



***R**efining &
Petrochemical
Development*

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RPD Business model: Design, Fabrication, Delivery/Operations of Pilot Units and consulting services



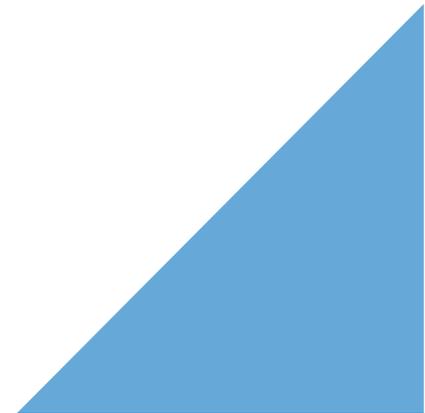
- *RPD supports clients in the **development, scale-up and commercialization of new technologies** focused on the **refining, petrochemical and renewable***
- *In operations since **2019***

Location: 26 acres plot/warehouse in Cedar Port Industrial Park in Baytown, TX

- *Conveniently located close to Houston energy and downstream center*

Capabilities: Nimble organization focused on customer needs

- *20+ employees/contractors – operations, crafts and process safety*
- *Mechanical, Electrical, Environmental certifications*
- *100+yr combined chemical engineering scale-up experience*



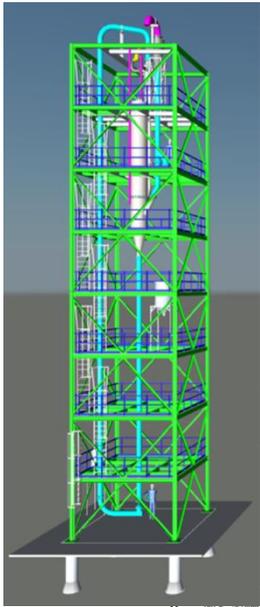
RPD capabilities spans the entire scale-up workflow

Design

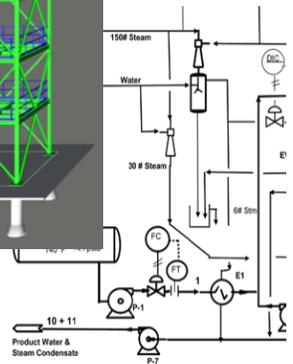
Construction
Commissioning
Start-up

Operations
Experimental
Program

Scale-up
Analysis
Modeling



- DBM
- PFD
- P&IDs
- Iso
- 3D



- RPD holds U & R stamps (section VIII, Div 1 ASME BPVC)
- Electrical cabinets and components (NFPA, UL)
- Full process control: PLC, DCS and SCADA for remote monitoring and historian

- Site permitted for multiple, large pilots – own flare
- PSM protocol: procedures, training, HAZOP and MOC
- Utilities at site: N2, air, CW
- Analytical: On site analytical with access to multiple day turnaround labs
- Highly experienced operators for 24-hr operations

- Process modeling tools
- Detailed mechanical design
- Hydrodynamics/kinetics modeling
- FEA stress analysis

Fixed Bed pilots (4) available for projects at site today



Max design conditions in hydrocracking service: 2500psig, 450°C

Skid mounted with dedicated feed / product recovery – 24hrs operations

- Mass flow meters for gases up to 300g/hr
- Dual barrel syringe pump for liquids up to 4.5kg/hr
- 95-99% mass balance closure

Dual series reactor, multi-zone furnace with isothermal or adiabatic profile

- Reactor options: ¾” sch40, 1” sch80 up to 1.5” sch80
- Inter-reactor sampling available

Batch distillation available for liquid product separation

- 2” column, 15 stages, 12-22L batch flask and 4x1L product flasks
- Adjustable reflux ratio and vacuum available < 1 torr

Fixed Bed and continuous distillation demo unit available at site



Max design conditions in hydrocracking service: 2500psig, 450°C

Deliver demonstration scale throughput 4.5 – 100+Kg/hr

- 6 reactors in series, pre-heater, cold knock-out, product stripper, tank farm
- Reactor options: 5" sch160 and 6" sch 80 with 5ft of heated length
- Inter-reactor sampling/make-up available
- 2 hydrogen compressors for makeup/recycle and VFD pumps



Continuous distillation unit to match demonstration scale throughput

- 4" sch40 SS316L, 40ft, tall 20+ stages with pall rings
- Setup for 10-200psig with vacuum available
- Multiple product withdrawals available

Examples of past projects

- **Catalyst testing** on multiple scales in vapor and liquid phase, two-phase (trickle, bubble, counter-current etc...)
- **Thermal pyrolysis** processes with feedstock ranging from light gases, VGOs to crudes
- Complex **distillation** runs on multiple scales
- **Fluidized beds** including CFB
- **Feed nozzle** applications testing
- **Material testing**
- **Filtration** and **blending** on multiple scales
- **Wide feedstock experience**: naphtha, pyrolysis-oils, residue, UMO, VGO, lipids and biomass/plastic derived streams.

Flexible contracts with multiple project options - examples



- Feed testing
- Catalyst testing
- Use RPD pilot
- RPD operates
- Data packaged
- Scale-up consulting avail.



- Co-Designed
- Construction
- Build & sell 'turn-key'



- +Operations
- RPD operates at site
- Unit transfers at project end
- Unit remains at RPD site
- Scale-up support

RPD Technologies ready to execute your project !