

SYN-TECHNOLOGY BULLETIN:

ENVIRONMENTAL FUEL TECHNOLOGIES Supplying Customised Hydroprocessing For Distillate Fuels

Criterion Catalyst Company L.P. was formed as a Joint Venture company between Shell and American Cyanamid Company in April 1988. Today, Criterion Catalysts & Technologies L.P. is a leading supplier of catalysts to the Oil refining and Petrochemical industries. Our vision is to continuously strive toward being the premier supplier of catalysts, catalyst related services and process technologies in our chosen fields, to the Oil and Petrochemical Industries. Criterion will continue to build on our know-how of hydroprocessing because for us hydroprocessing is our core business.

History will probably show that the 1990's was the decade in which the environmental agencies and lobbyists put the oil refining industry in survival mode. With refining margins tighter than ever before, refiners have been continuously challenged to produce fuels cleaner than ever before. Refiners in the developing economies throughout the world face even bigger challenges as they enter a truly global market for fuels and oil products.

In the U.S. the introduction of even lower diesel sulphur specifications (0.05% wt) and aromatic specifications by 1993 (10% vol., for CARB) caused much debate, concern and confusion. In Sweden, there was strong national commitment and tax incentives for refiners to produce ultra clean diesel fuel containing 10 ppmw sulphur and 5% vol., aromatics. Many oil companies and established process licensors debated that such low levels of sulphur and aromatics could be achieved only by installation of costly high pressure equipment. Criterion developed a lower pressure approach to achieve this objective.

Continuous improvement of our regular catalysts and the development of new high activity hydroprocessing, aromatic saturation and cetane improvement catalysts provided an ideal opportunity for Criterion to challenge conventional thinking and enter the process licensing arena with the lower pressure option. In line with our goal to focus on our strengths of catalyst development as well as process technology conceptualization, we decided to align our Technology group with recognized, leading engineering companies having proven hydroprocessing design expertise.

In 1991, we formed an alliance with ABB Lummus Global to market the SYN Sat process. Understanding the synergy of combining our special SYNCat catalyst and process technology know-how with the proven reactor design and engineering capability of ABB Lummus was such an important aspect of this relationship that we used the words "Synergetic" and "Sat-

uration" to derive the name of the process. In 1997 we enhanced the marketing of SYN Technologies by adding Fluor-Daniel's assistance with our efforts.

In late 1998 we announced formation of our SYN Alliance to include Shell Global Solutions along with ABB Lummus Global. The new team will bring to market the complementary expertise of each member and the combined best advantages of SYN Technology and Shell's SMDH process technology.

Also in later 1998, Lummus and Criterion announced entering into an agreement with Exxon Research and Engineering Co. to jointly develop and market the SYNsat distillate hydrogenation process. Exxon brings extensive research, development, design, and operating experience in hydroprocessing to the cooperation. The agreement provides for joint R&D to develop the next generation SYNsat process technology.

Since 1991, our team has been averaging 3-4 units per year, and we now have six units in operation including a grass roots unit in Sweden. Our success is attributed to the fact that we can customise our solutions to cost effectively meet the needs of the refiner -- "fitting chemistry to the pipes". We've added licenses in SYNShift and SYNFlow, two of our newer SYN Technologies.

We continue to build on the idea of successful alliances in other parts of our business. Following developments of novel catalyst or catalyst systems that will allow refiners to either optimise use of existing plant or to justify investment in new technology, we look for the appropriate application. The oil industry is regarded by many to be a mature industry that is slow to accept change. Rest assured, innovation and innovative thinking is still alive and kicking and will continue to force change.

The era of know-how based alliances and technology "leaping" to provide cost effective customised solutions is just beginning.....

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