

# Catalyst & Technology

October/November 2008

News



## Adding Value through Technology

With more than 50 years experience developing, manufacturing, and servicing catalysts, Criterion is a leader in technology innovation. We provide a variety of process technologies that can be packaged to create complete, optimized solutions for hydroprocessing challenges.

Various market changes, ranging from increased product demand through to alterations in product legislation and emission standards, can trigger strategic investment opportunities. But how do you evaluate – and execute – the projects that will secure the best returns?

World oil consumption has caught up with the industry's installed crude refining capacity, and companies across the globe are evaluating their options to profitably meet growing demand. There is a shortage of capacity for processing increasingly heavy crudes into lighter products, products that will have to meet ever more stringent fuel specifications.

Criterion, together with our parent company Shell Global Solutions, support refiners by licensing cutting-edge technology. We provide technical and operational support and are active in more than 130 countries and territories worldwide. By drawing on this extensive experience, we leverage our technologies and expertise for clients ranging from major international corporations through to national oil companies, and independent refineries.

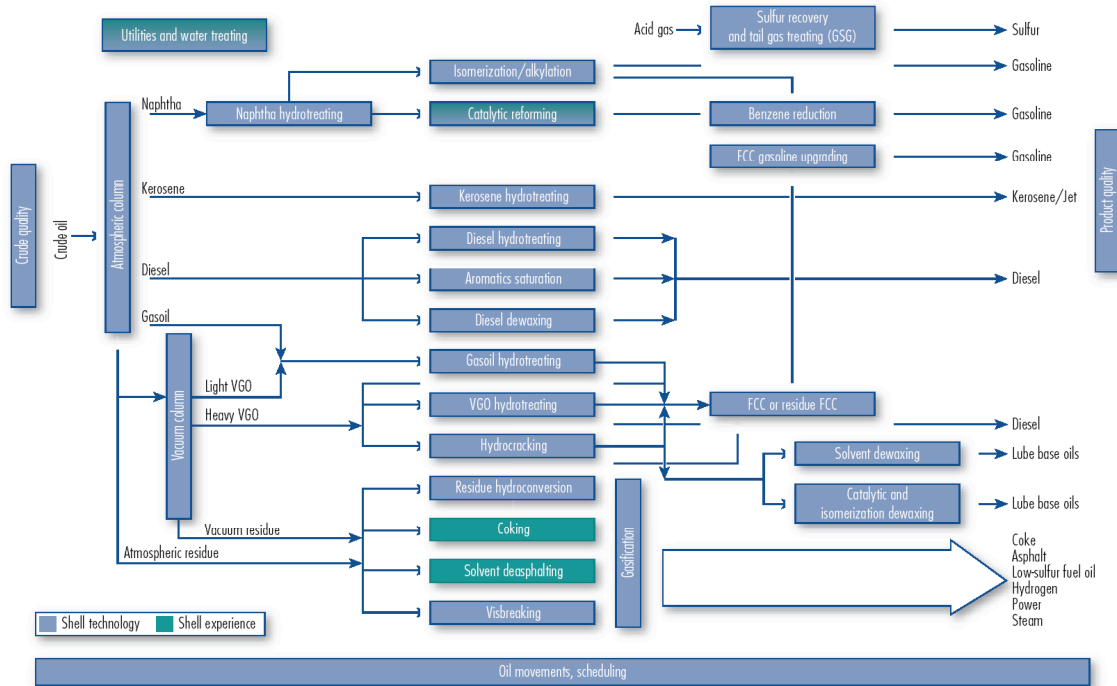
**Technology is key.** Many refiners need the right technology to raise plant capacity beyond original design levels. For others, regulatory compliance or increasingly stringent product specifications necessitate new technology for upgrading such as bottom-of-the-barrel conversion or hydrodesulfurization.

Shell Global Solutions, together with Criterion Catalysts & Technologies, license technologies to help customers:

- Upgrade capacity and performance of existing units
- Integrate new process units into existing refinery operations
- Incorporate advanced catalyst systems and reactor internals
- Plan, design, and implement new refineries

With every license, we can offer a process design package (or basic design package); detailed support to engineering, procurement and construction contractors; extended training at our facilities; start-up services; differentiated technical assistance during operation; and decision-making support.

We license a wide range of industry-leading technologies across many refinery processes (Figure 1 below).



## Hydrocracking

Shell is the largest hydrocracker operator in the world with a capacity of 512,000 barrels per day. Shell Global Solutions and Criterion provide technical support to over 50 hydrocracking units around the world. Our hydrocracking processes have undergone continual R&D since they were first developed over 40 years ago. The technology encompasses single-stage (once-through and recycle mode) and two-stage units that can match your product needs – whether they are to maximize middle distillate or gasoline production, or to produce base oils, or to produce FCC or ethylene cracker feedstocks.

### **Business value**

Our hydrocracking technology and expertise offer a range of commercial benefits:

- Long-term sustained operational excellence
- Technical services and advice on unit optimization to help meet fluctuating market demands and changing legislation
- Access to catalysts that provide continuous improvement in yield, stability and activity advantages
- Integrated life-cycle catalyst service and advice

## **Licensing Example - Hydrocracking**

China National Offshore Oil Company (CNOOC)

CNOOC licensed Shell Global Solutions' hydrocracking technology as part of its new refinery in Guangzhou Province, China. It is the highest capacity hydrocracker in the country, and is designed to produce diesel and jet fuel that meet future stringent Chinese specifications while producing high-quality feedstock for the new ethylene cracker in the Nanhai petrochemical complex.

## **Hydrotreating**

Our advanced hydrotreating processes have helped many refiners worldwide rise to the challenges posed by recent increasingly stringent legislation. These have been developed in-house using a combination of ongoing R&D effort and operational feedback. Shell's hydrotreating capacity represents 8% of the world's capacity, and Shell has designed and serviced more than 180 units over the past 50 years.

### **Business value**

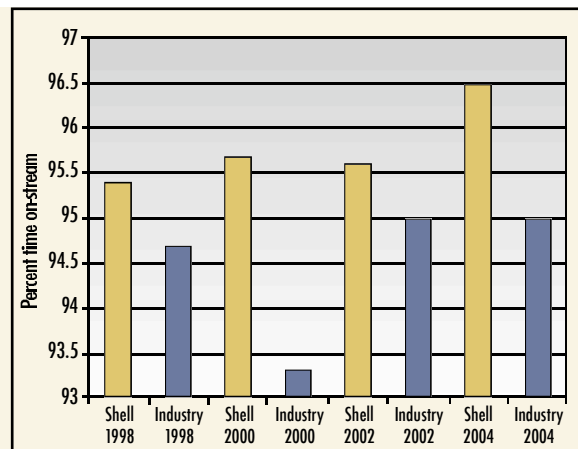
Shell Global Solutions' hydrotreating technology integrates successful operating practices with innovative designs. The technology is designed to offer our customers benefits in several areas:

- **Energy efficiency:** The efficient use of energy is an increasingly important driver for refiners due to high energy costs and the growing focus on businesses' carbon footprint. Our technology is designed for high efficiency and incorporates lessons learned in refineries around the world.
- **Reliability:** Hydrotreater downtime is increasingly costly because today's stringent specifications mean that refiners have less processing flexibility. From industry studies covering performance from 1998 to 2004, a comparison of hydrodesulfurization (HDS) units shows that Shell Global Solutions' technology offers advantages in terms of availability, onstream factor, utilization and turnaround duration.

### **On-stream Factor**

- Capable of exceeding 96% time on-stream

Comparison of Operational Availability of Shell HDS units with Industry (source: Industry report)



- **Catalyst selection:** We offer technology coupled with market-leading catalysts. We optimize the hardware design and select the best catalyst for an application.

## **Licensing Example - Hydroprocessing**

Kuwait National Petroleum Company (KNPC)

KNPC has selected deep HDS technology from Shell Global Solutions for a new refinery complex in Kuwait. This will produce ultra-low-sulfur diesel (<10 ppm) that meets the cold-flow properties required by stringent European Union environmental legislation. The 180,000-barrels-per-stream-day HDS unit also includes Criterion dewaxing catalyst technology.

## **Reactor internals**

Shell Global Solutions is a leading supplier of hydroprocessing reactor internals technology. These internal are designed to create excellent flow distribution over a wide range of conditions. Our internals have been commercially proven in over 300 hydroprocessing applications. More than two-thirds of these applications were non-Shell plants.

These are just a few of the many licensed technologies that Shell Global Solutions, together with Criterion Catalysts & Technologies, offer refiners. For more details and information, please visit [www.criterioncatalysts.com](http://www.criterioncatalysts.com) or contact your local Criterion representative.

## **What differentiates Shell Global Solutions /Criterion**

### **Technology**

Technology is the backbone of Shell's worldwide refinery operations. The state-of-the-art solutions that we license have evolved through the application of lessons learned from operating refineries all over the world.

### **Operational excellence**

We have the intimate knowledge of what makes technology competitive. Our focus is on achieving benchmark levels of operability, reliability and integrity in our designs.

### **Performance**

Market leading catalyst performance is at the heart of our licensed hydroprocessing systems. The right catalyst, in the right reaction environment, helps ensure operating success.

If there questions you would like to pose to the hydroprocessing experts at Criterion, contact us today to learn more at [CriterionPublicAffairs@cri-criterion.com](mailto:CriterionPublicAffairs@cri-criterion.com).

### **Important:**

All information contained in this document is considered accurate at the time of the testing, based on the equipment, and specific conditions and other limitations during the testing process. It is being furnished upon the express condition that the user will make its own assessment to determine the accuracy and applicability for the user's particular purpose.

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