Compressor package ensures delivery of high pressure turbine fuel gas

RESULT

- Single source accountability for fuel gas booster package design and fabrication
- Combined Heat and Power (CHP) cogeneration plant with 4.6MW Combustion Gas Turbine Generator and a Heat Recovery Steam Generator that produces 90,000 lb/hr of steam
- Essentially pulsation-free fuel turbine gas delivered using Vilter single screw compressor technology
- Boosted available pipeline gas pressure from 30 psig to 250 psig, independent of supply pressure variations and turbine demand
- Vilter single screw compressor design prevented bearing load wear issues associated with high pressure operation
- Enabled reliable onsite power generation that provides 95% of Campbell Canada's electricity needs

APPLICATION

Cogeneration is the simultaneous production of electricity and useful heat or cooling from a single fuel source. Electricity produced by a cogeneration system on-site displaces electricity purchased from the utility. The combined efficiency of cogeneration (up to 85%) is higher than the separate production of electricity and thermal energy.

The CHP project at Campbell Canada's site uses a natural gas turbine to drive a generator, which produces electricity. The hot combustion gas is then delivered to a secondary system which is integral to the CHP plant. Hot exhaust air produced by the turbine is delivered to a heat recovery steam generator, which uses the heat energy to produce steam at a pressure which is suitable for Campbell Canada's needs.

"For more than 25 years, Campbell Canada has implemented energy conservation programs at our Toronto plant. CHP technology is the next step in becoming an even more energy-efficient and sustainable company."

- Ana Dominguez, President, Campbell Company of Canada

EMERSON
Climate Technologies

CUSTOMER

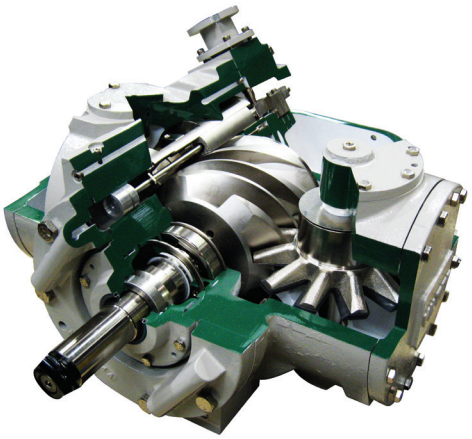
The Campbell Company's plant in the west-end of Toronto opened in August 1931 and produces more than 12.5 million cases of soup annually. Two-thirds of Campbell Canada's ingredients (fresh carrots, potatoes and mushrooms) come from within three hours' drive of the plant and is the first Campbell Plant in North America producing an aseptic carton product.

CHALLENGE

Campbell Canada is dedicated to driving corporate sustainability. The company intends to cuts its environmental footprint in half as measured by water use and greenhouse gas (GHG) emissions per ton of product produced; and reduce energy use by 35 percent per ton of product produced and source 40 percent of the energy used by the company from renewable or alternative energy sources by 2020. The vision extends to recycle 95 percent of waste generated (on a global basis), deliver 100 percent of global packaging from sustainable materials (renewable, recyclable or from recycled content), and reduce water use by 20 percent and reduce the carbon footprint for tomatoes and vegetables by 20 percent.
A Combined Heat and Power (CHP) plant was suggested that could efficiently produce the electricity and steam needed at the plant. One critical project challenge was the need for higher pressure fuel gas than was available from the local pipeline. An additional requirement of the fuel gas booster is rapid responsiveness to variations in pipeline gas pressures in order to supply the required volume of gas at a constant pressure.

SOLUTION

Campbell Company of Canada installed a Combined Heat and Power (CHP) project at its production facility in Etobicoke. Campbell's CHP system incorporates a turbine with an Emerson Fuel Gas Booster to feed pressurized natural gas into the turbine to generate power. The fuel gas booster package uses a Vilter VSSG-601 screw compressor to compress 1300 cfm of natural gas from ~30 psig to 250 psig to feed the turbine in the CHP system at 300 bhp. The hot combustion gas is then delivered to a secondary system which is integral to the CHP plant.



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The power output of the generator is 4.6MW, and the steam – which is used for cooking the manufactured soup product – is generated at a rate of up to 90,000 lb/hour, at 165 psi. The CHP plant now supplies up to 93% of the company's annual steam requirements.

Emerson was able to apply its extensive experience in engineering screw compressor systems for fuel gas boosting to deliver a pre-packaged solution. The single screw compressor solution achieved high energy efficiency using the Vilter Parallex™ slide system. The unique ability to vary capacity and volume ratio independently enabled the compressor to run at optimum efficiency across all operating and part-load conditions.

The key to the single screw compressor's reliability is in its balanced design. At the core of this positive displacement rotary compressor is a single main rotor intermeshed with two opposing gate-rotors. This unique and balanced design results in ultra-low bearing loads with significantly decreased vibration and sound levels.

RESOURCES

Learn more about the Vilter single screw compressors at:
EmersonClimate.com/Vilter