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A FIRST FOR MAN MAX1
BLAST FURNACE INSTALLATION

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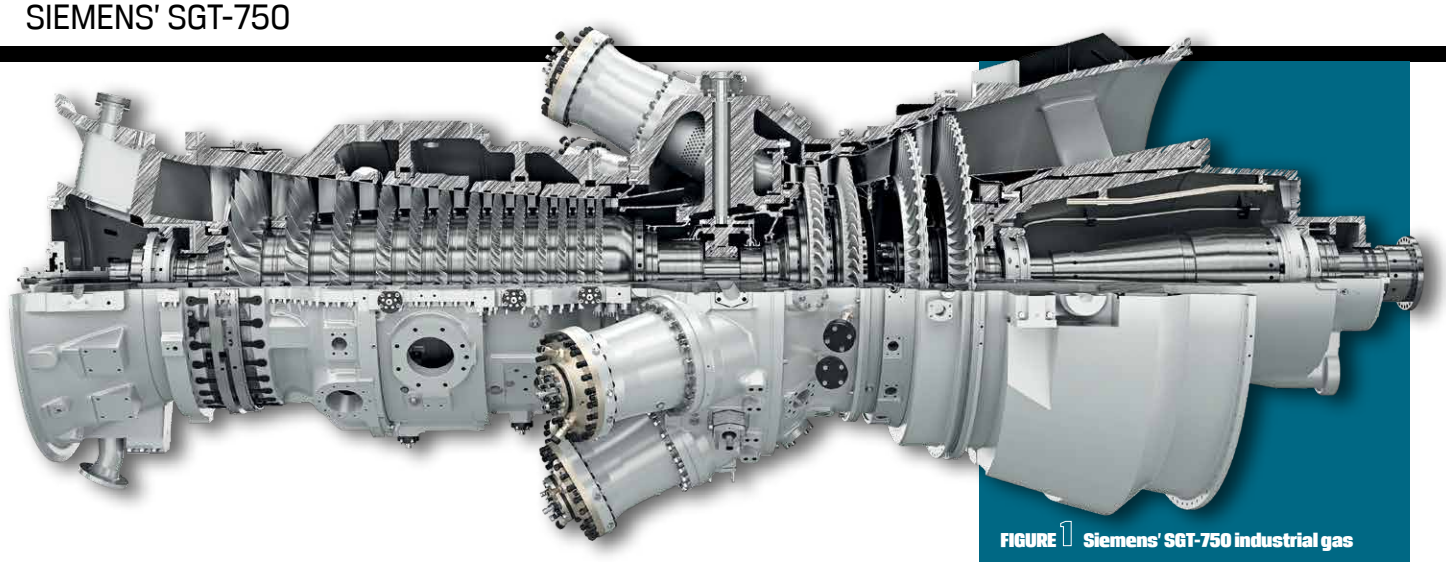

FIGURE 1 Siemens' SGT-750 industrial gas turbine, which is optimized for direct drives without intermediate gears and with a rotational speed of 6100 rpm.

Siemens equipment gets selected for midstream, downstream, offshore applications. By **Kirk Stalis**

SGT-750 gas turbine hits new milestones

In recent years, oil and gas operators across the supply chain have faced increased pressure to improve efficiency and minimize environmental impacts. During this time, Siemens' SGT-750 industrial gas turbine has been frequently selected for power generation and mechanical drive applications.

Optimized for direct drives without intermediate gears and with a rotational speed of 6100 rpm, the 41 MW SGT-750 gas turbine enables long intervals between maintenance events, helping customers increase production uptime and reduce facility lifecycle costs, Siemens said. Since the first unit went into service in 2013, the fleet has accrued more than 61,000 hours of operating service worldwide.

In 2018, the SGT-750 turbine underwent its first hot path overhaul at 36,000 hours. The components that were inspected showed minimum wear and demonstrated the capability to further extend the overhaul cycle, Siemens said.

The SGT-750 goes to Mexico

In 2015, Siemens supplied three SGT-750s to Mexican midstream operator Fermaca for use in its El Encino compression station in Chihuahua. The trains recently became operational and play a key role in transporting natural gas from Waha, Texas, to power plants and industrial parks in Chihuahua, Coahuila and Durango, as well as to central and western Mexico. The three turbocompressor trains have an installed rated power output totaling 155,000 hp (115,583 kW) and a compression capacity of 1.2 Bcfd (33.9 X 10^6 m^3/d).

The Fermaca project marks the first installation where an SGT-750 is being used as a mechanical drive unit coupled with STC-SV pipeline compressors. The turbine provides a 13-stage compressor with a pressure ratio of 24:1 and mechanical efficiency of 41.6%. The SGT-750 minimizes starting power requirements but delivers a high starting torque and variable compressor speeds from 50% to 105%.

North of the border

Earlier this year, Encana selected the SGT-750 for its Pipestone processing facility in Alberta, Canada. For the project, Siemens will provide one feed and sales gas train, along with a refrigeration compression train. The feed and sales gas train will use an SGT-750 to drive two Dresser-Rand Datum compressors, combined with a Siemens waste heat recovery unit for process heat. The refrigeration train will consist of an electric motor-driven Datum compressor with a Siemens variable frequency drive. The Datum compressor line is suited for unspared feed/sales gas and refrigeration compression

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PRODUCT NEWS
SIEMENS' SGT-750

FIGURE 2
The SGT-750's removal from the package. The SGT-750 has been used in midstream, downstream and offshore applications.

applications, Siemens said.

The Pipestone processing facility will provide Encana with 19,000 b/d of net raw condensate processing capacity, plus 170 MMcfd (4.8 X 10^6 m^3/d) of net inlet natural gas processing capacity. Keyera will own the Pipestone processing facility and provide processing services to Encana. The facility will have a total processing capacity of 200 MMcfd (5.7 X 10^6 m^3/d) and is expected to start up in 2021.

The project marks the first gas processing plant application of the SGT-750 in North America. Siemens will supply all the equipment for the two compression trains, which will reduce interfacing complexity for Encana and contribute to streamlined project delivery, Siemens said.

Something new in the downstream

Another SGT-750 milestone occurred this year when the first-ever downstream application of the unit became operational in China. The turbine (Figure 1) is being used to drive two Siemens single-shaft STC-SH compressors for a reactor effluent compressor train at Zhejiang Satellite Energy Co.'s propane dehydrogenation (PDH) plant in the Zhejiang province.

FIGURE 3
The SGT-750 core engine exchange, which demonstrated the ability to remove the core from the package and replace it to minimize downtime during maintenance.

This order follows a previous one from Zhejiang Satellite Energy for the PDH project in 2013, which consisted of a compressor train featuring two STC-SH compressors and an SGT-700 gas turbine. The single-shaft compressor comes with standardized components for ease of maintenance, making it suited for petrochemical process applications with a wide range of volume flows, the company said.

Compared with steam turbine-driven or electric motor-driven compressor options, which are more commonly used in PDH processes, gas turbine-driven solutions allow operators to burn waste gas generated in the process. This provides fuel savings and, in turn, lower lifecycle costs. Siemens has experience in burning a wide range of waste gas with dry low emission (DLE) technology. This, along with the SGT-750's attributes, were critical factors in it being used for the plant, Siemens said.

The fourth-generation DLE burner included with the SGT-750 turbine enables it to operate on a wide variety of fuels. This includes fuels with high amounts of inert gases; very lean fuels containing natural gas diluted with more than 40% CO_2 and more than 50% N2; and highly reactive gases containing high concentrations of C_2+ and H_2. The combustion system can also automatically handle quick variations of the Wobbe index thanks to the Active Wobbe Algorithm (AWA) integrated into the control system.

Despite the high concentration of ethane in the gas used for firing at the PDH facility, the turbine achieves low NOx emissions of 25 ppm. The continuously controlled fuel control to the burners enables a permanent stable operation in the load range with no need for complicated staging sequences in different load regimes or seasonal mapping. In other applications with more favorable gas compositions, the SGT-750 has been able to achieve emissions as low as 9 ppm NOx down to 20% load.

First offshore application in the Barents Sea

For offshore facilities, particularly floating, production, storage and offloading (FPSO) vessels, profitability is becoming increasingly contingent on the use of topsides packages that can efficiently deliver the horsepower to exploit resources in a range of water depths and operating conditions. At the same time, operators must be cognizant of lowering emissions, reducing OPEX and minimizing the weight and footprint of modules.

The SGT-750 is designed to meet these objectives, Siemens said. In 2018, Siemens received the contract to engineer, manufacture and commission a compression train utilizing the SGT-750 for Equinor's FPSO

FIGURE 4
Siemens' STC-SH single-shaft compressor with a horizontally-split casing offers a robust design with standardized components for maintenance simplicity.

vessel in the Johan Castberg oilfield on the Norwegian shelf in the Barents Sea.

The turbine will drive two Dresser-Rand Datum compressors operating in a tandem arrangement. The GT package was specially designed for harsh environments and features a unique design that eliminates the need for a speed-increasing gearbox, which reduces its weight and footprint. The compressors will reinject gas into the oil reservoir, providing pressurization and eliminating the need for capture or flaring, the latter of which is not permissible in the region.

For the FPSO, Siemens will also supply a waste heat recovery unit to recover gas turbine exhaust heat, which will be used for process heating and anti-icing. The turbine was delivered earlier this year and was subject to extensive testing to ensure the necessary levels of reliability and serviceability. The testing included a demonstration of an engine exchange to showcase the ability to remove the core from the package and replace it to minimize the downtime during the maintenance period (Figures 2 and 3).

Fit for oil and gas applications

The SGT-750 was designed to incorporate the size and weight advantages of an aeroderivative gas turbine while maintaining the robustness and flexibility of heavy-duty models. With 68,000 operating hours to a first major overhaul and a service plan with only 17 maintenance days in 17 years, the turbine has become a popular option in oil and gas applications, Siemens said. **CT2**