

BE FUTURE FORWARD

Introducing the Refinery of The Future

– John Gugel



John Gugel
President and CEO
Honeywell UOP

Businesses that develop and commercialize process technology are in a unique position to identify and evaluate global trends in our industry. For more than a hundred years, UOP has advised its customers in the application of new technologies to improve their profitability in an ever-changing global energy marketplace. In most cases, this consultation commences many years before our clients are ready to make final investment decisions. This is what forms the basis for a clear, long-term view of the trends emerging across the industry.

One important long-term concept is what UOP has defined as the “Refinery of the Future.” It’s based on a philosophy that refineries must be designed to facilitate an evolution of product slates and deliver sustainable competitiveness in terms of the overall cash cost of production, capital efficiency, responsiveness to regulation and competition, and the agility to manage molecules for the greatest profitability. The Refinery of the Future also is designed for the flexibility to cost-effectively address changes in market conditions in the short term -- and in 10 or 20 years’ time.

Today’s refiners face an array of new challenges, the greatest of which are the need to continue making investments to

produce even cleaner burning fuels, react to market dislocations, and adapt to the widely-forecasted plateau in demand for transportation fuels. Each of these challenges will affect product mix and investment strategies for refiners in the future. Added to that is the need to address operator turnover and inexperience in an environment of increasing complexity -- from feedstock to products.

For many, the stricter rules intending to eliminate the use of high-sulfur bunker fuel presents a pressing challenge. While at the same time, many countries are also moving away from burning fuel oil for power generation and heating. These trends are quickly closing the market for heavy, high-sulfur fuels and creating mounting pressure for significant upgrades in refining capabilities. More than ever before, these upgrades must be made with a clear view of future market conditions.

Meanwhile, high-growth economies with rapidly growing middle classes will increase their consumption of transportation fuels, and many of them also are investing in a new domestic refining infrastructure capable of producing cleaner-burning fuels. Existing refiners that traditionally have supplied fuel products into these export markets will find demand in

those markets being met by newly established domestic refiners. As a result, millions of barrels of export refining capacity could be at risk of being stranded – that is, unless the assets that produce them can be adapted or repurposed.

With overall fuel volumes forecast to peak around the year 2035, most refiners -- even those in markets where fuels are growing -- are looking for paths to better manage their molecules so they can enter product categories that offer growing volumes, as well as greater profitability. Many of these refiners plan to expand into petrochemicals, where global demand is growing 40 percent faster than gross domestic product, and several times faster than transportation fuels.

This strong demand for petrochemicals is being driven by dozens of countries such as China, India, and Indonesia, where nearly 3 billion people will graduate into the middle class by 2050. These consumers will fuel demand for more synthetic fibers, packaging, automobiles, new food options and pharmaceuticals, and countless other consumer goods.

To satisfy this growing demand, the Refinery of the Future must have the ability to upgrade crude oil into high quality cleaner-burning fuels, in addition to higher-value petrochemicals. The technologies that enable both production of a clean fuels slate, and an efficient pathway to “crude to chemicals” from cost-advantaged feedstocks are essential to the long-term profitability of refiners.

There was a time when refineries that converted 15 to 25 percent of their production into petrochemicals were considered highly integrated. UOP recently licensed a world-scale complex that currently is in construction, and that will efficiently convert more than half its crude intake into petrochemicals. Even at this level, 50 percent is by no means the technological limit. It’s simply the level of petrochemicals production that satisfied the customer’s targeted product slate, which includes production of clean fuels.

Refineries such as this – integrated with substantial petrochemicals production -- are likely to be among the most consistently profitable over the long run. In fact, refineries that produce only petrochemicals are clearly on the horizon.

As important as any other factor, the Refinery of the Future will be a digitally connected facility. It will be equipped with cloud-based connected plant services that analyze plant performance data with proprietary models to provide recommendations that improve process optimization and operational reliability, minimize energy consumption and emissions, eliminate waste products and better manage water. It also can bridge gaps in experience caused by retirements and personnel attrition, providing insights and guidance to plant operators.

References

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For more information

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UOP LLC, A Honeywell Company

25 East Algonquin Road
Des Plaines, IL 60017-5017, U.S.A.
www.uop.com

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