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Catalysis, Chemistry and Process Units – Criterion Integrates All for A Sweet Sounding Operation

By Carol Cole, Octane Week

Refineries humming with the production of clean fuels will rely on advanced catalysts, understanding of chemistry, information technology and revamped process units all working in sync. The correct combination will produce a sweet sound, not only to refinery operators, but to company shareholders as well, said Richard Stade, president of Criterion Catalysts & Technologies LP.

The technology provider who pulls all those instruments together into a harmonious operation will succeed like the maestro who coaxes the finest performance out of an orchestra. To achieve this the technology provider must have a fundamental understanding of each of these technology components and an intimate knowledge of process unit operations. Refineries without those tools, or without their proper integration, will clang like a misplaced symbol or a dropped instrument.

Knowing how to combine process units and catalysts in a way that will extract the best performance from both is critically important, Stade observed, as important as the technologies themselves. Processes have improved steadily over earlier generations, but step-out advancements are unlikely in the near future. Even if a big process solution emerges, the Criterion executive warns it will probably cost a lot of money.

“Refiners have four ground rules for the future,” he mused. “Big spending is not one of them. The first is to improve shareholder value. To do this usually means avoiding capital spending, which is the second rule. The third ground rule is to use the most economic crude, which generally has the poorest quality in terms of contaminants and boiling range. Lastly, but most importantly, the refiner must produce what customers need – for example, in the 2003-2006 timeframe, it is ultra low sulfur gasoline and diesel.”

“If spending is out, then technical solutions are in. As a technology supplier, our challenge is to apply existing technologies in precise ways so as to extract the products needed from the chose feedstocks in the time frame required, with minimal capital.”

The existing technologies are very useful tools indeed. “One key tool is information technology,” he said. “Computer applications are increasing, and they’re allowing refiners to do things they couldn’t do a few years ago. Personal computers run more and more operating loops in refineries, and that’s going to continue.

“Chemistry is moving back to science to understand the molecules better,” Stade continued. “Future fuels production will be oriented to the molecular level and away from the sledgehammer approach that broke crude into the simple fuels of the 1970 and 1980s. Much like a chemical plant operator, a refiner will have to know every molecule, every species and how to deal with it. Not everyone has the staff that can cope with that kind of chemistry.”

Most importantly, catalysis and technology integration will be the key to achieving the refiner’s goals – this is where Criterion when working with our technology associates, ABB Lummus and Shell Global Solutions, excels. “There is no doubt that when refiners look for technical solutions that avoid capital spending, they turn to catalysis. In the 1990’s, we had a real surge in high performance catalysts. There have been major advances in catalysts capacity in the last decade. Instead of increasing at 7% per generation, catalyst activity has been increasing at 20% per generation. There have been advancements in the fundamental construction of the catalyst, the surface chemistry and the use of active materials. It’s these catalysts that will deal with the individual sulfur species when making the fuels of the future.

“Now, reactors tend to be the constraining force, not the catalyst. Maybe a revamp is needed, but maybe it’s not. Much depends again on the sulfur species and how the fractionation is set. All these questions can be answered, not with capital, but with intellectual capital.

Criterion and its partners are the kind of solutions provider that participates in the selection, integration, implementation and operation of the refinery. “That approach is much like the orchestra leader, who pulls everything together into a harmonious whole. He is the integrating force, and that is an art in itself.”



Richard Stade, President
Criterion Catalysts & Technologies