ROMeo Refinery Reactor Model Portfolio

ROMeo Refinery Reactor Models are the digital twin for the operation of the reactor units in your refinery or petrochemical plant. Tested and proven on industrial units, the reactor models predict accurately plant behavior in a wide range of feed, catalyst and operating conditions. With these easy-to-update reactor models tuned to the current operating conditions, you can derive up-to-date information that can be acted on, and make informative engineering, operational and business decisions.

Business Value

Process data tuned reactor models are applied for offline simulation and optimization, process engineering debottlenecking, LP vector generation, performance monitoring and real-time optimization (RTO) to help refiners and plant operators capture full benefits from there action processes and make informative business decisions.

ROMeo Refinery Reactor Model Portfolio

ROMeo Refinery Reactor Model Portfolio is a major component of the Refinery and Plant Modeling solution of the industry-leading ROMeo Process Optimisation. It contains models for the following reaction processes.

- Fluid Catalytic cracking (FCC)
- Hydrotreating and hydrocracking
- Resid hydrodesulfurization (RHDS)

- Catalytic reforming
- Hydrofluoric acid alkylation
- Sulfuric acid alkylation
- Delayed coking
- Visbreaking
- Light naphtha isomerization

ROMeo Refinery Reactor Models provides a plant-wide optimization solution, delivering increased refining profits by optimizing the feed train, crude processing and vacuum units and hydrocracking, reforming and catalytic cracking applications. This solution is based on ROMeo Process Optimisation simulation software and improves process monitoring, process optimisation, utilities and hydrogen management, reactor model simulation and planning and scheduling.
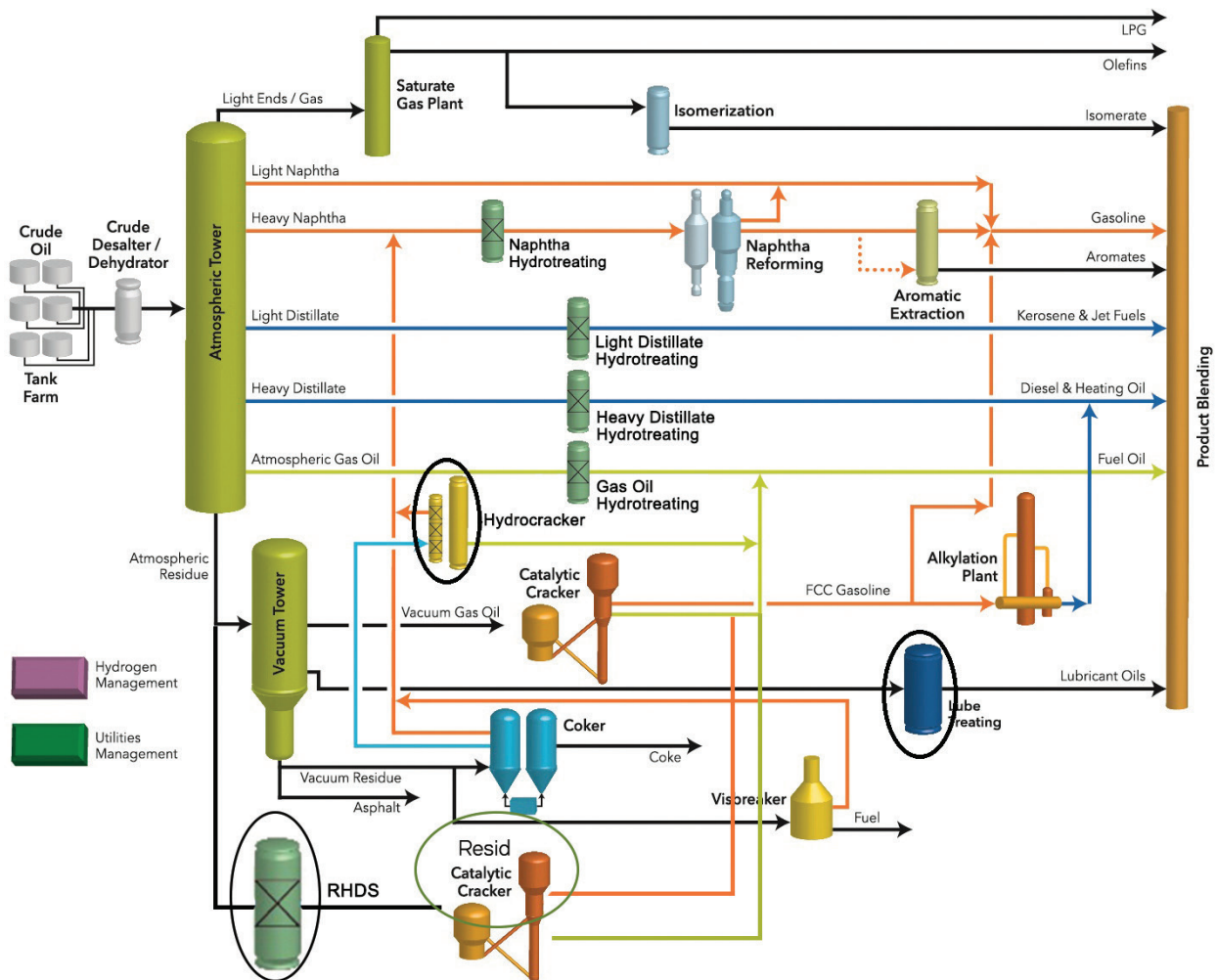
PORTFOLIO

FCC

- Rigorous kinetic catalytic and thermal cracking model
- Rigorous coke and CO burn kinetic model
- Rigorous pressure balance predicting catalyst circulation rate

Hydrotreating and hydrocracker

- Rigorous kinetic model for both hydrotreating and hydrocracking
- Structure-oriented lumping (SOL) technology based feed and product characterization with up to 430 components for more detailed and accurate representation of the feed and products
- Inhibition effects of CO, H2S, NH3, aromatics and organic nitrogen modeled

RHDS

- SOL based feed and product characterization with 524 components and NBP up to 850C
- Demetalization kinetics
- Connect CDU and RFCC units for integrated RTO or feed crude selection

Reformer

- Rigorous kinetic model for C6-C11 reforming reactions to represent fuel and aromatics reforming operations
- Kinetics based on dehydrogenation, dehydrocyclization, hydrogenolysis, hydrocracking, 5– and 6-ring naphthene and paraffin isomerization and cyclization

Hydrofluoric acid (HFAlky)

- Model both reactor and acid settler
- Predict alkylate and ASO yields, alkylate properties (specific gravity, RON and MON) and acid and caustic consumptions from olefin and recycle feed (isobutane) and operating conditions

Sulfuric acid alkylation (SFAlky)

- Sulfuric acid alkylation model with rigorous energy and VLE balances
- Predict alkylate, ASO and iso-pentane yields, alkylate properties, isobutane consumption, spent acid strength etc.,

Delayed coking (DCU)

- Can process resid, FCC main fractionator bottoms and thermo tar feeds
- Predict vapor, liquid and coke product yields and properties including sulfur , Conradson carbon, metals, PONA, viscosity etc
- User can produce custom cut liquid products

Visbreaking (VOM)

- Can process resid and vacuum gas oil feeds
- Predict product yields and properties from furnace geometry, coil inlet/outlet temperature and residence time

Isomerization (ISOM)

- Kinetic light naphtha isomerization model with C1-C9 real components
- Can model both isothermal and adiabatic reactor setup
- Catalyst acid activity modeled

BENEFITS

Real-time optimization

As the industry leader of real-time optimization software, ROMeo Process Optimisation accesses process data historian automatically, detects gross errors and reconciles the process data while simultaneously tuning the reactor model to match the plant. With built-in rigorous kinetics, the auto-tuned model predicts the reactor behavior in a wide range of operating conditions away from the current condition. With its nonlinear optimizer, ROMeo Process optimisation finds the optimal operating condition (setpoints) that maximize the benefit within operating constraints. The new setpoints can be sent to Advanced Process Control to drive the unit to the optimal condition. The economic benefit of RTO may vary from refinery to refinery. A typical FCC RTO will yield $0.10-0.20/bbl benefits to the operation. With a portfolio that covers all major reactors in a typical refinery, ROMeo Process Optimisation is the digital twin necessary on your path to refinery-wide optimisation.

Reactor and catalyst performance monitoring

The reactor models auto-tuned by process data accurately calculates catalyst activity and other reactor KPIs such as product yields and properties. The trend of these indicators can be used to evaluate the performance of the operation, equipment and catalyst to support business decisions and provide information on maintenance schedule planning.

Offline process engineering, simulation and case study

A rigorous reactor model tuned by reconciled plant and lab measurement data provides process engineers with the best insight of the reactor's behavior for process simulation of different operating conditions, debottlenecking, what-if analysis and offline optimization. With aneasy-to-use Excel offline interface, offline process simulation has never been easier.

LP vector generation

Refinery planners are facing the challenge of updating the LP vectors to reflect the constantly changing feed and operating conditions of the refinery or plant. Without up-to-date LP vectors, the planning model will not reflect the real plant and may not capture the full potential. With rigorous reactor models tuned with plant and lab data, ROMeo Process Optimisation generates yield data that can be transformed to LP vector format by the LP Update Manager. With an intuitive and easy-to-use interface, the LP Update Manager is designed to allow the process engineers and planners to construct a mapping from the ROMeo Process Optimisation variables to the LP vector

variables with minimum effort and use the mapping to generate new LP vectors from plant data tuned, up-to-data reactor models. The LP Update Manager also trends historic LP vectors so planners can keep track of changes in LP vectors, due to condition change.

Advantages

- Full suite of reactor modeling technology for Refinery-wide Optimisation
- Rigorous kinetics based models allow accurate modeling over wider operating range
- Open equation based modeling, enabling robust & broader scope modeling & optimisation
- Based on years of operating experience and validated by different applications
- Capturing online and offline benefits continuously for over 100 units worldwide

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