



■ TDE is currently fabricating the third train of a grassroots LPG recovery plant for Turkmenistan. The new train will be similar to Trains 1 and 2 that are already installed and operational.

## RISING TO THE CHALLENGE

*Thermo Design Engineering Ltd. Evolved from an Idea to Become One of Canada's Leading Engineering, Project Management and Fabrication Companies*

by Frances Purslow

Since its incorporation in 1979, Thermo Design Engineering Ltd. (TDE) has grown from an idea shared by five engineers to one of Canada's leading engineering, project management and fabrication companies, specializing in process plants and equipment for the oil and natural gas industry. Over the past 26 years, TDE has built more than 250 plants worldwide. Because their locations are often remote from major population centers, they require unique logistical solutions for the transportation and installation of facilities.

In addition to the head office and fabrication facility located in Edmonton, Alberta, TDE has sales offices in Brazil, China, Cyprus, India, Indonesia, Poland, Iran, Mexico, Russia, Turkmen-

istan and two in Canada: Calgary, Alberta and Richmond Hill, Ontario.

"We prefer large or unusual turnkey projects that allow us to manage the entire process from initial design through to completion of the facility on-site," said Jim Montgomery, president and one of the founders of TDE. "In the last few years, the larger projects have been overseas. Consequently, that is where 80% of our work has been."

A typical project for TDE is the Petrobras Catu LPG recovery plant completed in Brazil in 2004. For two years, TDE designed and fabricated this cryogenic plant for the largest corporation in Brazil. The twin Dresser-Rand 6-throw, single-stage HOS reciprocating compressors are capable of handling 83 MMscfd at a pressure

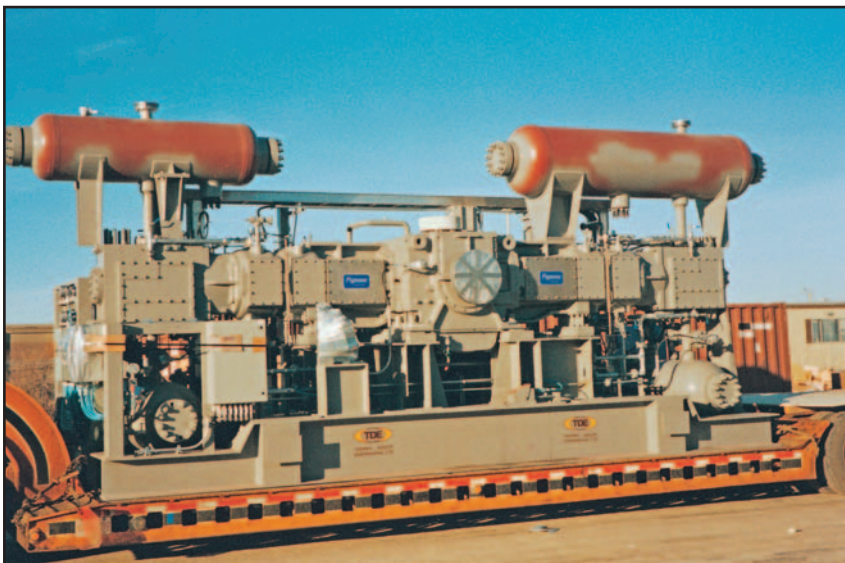
ranging between 218 psig and 507 psig ( $2.3 \times 10^5$  m<sup>3</sup>/day at 15 barg to 35 barg). The WEG electric motors used for the driver produce 4828 hp (3600 kW) at 1200 rpm. The turboexpander chosen to supercool the gas to -100°F (-73°C) for ethane extraction is Mafi-Trench EC/frame 3.0 pre-boost.

TDE uses the modular design concept in all of its natural gas processing plants. The company feels that it offers substantial savings in time and money compared to traditional on-site construction methods. It also allows design and fabrication to be conducted in the controlled environment of its fabrication facility in Edmonton.

TDE's fabrication facility is situated on 16 acres (6.5 hectares). It encompasses five shops, as well as office,



■ TDE typically uses Mafi-Trench turboexpanders on its cryogenic packages.



■ This Nuovo Pignone 2-throw hydrogen compressor was packaged by TDE for use in Lloydminster, Alberta.

storage and yard space. TDE currently employs approximately 250 people at this facility.

Main vessel fabrication and major pipe spooling are completed in the fabrication shop, which is 90 ft. (8.5 m) wide by 300 ft. (91 m) long. Four cranes in this shop (3, 6, 10 and 10 tons) each have an underhook height of 17.5 ft. (5 m). Overall assembly is conducted in the module assembly shop, which is 66 ft. (20 m) wide by 275 ft. (84 m) long. Three cranes (10, 16 and 20 tons) each have an underhook height of 35 ft. (10.5 m). Attached to the fabrication shop is a dedicated facility for electronic control panel assembly, programming and testing.

All structural fabrication is completed in the structural shop, which is 120 ft. (36.5 m) wide by 210 ft. (64 m) long. It houses nine cranes ranging between 1

and 10 tons of varying heights. The three major shops have a single vessel capacity of 250 tons (275 tons) and 20 ft. (6 m) diameter with 1200 amps of continuous-feed, multi-head, submerged-arc automatic welding. Medium and large diameter pipe spooling is fabricated on a RotoWeld 2000 computer-controlled welding machine.

After fabrication is complete, the units are cleaned in the sandblasting building, which is 71 ft. (21.5 m) wide and 132 ft. (40 m) long. From there, they are sent to the 9000 sq.ft. (836 m<sup>2</sup>) paint shop, where external coatings such as enamel, zinc rich products, epoxy, urethane and glass flake can be applied. If internal coating is required, it is typically subcontracted. The paint shop has the same dimensions as the sandblasting building. However, it is equipped with a 5-ton

crane with a 24 ft. (7 m) underhook height.

TDE's engineering, drafting, purchasing and support departments are housed in 17,000 sq.ft. (1580 m<sup>2</sup>) of office space.

"The modular concept is ideally suited for remote installations," said Montgomery. "All of the major equipment and associated systems are configured and assembled onto prefabricated structural steel skids, which are sized in accordance with local transportation restrictions and requirements. The skidded components or modules are then shipped to the job site, where installation and commissioning can take place in a matter of weeks."

"We specialize in custom design and fabrication," said Jim Hornett, TDE Canadian sales manager. "Every solution we provide is uniquely designed to address the particular volumes and compositions handled by our customers. Two of the largest custom projects that TDE has undertaken have been for OrenburgNeft of Russia and TurkmenGas of Turkmenistan.

TDE's relationship with OrenburgNeft began in 1992, when the Russian company approached TDE to help it deal with the challenge of treating one million tons per year of crude oil at the unusually high pressure of 490 psig (33.78 bar) (vessel design pressure). OrenburgNeft wanted the crude to be preheated externally from the treaters and then electrostatically treated. TDE provided the fabricated process modules, including free water knockout vessels, heater treaters, shell and tube heat exchangers, modular pipe rack, control room and SCADA-based control system. In addition, TDE was responsible for the field construction and start-up of the facility. As a result of this successful collaboration, TDE was awarded another contract in 2000. It entailed completing a turnkey grass roots gas processing plant in Tulipan, Russia, that would process a maximum of 220 MMscfd at 830 psig (6 x 10<sup>6</sup> m<sup>3</sup> at 57.26 bar) of natural gas. In addition, TDE designed future phases of the plant expansion, including oil and condensate stabilization and a mini-refinery capable of processing 500,000 tons (453,592 tonnes) per year of stabilized crude into gasoline, motor distillate and residue fuel oil.

The modular gas processing plant was designed and manufactured as twin parallel processing trains. Each train included inlet gas handling, a propane refrigeration loop complete with gas turbine-driven centrifugal compressors, liquid hydrocarbon recovery equipment, and an LPG fractionation plant. Solar Mars 90 gas tur-



■ A 10 MW power generation and distribution plant was fabricated by TDE for OrenburgNeft in southwest Russia.

bines, with a nominal rating of 12,600 hp (9396 kW), were used to drive the Dresser-Rand CBF-742 centrifugal compressors. In gas chilling and LPG recovery, the refrigerant flow was 158,760 lb./h (1203 kg/min) for each compressor train. For this, York M538A centrifugal compressors were driven by Solar Centaur 40 gas turbines, which have a nominal rating of 4700 hp (3500 kW). In addition, TDE supplied the plant utility systems, including 10 MW (13,410 hp) of gas turbine electric power generation (provided by two Solar Taurus 60 gas turbines with Ideal electric generators) with 6000V and 660V switch gear, low- and high-pressure steam generation utilizing waste heat recovery boilers and fired boilers, as well as plant air and nitrogen generation facilities with storage. TDE also supplied, programmed and commissioned the plant

distributed control system and emergency shutdown programmable logic controllers, complete with Russian language display.

At the end of 2000, TDE was awarded a contract by Turkmenigas to supply an LPG recovery plant in Turkmenistan with a nominal inlet gas flow of 320 MMscfd at 580 psi and 104°F (9 x 10<sup>6</sup> m<sup>3</sup>/day at 40 barg and 40°C). This cryogenic plant features molecular sieve dehydration, Mafi-Trench EC/Frame 3.75 turboexpanders to condense hydrocarbon liquids, and LPG fractionation. It consists of two identical parallel trains with 160 MM-SCFD (4.5 x 10<sup>5</sup> m<sup>3</sup>/d) capacity each, built and delivered on a turnkey project basis.

The LPG recovery plant chills the gas from an inlet temperature of between 94° and 104°F (34° and 40°C) to the required de-ethanizer overhead

temperature of -100° and -120°F (-73° and -84°C). After the chilled gas has passed through the 72.5 ft. (22 m) high de-ethanizer tower, over 90% of the propane will have been recovered. As is usually the case, TDE supplied all process modules, pipe racks, utilities, control room and electrical systems, while construction and start-up were completed using the local workforce under TDE supervision.

More recently, TDE has begun building vessels for Phase 3 of this project, which will increase total plant capacity to process 480 MMscfd (13 x 10<sup>6</sup> m<sup>3</sup>/d) of gas and to recover 550 tons/day of LPG and 330 tons/day of C5+ product. "If volumes should decrease at some point, a train can be removed," says Hornett. "This is another of the benefits of modular construction. It allows for easy relocation, if the client's needs change in the future." ■

REPRINTED FROM JUNE 2005 COMPRESSORTech<sup>Two</sup>

Copyright Diesel & Gas Turbine Publications  
Printed in U.S.A.