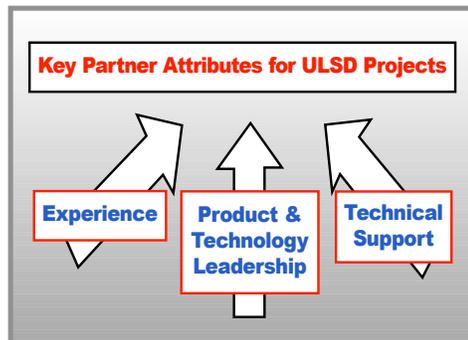


How is Your ULSD Solution Progressing?

Points to consider for executing a successful ULSD strategy

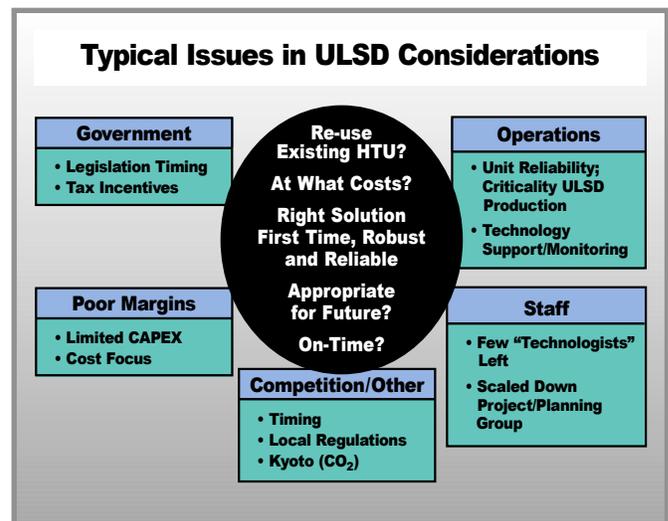
With Ultra Low-Sulphur Diesel regulations bearing down on the North American diesel fuels market in 2006, most refiners in the region will soon enter the final technology selection and implementation phase of their ULSD projects. Expected surges in engineering services and catalyst demand over the next couple years will certainly challenge both refiners and suppliers. So, making the right decisions quickly will be extremely important.

In Europe, many ULSD projects are into the operational phase. Looking back, it is apparent that the most successful refiners focused on several key elements when selecting their supplier/technology providers - namely experience, product and technology leadership, and technical support.



Choosing an Experienced Partner

Due to the each refinery's unique situation (for example, refinery design, crude source and production goals), no single ULSD strategy can be a best fit for every refinery. Multiple variables must be studied and understood to create the optimum solution (see inset). Because of the breadth and complexity of the issues, choosing a supplier who has successfully implemented a wide range of ULSD projects should be a high priority. Also, it is important to know the full extent of the supplier's capabilities and his flexibility in working with a variety of engineering firms

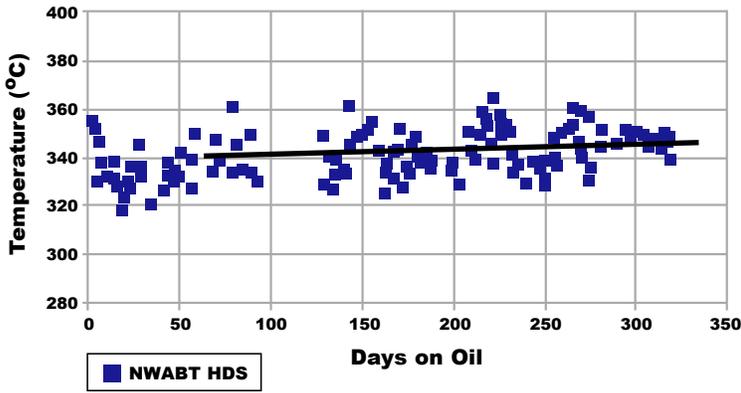


or providing in-house engineering resources.

Starting in the early 1990s, Criterion Catalysts & Technologies began working with European refiners to produce ultra-clean diesel fuels. Since that time, Criterion has worked with a variety of refiners (big, small, integrated, independent, etc.) to develop and execute clean diesel fuel projects. The SYN technology, which is offered by the ABB Lummus/Shell Global Solutions/Criterion alliance, has been selected for more than 30 diesel projects around the world. Currently, Criterion is involved in more than 50 ULSD projects in North America. In executing these projects, Criterion has worked with nearly all the major engineering companies, using proprietary or open-art technology to provide the best fit with each customer's preferences and capabilities. Shown here is a plot for a German refiner's distillate hydrotreater that was revamped by Criterion and Shell Global Solutions for ULSD operation. The unit's stable performance is typical of the results achieved in distillate hydrotreater projects that Criterion has helped execute.

DHT producing Sp <10ppm revamp by Criterion/Shell Clean Fuels Team

...very stable operation making Sp <10ppm



- New reactor with CENTINEL catalyst installed increased feed rate/LHSV constant
- Sp reduced to <10ppm from Sp=400ppm
- Unit performing per design

Leveraging leading Products and Technology

Improving catalyst performance is one of the key ways that catalyst suppliers can help refiners reduce the cost of ULSD implementation. In this regard, Criterion has expended considerable resources to advance catalyst performance and better understand the variables affecting catalyst selection for ULSD. Introduced in 2000, Criterion's CENTINEL catalyst line has significantly boosted the capabilities of existing distillate hydrotreaters. Criterion expects to commercialize a new generation of CENTINEL catalysts by the end of 2003 to help refiners develop even more cost-effective ULSD strategies.

Technical Support is Critical

In the Americas, the role of distillate processing units is quickly evolving. Producing ULSD reliably and cost-effectively will require more than just good unit design and high-performance catalyst. The quality of ongoing technical service will also be a major determinant in the project's economics. Based on years of experience with ULSD operations, Criterion has created a technical support system that can efficiently deliver the analyses needed to make good decisions about the ULSD operation. Continually working to enhance its service tools, Criterion has now developed an improved technical support system built upon the successful principles of CATSCAN, the performance monitoring and modeling system developed for petrochemical applications by Pavilion Technologies, Inc. and CRI Catalyst Company, Criterion's sister company. The system gives refiners much-needed tools for making quick operational evaluations and supplies Criterion the information it requires for in-depth analysis.

It is a demanding time for refiners and suppliers dealing with the growing ULSD market. Refiners can benefit from choosing the right partner to help navigate the difficult choices. Be assured that Criterion is prepared to help you achieve success.

CATSAN is a registered trademark of CRI Catalyst Company.

