A history of testing

New York facility keeps pace with ever-changing industry demands.

By **John Stahley**

Siemens' compressor testing facility is equipped to perform ASME PTC-10 Type I and Type II testing, as well as API mechanical tests, individual compressor load tests and complete string testing.

Siemens' New York test facility has 145,000 sq.ft. (13,471 m²) of manufacturing and testing space. This photo shows the facility's reciprocating compressor test area.

As part of their goal to maximize uptime in the field and lower operating costs, oil and gas operators continue to demand more energy-efficient, reliable and robust compressors. In response, OEMs are enhancing compressor systems and improving the performance of existing equipment designs. Test facilities are key to demonstrating the performance of these new technologies.

Testing throughout the years

Such real-world testing is the primary focus of the Siemens Oil & Gas turbomachinery test facility in Olean, New York, which has 145,000 sq.ft. (13,471 m²) of manufacturing and testing space. The current test bench was built in 1972 on the site of the company's more than 100-year-old manufacturing plant.

The facility was originally constructed to test the manufacturing plant's primary product line – centrifugal compressors. During testing, a steam turbine drives a compressor with one of four boilers from a custom-built steam plant providing the steam. The boilers provide test steam at temperatures ranging from 425°F to 750°F (218°C to 399°C), pressures from 150 to 600 psi (10.3 to 41.3 bar) and a maximum flow rate of 340,000 lb/hr (154,221 kg/hr). A cooling water system was also built, capable of extracting up to 350 million Btu/hr (102 MW) of heat.

In the early 1990s, four test stands driven by variable speed electric motors were added to the compressor testing facility. Every compressor manufactured at the Olean plant is tested per industry standards from ASME and API. The test facility includes a gas blend system that supplies an online, on-the-fly mixture of gases, such as propane (C_3H_8), methane (CH_4), carbon dioxide (CO_2), helium (He) and nitrogen (N_2) to test compressors using a blend that approximates the composition and properties of gas encountered in the field. The Olean test facility is capable of completing all required industry testing, including ASME PTC-10 Type I and Type II.

Several renovations and expansion have occurred to the campus over the years to keep pace with the changing demands of the industry and the development of new technologies. In 1991, an additional testing facility was added to perform full-load, full-pressure (FLFP) hydrocarbon (natural gas) tests that duplicate the conditions that a compressor experiences in the field. The facility provides compressor operators with the assurance that the compressor train will operate as designed for critical services in the field, such as offshore environments, where the costs and complexities of repairing equipment are high.

In 2011, the Olean campus built a dedicated 10 MW, high-pressure CO_2 testbed to test supersonic compressions capable of up to a 10:1 compression ratio in a single impeller and 100:1 with two impellers. This testbed helped deliver the first supersonic 10:1 pressure ratio CO_2 compressor in 2015, Siemens said. Also, in 2011, a Type I FLFP test was completed at a discharge pressure of 7984 psi (550 bar), on a reinjection compressor for offshore service in the Tupi pre-salt fields. With a gas density of 34.7 lb/cu.ft. (556.2 kg/m³), this test set a world record for a centrifugal compressor, according to Siemens.

The test campus was poised for further growth as the manufacturing plant began building reciprocating compressors in 2018. Three reciprocating compressor testbeds were built over 10 months and became fully operational in February 2019. Due to the operating nature of a reciprocating compressor, the test stands require a very stable foundation. To that end, each stand sits on a 12 ft (3.6 m) deep platform of reinforced cement. This facility is the only one in the company portfolio equipped to test the full reciprocating compressor product

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range, including the largest model BDC units, Siemens said.

By upgrading the facility to include reciprocating compressor manufacturing and testing, operators have flexibility when it comes to compressor selection and sourcing, Siemens said. Centrifugal and reciprocating compressors can be built and tested in a single location, a particular benefit to operators purchasing both types of compressors for the same project. There is essentially no overlap or competition for resources, manufacturing equipment or testing space between the two compressor types, which allows the OEM to build and test multiple compressor sizes and styles with greater efficiency, Siemens said.

Digitizing processes

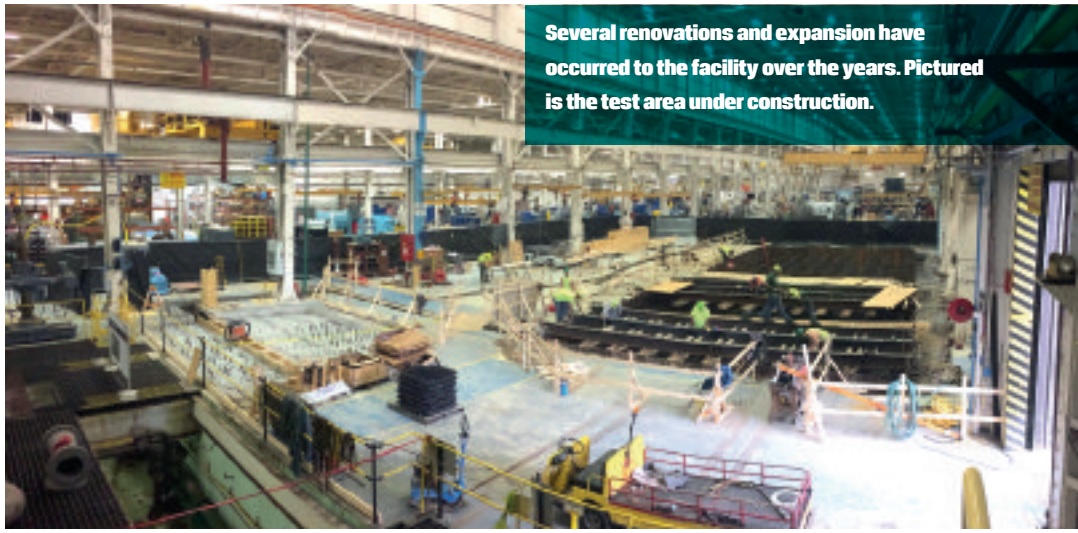
As digital technologies have advanced and dropped in price, they are finding greater application in a range of manufacturing and testing applications. For example, Siemens has started using tools available on its MindSphere platform to analyze equipment performance during manufacturing and testing. The platform allows users to monitor machine tool status and spindle performance, which subsequently leads to several process efficiency improvements in the parts manufacturing area. The platform's applications now include tracking electricity usage, at the point of use, in the testing area. This data will help ensure proper load balancing on the power distribution system, Siemens said.

The testing facility also includes the Siemens PCS 7 control system and in-house developed DAQ system. The control system lets the OEM's test engineers sit in an office above the test floor and remotely control auxiliary systems on the test stand. At the same time, the DAQ system provides real-time monitoring of test conditions. Customers also frequently witness these tests and monitor the same data, creating real-time discussions with the OEM engineers and greater collaboration to resolve any issues the testing might have uncovered.

These capabilities helped improve the performance of two new gas turbine-driven compressors, as well as revitalize five legacy gas engine-driven compressors for a natural gas provider in the western United States, Siemens said. The gas provider required these compressors to improve the reliability and reduce emissions for a pipeline that transports natural gas to more than 20 million customers in Southern California.

As part of the revitalization portion of the project, Siemens provided its Enginuity high-pressure fuel injection system, which provides fuel gas delivery for direct-injected, natural gas-fired engines. The injection system also includes an updated control system that increases operational reliability and features engine digitalization technology, Siemens said. These features make remote diagnostic data gathering and proactive maintenance planning possible.

The equipment was manufactured and tested at the Olean facility, transferred to the Houston facility for packaging and then shipped to the natural gas company at the end of April 2019. Based on the testing results provided by the Olean test engineers, the gas company is confident that the compressors will help them meet their performance goals once the project comes online later in 2020, Siemens said. **CT2**



Several renovations and expansion have occurred to the facility over the years. Pictured is the test area under construction.