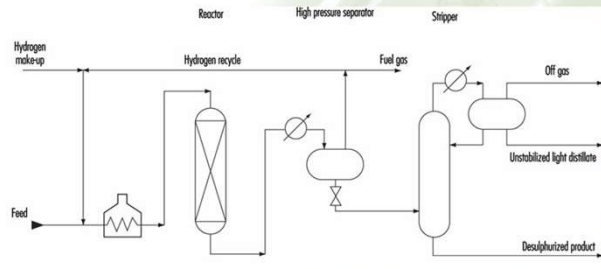


Typical Constraints in a HydroTreater

- ✓ Capacity
- ✓ Feed Quality
- ✓ Product Quality
- ✓ Catalysts
- ✓ Yield / Selectivity
- ✓ Reactor Performance
- ✓ Separation Equipment performance
- ✓ Corrosion & Fouling issues
- ✓ Hydrogen Utilization / Availability
- ✓ Equipment design



.....When is profitability maximised?

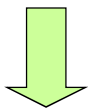
When unit constraints are achieved!

.....How to further increase profitability?

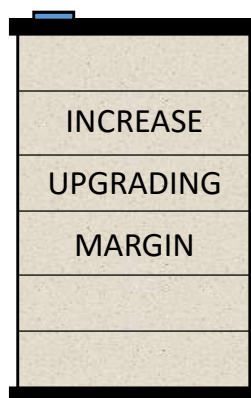
releasing the constraints!

Maximise HydroTreater Profitability

- Feedstock Heaviness
- Catalyst Selection
- Reduce Energy use
- Minimise Unplanned Shutdowns
- Reduce Planned Shutdown time



Reduce Cost



Increase Revenue



- Achieve highest profitable yield
- Increase availability
- Increase throughput – Revamps
- Increase throughput – Low Cost Options
- Process Monitoring to ensure performance
- Optimise Reactor Internals
- Modelling & Training

.....Map the existing constraints:

"Unit Health Check"

- 1) Operational review (availability, Yield & Expense, energy, hydraulics, pressure profile, monitoring)
- 2) Reactor utilization & tray efficiencies
- 3) Feedstock selection & catalyst (cycle & pool) optimization
- 4) Catalyst replacement & Turnaround maintenance
- 5) Short & long term improvement generation (capacity creep, on-stream factor, cost reduction, low-cost debottlenecking)

31-Aug-16

CONFIDENTIAL

3

Unit Health Check: how?

1. Questionnaire sent upfront to site Focal Point
2. visit by consultant
 - a. Introductory presentation, data gathering, interviews with Technology, Operations and Maintenance staff
 - b. *Gaps analysis* in close cooperation with refinery team
 - c. *Close-out presentation* with summary of findings
3. Final reporting 2-3 weeks after visit (optional)

31-Aug-16

CONFIDENTIAL

4

Fundamentals of HydroTreating course

Target audience: refinery technologists, process engineers & economists

Enables participants to:

- a. operate their plant safely
- b. optimise its margin, catalyst & energy use
- c. select best catalyst for future cycles
- d. guide improvement projects for their plant

Subjects: Kinetics, Catalyst Selection & handling, Operational aspects, Safeguarding, Reactor internals, Monitoring, Troubleshooting, Fouling & wash water, Materials & corrosion, Clean Fuels (revamp) projects

How: 3 d. on site, max. 25 participants, presentations with daily exercises

31-Aug-16

CONFIDENTIAL

5

Contact

Ed Ouwerkerk, Ph.D., HydroTreating Consultant

Amsterdam Area, The Netherlands

T: +31 6 1997 7876

E: info@optitreat.nl or Skype: ced.ouwerkerk

W: www.optitreat.nl and nl.linkedin.com/in/edouwerkerk



31-Aug-16

CONFIDENTIAL

6