UniSim® Design Delayed Coker Unit (DCU) Reactor

Product Information Note

High fidelity kinetic reactor module helping refiners optimize unit performance and enhance the delayed coking process

The Challenge: Increase the yield of valuable light refinery products at the expense of heavier products such as asphalt and residual fuel oil

Among the various upgrading technologies currently used in oil refineries, many applications employ coking processes. Coking is the primary technique used to upgrade petroleum residues. It produces a solid coke, which has high carbon content.

Amongst coking technologies, including delayed coking and fluid coking, delayed coking is the most prevalent with approximately 78 percent of the global installed coker capacity. Delayed coking is one of the few processes able to convert heavy products (atmospheric and vacuum residues) into lighter ones with high economic value through thermal cracking.

The required heat for thermal cracking is provided by pre-heater furnace. The cracking reactions happen inside a huge drum called Coke Drum, which provides sufficient resident time for cracking and coke creation. The produced coke stays in the coke drum for each cycle time, and the vapor effluent of the reactor is sent to the downstream fractionator to separate light gas, naphtha, coker gas oil and other distillates.

WHY DO CUSTOMERS CHOOSE OUR SOLUTION?

- Proven technology backed by decades of refining industry experience
- Built on the UniSim EvOlution platform, which enables process design and optimization under the same environment
- Enables the configuration of “Once Through” and “Conventional” Delayed Coker Unit with the option to choose multiple coke drums where drums geometry can be specified
- Helps refinery personnel understand the cause and effect of different feeds, feed rates, drum pressure and other operating conditions
- Identifies the most efficient and profitable operating strategy for the delayed coker unit given its process constraints
- Enables an accurate determination of the yields for residual feeds from various available crudes
- Includes models that can be leveraged throughout the plant lifecycle
- Best-in-class support through Honeywell’s Benefits Guardianship Program (BGP)
In recent years, as the worldwide crude slate has shifted to heavy and extra heavy feeds, refiners have had to rely on the processing of heavier materials and residues. The increase in coke production is partly due to an increase in the amount of heavier crude refined. However, a greater part can be attributed to the overall refinery goal of increasing the yield of more valuable light products at the expense of heavier products such as asphalt and residual fuel oil.

The Opportunity: Optimize coking operations to lower energy costs, increase throughput, reduce emissions, and improve profits

In the current competitive climate, refineries are looking for ways to optimize the efficiency and productivity of their delayed coker operation. As the quality of crude oil inputs declines, delayed coking will serve to meet growing transportation fuel demands and also produce increasing quantities of fuel-grade and needle petroleum coke.

Refinery engineers need answers to key questions such as:

- How can we optimize our delayed coking unit to achieve energy savings, maximized throughput, decreased CO emissions and improved yields while increasing the overall profit of the refinery?
- How can we eliminate most or all of the low-value bottoms from crude oil to achieve higher yield of lighter products?

How can we maximize feed/throughput and also the middle distillate yield, while keeping the unit within equipment constraints?

Bottoms upgrading technologies have gained greater importance as a way to effectively reduce the quantity of fuel oil products by producing valuable distillate products.

The Solution: UniSim Design DCU Reactor

Honeywell Process Solutions is recognized for providing advanced software solutions enabling customers in refining and other industries to capture and share process knowledge, improve plant profitability, and maximize the return on their technology investments. For example, our UniSim® software family substantially improves simulation of online and off-line process unit design and optimization applications. It also helps determine the workflow, equipment needs, and implementation requirements for a particular process.

The UniSim solution is part of the Honeywell Connected Enterprise, which connects processes, assets and people to make the most of plant data and process domain expertise.

The UniSim Design Suite provides intuitive process modeling software that enables process engineers at refineries to create steady state and dynamic models for plant design, performance monitoring, troubleshooting, business planning, and asset management. UniSim simulation technology also helps engineers gain the expertise they need to work with a host of complicated refining processes.

Employ the EO platform for comprehensive modeling: UniSim Design Suite now includes modules representing specific refining conversion reactors. The UniSim Design DCU Reactor is one of the latest offerings in the UniSim Refining portfolio. It includes the only individual reactor models built from the ground up on the next-generation Equation Oriented (EO) modeling platform, which solves all equations simultaneously (rather than sequentially) and provides comprehensive, model-wide optimization. The DCU reactor can be configured within the UniSim EO environment, together with other unit operations. It fits into Honeywell’s overall UniSim refining model with interconnected processes allowing simulation of how one processing unit influences another. The result is a larger, refinery-wide simulation of how to run operations to produce more valuable and...
salable products.

Take advantage of Honeywell UOP experience: Validated by pilot plant data from Honeywell UOP, a global leader in advanced refining technology, the UniSim Design DCU Reactor employs a high-fidelity kinetic reactor module and is able to handle highly integrated and complex flowsheets. The reactor can be configured with other unit operations to represent the entire delayed coker plant. It allows simultaneous solving of the complete DCU flowsheet without nested convergence loops.

With the versatile UniSim Design DCU solution, refineries can eliminate heavy crude processing bottlenecks, optimize product yields and keep track of coke production and product specifications by accurately modeling their delayed coker. By allowing users to predict coker yields and product qualities for all feedstock possibilities, coke drum operating conditions, and recycle rate options, this solution enables refiners to run their coker unit more effectively and safely.

The Benefits

Improved understanding of unit performance: The UniSim Design DCU Reactor provides access to valuable and timely key performance indicators (KPIs) related to the overall delayed coking operation.

Enhanced modeling capabilities: The UniSim Design DCU Reactor enables refineries to perform reactor calibration and/or kinetic parameter optimization to determine the best fit model depicting their plant configuration and conditions. They can also keep LP programs up to date for scheduling and planning purposes.

Better decisions about critical operations: The UniSim Design DCU Reactor is implemented in the UniSim EO environment, which enables engineers to arrive at key operational decisions faster—making it suitable for both design and optimization applications. Additionally, they can do simple calibration and tuning. The reactor was specifically developed for refining end users, eliminating the need for expert consultants.

Knowledgeable Support

The UniSim Design DCU Reactor software is backed by the domain expertise of Honeywell Process Solutions and the deep insights of Honeywell UOP, which cover all aspects of the refining and petrochemical field. Customers can rely on Honeywell’s Global Technical Assistance Center (GTAC) for the help they need, no matter where they are located.

UniSim Design Suite Support Services

This product comes with worldwide, premium support services through our Benefits Guardianship Program (BGP). BGP is designed to help our customers improve and extend the usage of their applications and the benefits they deliver, ultimately maintaining and safeguarding their advanced applications.

Honeywell provides a complete portfolio of service offerings to extend the life of the plant and provide a cost-effective path forward to the latest application technology. The services include:

- Standard and Customized Training
- Consulting
- Model Building
- Engineering Studies
• Custom Thermo/Unit Operations

Why Honeywell

• With over 40 years of worldwide experience in the refining industry, Honeywell provides proven technologies to support a quick and safe refinery start up, and efficient operations. Our solutions enable refiners to meet today’s demands in innovative and effective ways, lowering costs while reducing risks, optimizing processes, and maintaining the newest and best infrastructure to support their business and operational needs.

• Honeywell Process Solutions is committed to providing a wide range of software solutions for refining and petrochemicals. By combining our best-in-class automation technology with proprietary know-how of plant and process design from Honeywell UOP, we provide the largest portfolio of products and services available to refining companies. This includes solutions for automation & process control, advanced applications, regulatory compliance, and operator performance.

For More Information

Learn more about how Honeywell’s UniSim Design DCU Reactor can improve performance, visit www.honeywellprocess.com or contact your Honeywell Account Manager.

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