

# Slow growth for refinery catalysts

## Demand to return to pre-COVID levels in 2023, sustainability will drive new technologies

▸ Sotirios Frantzas

**D**emand for refinery catalysts is returning to pre-pandemic levels following a decline in 2020 and 2021. Sustainability, regulations, and demand for cleaner fuels, renewable feedstocks, and regeneration and rejuvenation of catalysts will drive innovation and growth in the refinery catalysts business in the medium term.

The value of the global refinery catalysts market declined in 2021 as consumption decreased in all regions except China, Southeast Asia, and India, according to the Catalysts, Petroleum, and Chemical Process Report published recently by S&P Global's Specialty Chemicals Update Program (SCUP). The largest catalyst segments in terms of value were hydrotreating and catalytic cracking, and the largest-volume products were alkylation catalysts, the report says.

Rajesh Gattupalli, vice president and general manager/LST refining at Honeywell, tells *CW* there was a downturn in refining catalysts in 2020–21 due to COVID-19 and related economic slowdowns. "This rebounded somewhat in 2022, and we expect to see the refining market get back to the pre-pandemic levels in 2023," Gattupalli says.

Separately, the president of the newly formed Ketjen Corp. (Houston, Texas), Raphael Crawford, says that geopolitics and macroeconomics affected each region differently in 2022. "European, Indian, and Asian refiners have experienced imbalances in product markets and changes in their crude selection, while US refiners have experienced higher utilization rates. All of this has resulted in the need to re-optimize refining operations, which is where Ketjen's catalysts play a role," Crawford tells *CW*. "The key metrics for 2023 will be refinery utilization and regional pricing for propylene, the latter being a proxy for polypropylene [PP] demand that will likely direct integrated refiners to shift focus to margins in petrochemicals or maximize transportation fuels."

Ketjen is a wholly owned subsidiary of Albemarle that emerged through the launch of Albemarle's advanced catalyst solutions business as a separate entity. Ketjen crafts tailored, advanced catalyst solutions for the

petrochemical, refining, and specialty chemical industries.

China's reopening will likely make the biggest difference between 2023 and 2022, says Chris Dziedziak, sales and project manager at The Catalyst Group (TCG). And airline travel is most likely the market that remains furthest below pre-pandemic levels, which is affecting demand for jet fuel, he says. Another potential medium-to-long-term trend is that workers are not commuting as much as before, as the "stickiness" of working from home has remained, hurting demand for gasoline, he adds.

Demand for fluid catalytic cracking (FCC) and hydroprocessing catalysts has survived the drop caused by the pandemic and is quite strong, John Murphy, CEO of TCG, tells *CW*. "The scheduled turnarounds have now begun to take place, boosting the demand for hydroprocessing catalysts, especially for technologies like hydrotreating and hydrocracking that provide more value-added-type conversions in the refinery," he says.

In addition, supply-chain security has become hugely important as a result of geopolitical issues such as the war in Ukraine, Murphy says. "Companies are taking directed and, in some cases, redundant efforts to ensure that the supply of raw materials and energy are available," he says.

The receptiveness and willingness of end markets to tolerate higher prices will continue, as companies passing on higher energy, raw material, and conversion costs. The marketplace understands what the catalyst providers are facing and unless there is an unexpected persistent downturn, these price increases can be maintained, Murphy notes.

"By the end of 2023, the expectation is to be back to pre-COVID levels, certainly not business as usual because of the geopolitical situation, but in terms of volume, value, and margin contribution, this year will certainly be a more traditional year than 2022," Murphy says.

In the short term, the more sophisticated refiners, or the ones that have other resources, are scaling back refining capacity to avoid overcapacity, Murphy adds. "So, if they can manage to keep utilization rates in the high 80s or low 90s, they will do that," he says. "This is driven by the expectation that liquid fuels will be a decreasing component of the transportation fuel market, highlighting a concern that restrictions or regulations on refined products will continue to become challenging and financial support for expensive projects will become less available."

According to Dziedziak, there is optimism among companies that stopped doing business in Russia that business in the country will start to pick up again. This may take a couple of years or more, depending on how the situation there develops, he says.

### Medium-term opportunities

Production of refinery catalyst was traditionally an expanding business, but in recent years it has become a mature market in developed countries as well as developing regions, S&P Global's report says. This means growth is expected to be minimal in the next five years, it says.

Several factors are expected to drive growth in the refining catalyst market in the medium term, says Honeywell's Gattupalli. These include a near-term production shift from refiners toward middle



**GATTUPALLI:** Transition to cleaner fuels will drive growth.



**CRAWFORD:** Global challenges affected demand in 2022.



**PURNELL:** Use of renewable feedstocks set to grow.

distillates in order to capitalize on high crack spreads for diesel and jet fuel; increasing demand for cleaner fuels in developing countries; and a rebound in travel after the pandemic, Gattupalli says.

Scott Purnell, interim president/refining technologies at WR Grace, tells CW that the company sees opportunities related to “bottom of the barrel upgrading and the processing of renewable feedstocks,” in FCC as well as in the advanced refining technologies (ART) hydroprocessing business.

“In FCC, customers continue to demand catalysts that reduce yields of low-value slurry oil and minimize coke make. In ART, bottom of the barrel upgrading continues to drive the licensing and operation of resid desulfurization [RDS] units and ebullating bed hydrocrackers to upgrade and desulfurize the heaviest fractions of a barrel of oil,” Purnell says.

Sustainability, carbon footprint, and energy efficiency are impacting the “overall value equation” for refiners in the two segments, he adds. Renewable feedstocks are beginning to dominate the conversation and are already being employed by many of Grace’s customers, Purnell says.

In FCC, customers are co-processing various bio-based and unconventional materials together with traditional VGO (vacuum gas oil), to reduce their carbon footprint, Purnell says. In ART hydroprocessing, demand for units targeting renewable production “exploded” over the last several years, and now units producing sustainable aviation fuels (SAF) are beginning to do the same, he says. “Catalysts that enable these operating strategies and further enhance their profitability are key,” he adds.

Global growth rates for PP continue to drive demand for FCC catalysts that maximize propylene, and the high value of an octane barrel leads to a push for catalysts that enhance butylene yields for downstream alkylation, Purnell says.

The continuing regulatory drive toward lower sulfur in transportation fuels underlies catalyst demand for ART, since developing countries are only now starting to catch up to low-sulfur regulations that have been in place for many years in developed economies, Purnell adds.

Worldwide environmental regulations now mandate the production of cleaner fuels, S&P Global’s report says. Consequently, refiners are experiencing severe pressures from market forces that demand a change in the product mix, aside from quality, the report

says. In addition, the report notes that as the global refining industry moves to cleaner fuels, refiners are being squeezed on hydrogen availability.

TCG’s Dzedziak tells CW that mixing or co-feeding biomass into a process is an important long-term trend for the refining industry, as using biomass as a feedstock is likely one of the best ways for refiners to reduce CO<sub>2</sub> emissions and advance their sustainability goals. In addition, a range of biobased feedstocks will be used all over the world to make these products, as different rules and regulations

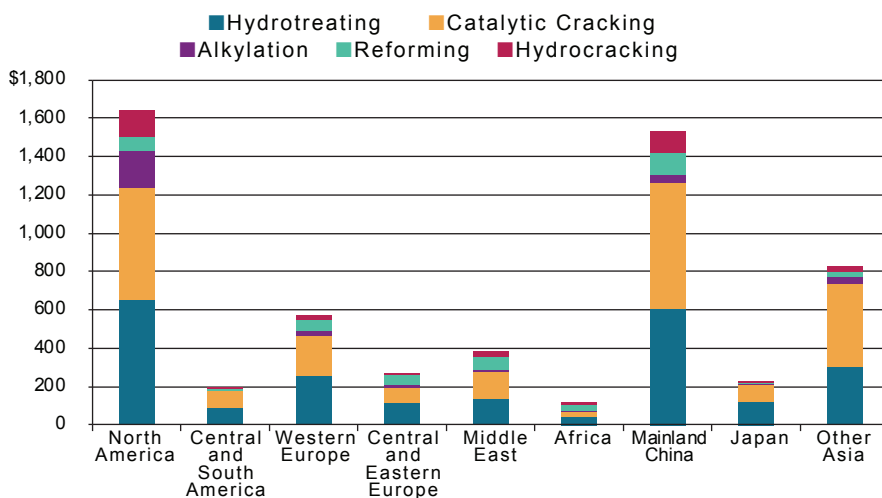
emphasis moves toward raw-material circularity and reuse,” he says.

As a result, some of the leading catalyst providers are increasingly talking about manufacturing methods that incorporate rejuvenated or regenerated catalysts, as well as developing catalysts that can be regenerated or rejuvenated, replacing catalysts that have been traditionally disposed of, according to Murphy.

Catalyst providers will need to partner with customers to anticipate and mitigate changes as they occur in real time, says Ketjen’s

### World consumption of petroleum catalysts

Consumption of catalysts in major petroleum refining segments in terms of value by region in 2021 (\$ million).



Source: Catalysts, Petroleum and Chemical Process Report by SCUP © 2023 S&P Global

apply in each region, he says.

“Thus, making a catalyst that can handle the variety of contaminants in these different feedstocks would help refiners with not having to switch out the catalyst just because they are switching to a different feedstock. Catalyst producers aim to develop robust catalytic solutions that can handle a breadth of contaminants and be able to make a range of products so that the refiner is not just limited to making only renewable diesel or only aviation fuel,” Dzedziak says.

According to TCG’s Murphy, catalyst suppliers are looking more carefully at, and spending more time on, catalyst rejuvenation and regeneration in order to maintain profitability and address issues such as decarbonization and circularity. “This practice is an alternative to purchasing new catalysts, but the idea of catalyst rejuvenation or regeneration has gotten a lot of attention as there is a lack of disposal outlets and as the

Crawford. “Innovation is key to support refiners as they navigate their transition to renewable and circular feedstocks and products. Aside from innovation, we will need new chemistry and partnerships to develop solutions that make sense technically and economically. While the momentum is different per geography and for each refiner, at Ketjen we are poised and ready to be a partner on that journey,” he says.

Ketjen will collaborate with customers in the petrochemical, refining, and specialty chemical industries across FCC, clean fuels, and hydroprocessing catalysts, and performance catalyst and curative solutions with the goal of providing solutions that will help them improve their production performance, Crawford says.

In addition, the new company will make investments to support its customers in their “unique” energy transition journeys from FCC to clean fuels to hydroprocessing to organometallics and curatives, he says. ■