

PROJECT facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Transportation Fuels
and Chemicals

11/2001

LEAD INDUSTRY PARTNER

Petro Star Inc

201 Arctic Slope Ave, Suite 200
Anchorage, AK 99518-3030

PARTICIPANTS

Degussa-Huls Corp

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FEV Engine Technology

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GTC Technology Corp.

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Koch Modular Process Systems, LLC

45 Eisenower Drive
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Travis/Peterson Environmental Consulting Inc.

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Anchorage, AK 99503-4475

CONVERSION EXTRACTION DESULFURIZATION PROCESS

Description

Petro Star Inc. has assembled a project team to further develop a process to remove sulfur from diesel fuel. Petro Star Inc. developed a laboratory-based Conversion Extraction Desulfurization (CED) process over the past 4 years. Petro Star is striving to make the CED process cost effective for small and medium sized refineries to compete with standard hydrodesulfurization (HDS) technologies. The CED process does not require costly hydrogen processing, high pressures, or high temperatures. The process selectively oxidizes sulfur compounds and removes the compounds by solvent extraction at near-ambient conditions. In addition to removing sulfur, the CED process removes nitrogen-containing compounds and aromatics that adversely affect diesel fuel quality.

This project will demonstrate the feasibility of the CED process, engine-test the processed diesel fuel, and design a pilot plant along with an estimate of capital and operating costs for a commercial demonstration plant. Further development of the CED process is needed because environmental regulations are forcing petroleum refineries to meet ultra-low emissions and to comply with the Ultra Clean Transportation Fuels Initiative. Compliance requires the removal of sulfur compounds from fuels used in internal combustion engines. Conventional HDS processes consume large amounts of hydrogen, require exotic catalysts that are easily poisoned and operate under severe temperature and pressure conditions. These conditions result in expensive capital and operating costs along with disposal problems associated with spent catalysts and the by-product formation of elemental sulfur. In addition, HDS cannot remove sulfur from the more refractory thiophenic sulfur-containing compounds without severe and costly treatment. These increased costs may force small and medium size refineries out of the low-sulfur fuel market.



Refinery locations

CONVERSION EXTRACTION DESULFURIZATION PROCESS

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COST SHARING

DOE \$1.3 million
Non-DOE \$0.9 million

CUSTOMER SERVICE

(800) 553-7681

WEBSITE

www.netl.doe.gov

Early cost evaluations indicate that the CED process can be affordable for medium and small size refineries that produce low-sulfur diesel, primarily because the process does not require energy intensive manufacture of hydrogen. This also results in less air emissions during processing. In addition to the positive economic and environmental aspects of the CED process, it will advance the Ultra Clean Fuels Initiative and, therefore, increase the supply of ultra low-sulfur diesel. Further, the deployment of the technology will help the U.S. maintain its leadership in developing and licensing new, environmentally benign, petroleum refining processes.

This project will collect laboratory-scale process data, use that data to perform chemical engineering process design and economic evaluations, and design a pilot plant. The project is expected to be completed within 18 months. The final product to the Department of Energy will be a report that documents the success of a bench-scale, continuous-flow CED unit, provides engineering plans for a 50 barrels per standard day (BPSD) pilot plant, and cost estimates for a 5,000 BPSD commercial demonstration plant.



Photo courtesy of Petro Star Inc.

Petro Star Valdez Refinery, the newest refinery in the U.S., was built according to environmental standards