



# HCR-SIM™ Technical Datasheet

A Yokogawa Company

## Benefits

### Optimise unit performance

- Select the most profitable feeds for the hydrocracker, taking into account product yields, hydrogen requirements, and catalyst life
- Determine the optimum total conversion and conversion-per-pass
- Determine the best operating strategy to take advantage of operating synergies between the hydrocracker and the FCCU

### Maintain the refinery LP

- Generate a consistent set of yield and product property vectors for different feeds and severities
- Regenerate data when the model or LP structure changes

### Understand unit behaviour

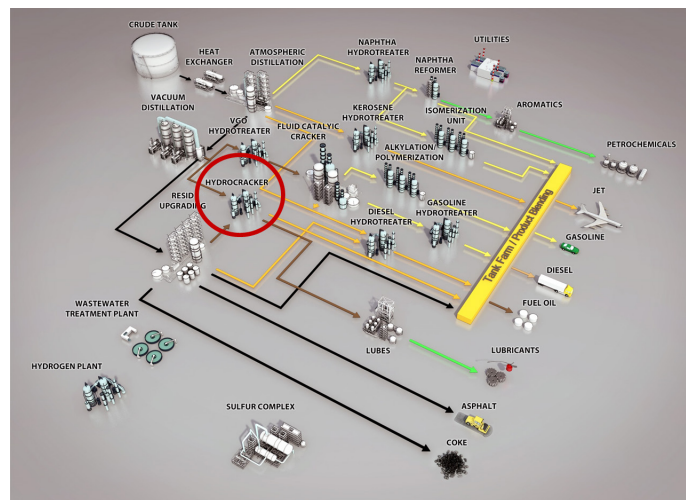
- Train engineers and operators new to hydrocracking by using the model to illustrate cause and effect through simulation runs
- Predict hydrogen requirements for changing process conditions

### Monitor unit performance

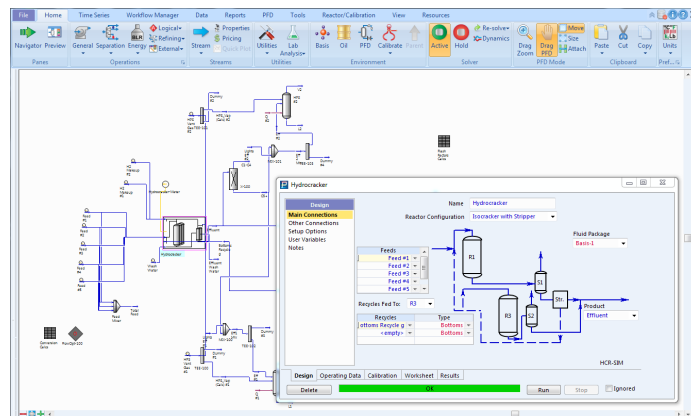
- Accurately monitor catalyst deactivation and determine time to shutdown
- Track mass balance, hydrogen consumption, and other key process indicators
- Compare actual yields versus predicted versus normalised

## Overview Summary

While Hydrocracking is one of the most flexible processes in refining, it is also one of the most complex in terms of possible operating strategies. There are a multitude of questions about feeds, conversion (total and per pass), catalyst life and hydrogen requirements which affect the profitability and safety of these process units. HCR-SIM is an excellent tool for enabling refining staff to fine tune this critical operating unit. Unit objectives may be maximum naphtha, kerosene, diesel, or lubes production.



The HCR-SIM combines a detailed, rigorous kinetic simulation of the reactor and accurate product separation to produce the industry's most trusted analytical tool for hydrocracking. HCR-SIM can be used to model all hydrocracking flow configurations, including units with one or two stages of cracking, once-through, partial, or recycle to extinction, and either one or two high pressure gas separators.



HCR-SIM is a valuable tool to determine the most profitable feeds and time to shutdown, to establish the best operating strategy, to monitor catalyst deactivation, and to develop a consistent set of yields vectors.

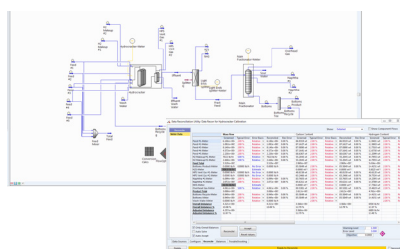
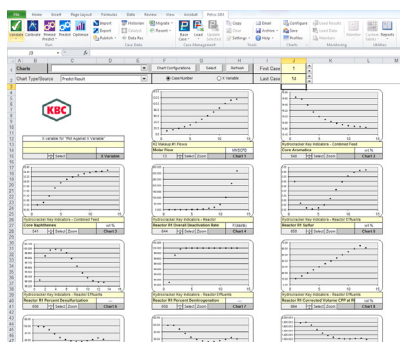
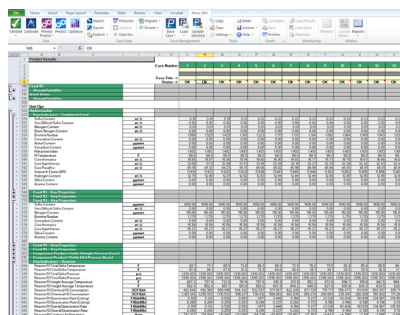


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## Features

- A detailed simulation of the reactor section, including the hydrotreating and hydrocracking reactors by bed, as well as quenchers, downstream flashes, and all recycle gas loops
- A rigorous kinetic representation of all key reactions – Hydrodesulphurisation (HDS), Hydrodenitrogenation (HDN), Hydrodemetallisation (HDM), olefin saturation in the hydrotreater, and cracking and ring-opening in the hydrocracker(s)
- Detailed heat balances to allow the calculation of bed temperature rises and resulting quench requirements
- Accurate modelling of catalyst deactivation based on catalyst temperature, hydrogen partial pressure, and feedstock qualities
- Reaction section scaling for reconfiguration studies
- Detailed feed pseudo-component characterisation by paraffin, aromatic, and naphthene content and carbon number
- Two phase bed pressure drop calculation
- A built-in data reconciliation tool for reconciling mass and elemental balances
- Automatic data validation support to assess the quality of input data to the model
- A built-in optimiser allows you to identify the most profitable operation given feed/product pricing, catalyst costs, and unit constraints
- Direct access to process data historians
- Convenient and efficient platform for developing LP vectors to ensure accuracy of the LP



## Interface Options

HCR-SIM is available through a graphical user interface with the same user-friendly look and feel as other unit operations within the Petro-SIM family of process simulators. Make configuration changes through simple drag and drop techniques on a process flowsheet diagram, compare plant data results in a meter view, and perform case studies and optimisations all within a single environment.

HCR-SIM supports a real integration with Microsoft Excel® allowing you to readily create a customisable Excel application workbook for driving calibration, prediction, and even optimisation case runs. Analyse the results of several cases directly from within this Excel environment. Multiple charting options allow easy analysis of data and model predictions. Excel interfaces are automatically generated and can be customised to your specific needs.

## HCR-SIM™ and Petro-SIM™

Because HCR-SIM is available within the Petro-SIM environment, users with a Petro-SIM license can build very detailed process unit models that take advantage of Petro-SIM's sophisticated analysis tools, such as the popular LP Utility for easy generation and maintenance of LP submodels. Generate detailed models using downstream separation and auxiliary unit operations, link with assay and feed libraries and crude units to investigate feedstock effects, or use HCR-SIM as part of a complete refinery wide model, at a level of detail unsurpassed by any other process simulation package.

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