOR REFINERIES

hte

THE HIGH THROUGHPUT EXPERIMENTATION COMPANY

Still testing in the traditional way?

Evaluate commercial catalysts and optimize your operation.

- **Independent catalyst and process evaluation**
- **Screening of relevant process conditions using your feedstocks**
- **Scientific consulting & data interpretation**

Your benefits with hte

ESTABLISHED MARKET POSITION

- High data quality & reproducibility
- Excellent reputation with major oil companies
- Largest independent 3rd party refinery testing lab worldwide

ADVANCED TECHNOLOGY

- Feed processing flexibility – from naphtha to residue and waxy feedstocks
- Advanced analytics and software solutions
- Multiple test reactors for optimized catalyst selection with high statistical significance
- Accelerated customer-specific catalyst deactivation test

EASY TO WORK WITH

- NDAs with major catalyst vendors
- Short lead times
- Highly cost- and time-efficient
- Technical consulting
- Frequent project updates with full transparency
- Experienced staff – refinery services & support mentality

BENCHMARK CATALYST TESTS FOR MANY REFINING PROCESSES:

HYDROTREATING (HDS, HDN, HDA, HDO, HDM, ULSD)

HYDROCRACKING

RESID HYDRO-PROCESSING

DEWAXING

CATALYTIC NAPHTHA REFORMING

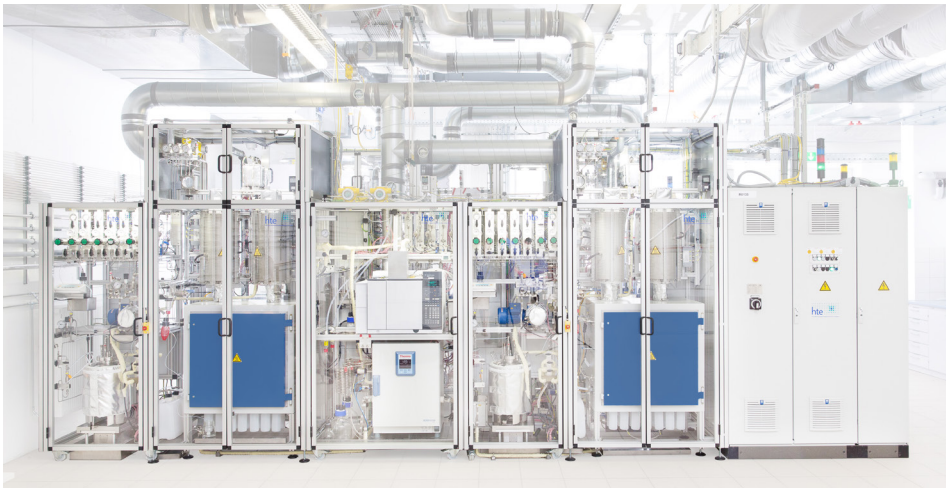
ISOMERIZATION

BIOFEEDSTOCK CONVERSION / BIOFUELS

AND OTHERS

REFINERY TESTING LAB

Advanced Reactor Systems and Analytical Tools



ANALYTICS FOR: GASOLINE - DIESEL - LVGO - HVGO - VGO BLENDED - RESIDUE - OTHERS

- Sulfur / Nitrogen
- Vanadium / Nickel / Iron
- Simulated Distillation
- Total Hydrogen (by NMR)
- Cetan Index
- D86 Boiling Range
- Density / API Gravity
- Dynamic Viscosity
- Cloudpoint / Pourpoint
- Aromatics (by HPLC)
- In-house destillation capabilities

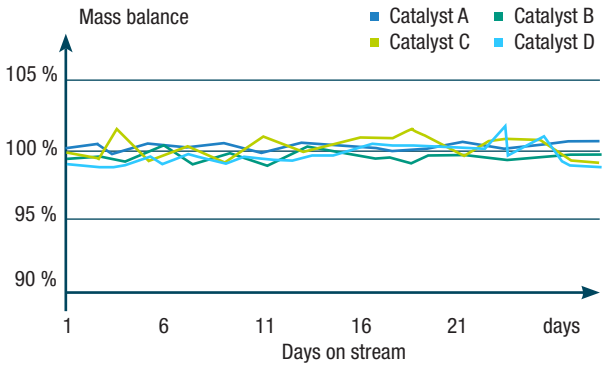
EXEMPLARY RESULTS

CASE STUDY A: CATALYST RANKING

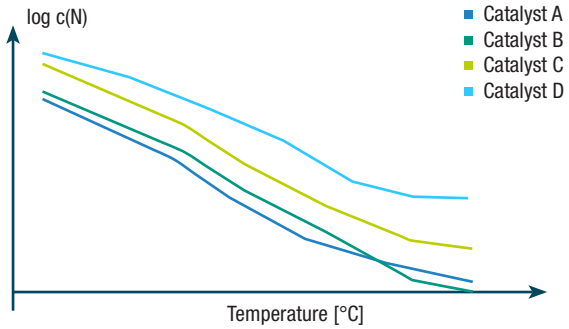
Catalyst	A	B	C	D
Temperature [°C] @ 60 % UCO-Conversion	Base +16 °C +/- 0.6 °C	Base +9°C +/- 0.1 °C	Base +9°C +/- 0.1 °C	Base +/- 0.1 °C
Yield Gas (C1-C4) [%]	4.2	6.2	3.6	3.4
Yield Naphtha [%]	26.2	30.2	25.5	25.5
Yield Kerosene [%]*	17.1	13.8	17.6	18
Yield Diesel [%]*	18	15.6	18.5	18.3
Selectivity to middle distillates [%]*	74.7 +/- 0.4	66.6 +/- 0.3	75.3 +/- 0.3	75.0 +/- 0.3

*Boiling range Kerosene & Diesel ≠ boiling range middle distillates

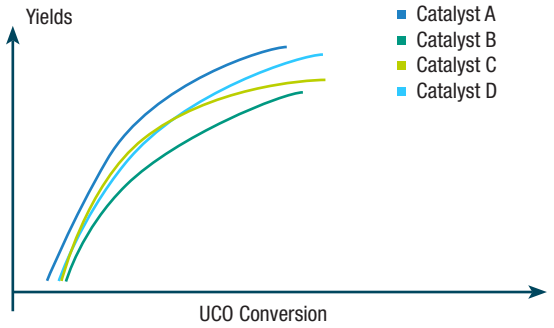
CASE STUDY B: MASS BALANCE



CASE STUDY B: PRETREAT NITROGEN SLIP VS. TEMPERATURE



CASE STUDY B: YIELD DIESEL VS. UCO CONVERSION



hte REFERENCES

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