FIG. 1 A gas-fired GE 7EA combined cycle plant could raise gross profits by 43% by adding liquid fuel burning capability.

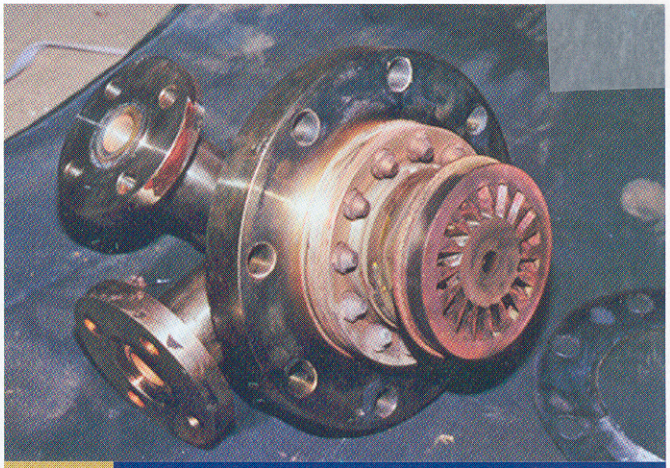

FIG. 2 Fuel nozzle for a gas turbine that is capable of dual fuel—gas and liquid—operation. The nozzle is also equipped with water injection capability.

Potential for 43% boost in combined cycle profits

Fern Engineering Inc., a worldwide company that provides consulting services and products to the turbomachinery industry, has recently conducted a case analysis on "dual fuel" capability. Results of the completed analysis are claimed to highlight the economic advantage of providing combined cycle power plants with the capability of operating on both gas and liquid fuel (Fig. 1).

"We conducted this study for a client that was interested in learning more about the economic incentive of adding liquid fuel burning capability to gas turbines that currently can only burn natural gas," explained Jeff Phillips, vice president and project manager of the dual fuel analysis.

In the analysis, the company considered two generic combined cycle power plants located in Massachusetts: a 293-MW Siemens Westinghouse W501F and a 130-MW GE Frame 7EA. Both the W501F and the 7EA were assumed to originally be equipped to burn only natural gas fuel. Fern Engineering then analyzed the economic impact of adding the capability of burning distillate no. 2 fuel oil to both plants.

The analysis revealed that, during a recent 12-month period, a W501F with access to only natural gas would have generated $19.8 million in gross profits. A W501F with dual fuel capability would have generated $27 million in gross profits, a profit increase of approximately 36%. In the same way, dual fuel capability on the smaller 7EA would have increased profits by approximately 43%—from $6 million to $8.6 million (Fig. 2).

"This study has undoubtedly brought to light the potential savings a gas turbine plant owner can garner by adding the capability of burning fuel oil," according to Mr. Phillips.

The hour-by-hour dispatch analysis was based on spot market prices for distillate no. 2 fuel oil and natural gas fuel and included the cost of delivery to Massachusetts in the assessment of the two fuels. In addition, the analysis was carried out using the wholesale electricity prices from the ISO New England real-time market.

Fern Engineering conducted the analysis from March 1, 2003, to February 29, 2004. The study addressed the issue of inconsistency with unit measurements by converting both natural gas and distillate prices to units of $/MMBtu on a "lower heating value" basis.

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Catalyst structure recognized as innovative

Engelhard Corp.'s pioneering research efforts for the distributed matrix structure (DMS) technology for petroleum refining catalysts and additives has gained industry distinction in a recent Frost & Sullivan catalyst study.

The DMS technology applies a unique materials science that is used to construct higher-performance and more-selective fluid catalytic cracking (FCC) catalysts and additives. This new family of catalysts has also enhanced stability and activity, while raising unit yield without generating make gas and coke.

"An advantage of this state-of-the-art technology is that it minimizes the diffusion resistance for cracked products to the internal crystalline surface, thus reducing the occurrence of overcracking. Though other technologies may have similar or higher pore volumes, Engelhard's DMS structure imparts a unique morphology and inherent zeolite-based cracking pattern," according to Anil Nadu, a research analyst for Frost & Sullivan.

The DMS technology enables enhanced diffusion of hydrocarbon feed for pre-cracking on highly dispersed zeolite crystals. The pre-cracking sites are located on the external part of the zeolite surface, thus minimizing overcracking of hydrocarbon feed. The feed first cracks on the surface of the zeolite rather than on the amorphous matrix materials. Less coking of the catalyst occurs. Patented DMS technology is being used in over 80 commercial FCC units globally.

The DMS technology has been used to develop several new products:

- NaphthaMax—The first DMS catalyst designed for short-contact-time processes.
- NaphthaMax-LSG—This catalyst extends the technology and enables sul-