



Engine Drives Are Fueling the Future of Breweries



Engine Refrigeration Compressor Drives Help Keep the Cost of Beer Down During Hot Summers

Demonstration Provides Substantial Operating Savings Using Natural Gas Engines in California



Two engine-driven compressor sets are providing an important hedge against the ever increasing industrial electric rates in California.

Engine jacket water is being recovered to heat the brewery water which contributes significantly to the overall operating savings of the engine-driven systems.

Miller Brewery is located in Irwindale, CA, a suburb of Los Angeles. Typical of most breweries in the USA, it uses ammonia as its refrigerant and the plant uses two suction temperature levels depending on the process. Two Frick screw compressors driven by 3512 turbocharged Caterpillar natural gas engines replaced two of nine electric motor-driven Sullair screw compressors.

Heat recovery from the engines plays a substantial role in the energy economics of the Miller system. Measured energy recovery rates ranged between 34% and 38% of the fuel input.

Operating under the current electric rate structure (June 2001) and using natural gas costs ranging from 30¢ per therm to 70¢ per therm, yield an operating cost savings ranging between \$300,000 and almost \$500,000 per year.

Economics

The brewery is a Southern California Edison customer and has traditionally used SCE's RTP-2i rate (real time pricing rate with an interruptible service option). Demand charges under RTP-2i were assessed on a 15-minute basis at a constant charge of \$6.40/kW. Energy charges are determined on an hour by hour basis based on the time of day and the previous days maximum ambient temperature (as recorded by the NWS station in Los Angeles).

The economic analysis was broken down by suction pressure level (25-psig - low temperature and 45-psig - high temperature) and by fuel type (electricity and natural gas). With the increase in the cost of electricity the disparity between gas and electricity becomes apparent, with savings rising to 38% for the most profitable case of one engine-compressor set operating on each suction level.

Based upon the project cost estimates, the premium for retrofitting the two engine-driven compressors at the Miller Brewery is \$800,000. Based upon \$3.00 gas rates, operating the units in hybrid mode (one engine-driven compressor on each operating load temperature) 10-hours per day would yield a 4.0-year payback. Operating the

units in hybrid mode (one engine-driven compressor on each operating load temperature) 24-hours per day would yield a 1.7-year payback. The above economics assumes the ability to achieve low, long term rates for natural gas and does not incorporate any California surcharge to recovery electricity purchases. Increasing gas rates up to \$7.00 and operating the units in hybrid mode (one engine-driven compressor on each operating load temperature) 10-hours per day would yield a 5.5-year payback. Operating the units in hybrid mode (one engine-driven compressor on each operating load temperature) 24-hours per day would yield a 2.67 years payback.

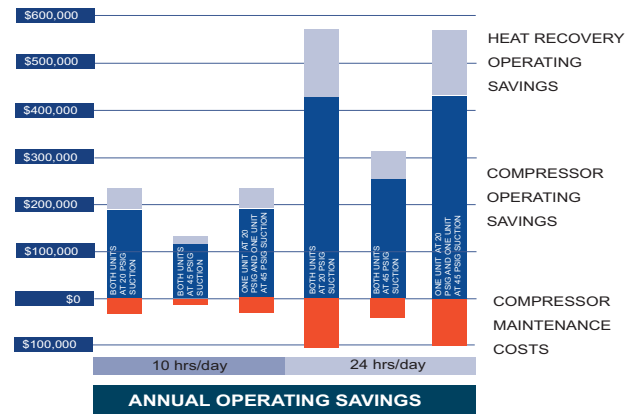


Heat Recovery Technology



Each engine is equipped with one of these heat exchangers. These heat exchangers preheat boiler feed water, which offsets a portion of the boiler gas requirements when the engine is running. The contribution that heat recovery makes to the bottom line in Miller's case is 32% or about \$150,000 annually as assessed below. Further energy savings could be realized by recovering the exhaust gas.

It is evident from the graph to the right that 24/7 operation of both engine-driven compressors pays off under the current electric rate structure and assuming gas prices stay low. Assuming natural gas prices remain low $\sim 30\text{¢}$ per therm one can expect savings in the \$500,000 range including maintenance. If gas rises to $\sim 30\text{¢}$ per therm the savings will be reduced to \$300,000 annually.



Gas Technology Fueling the Food Industry



150 HP standard engine-driven screw compressor product line



Standard brine chillers from 50 to 1,000 HP



Industrial custom engine driven compressor sets up to 5,000 HP



Dehumidifiers ranging from 1,000 scfm to 50,000 scfm



Industrial air compressors up to 750 cfm



Engine-driven onsite electric power generation in sizes up to 5 MW



Turbine-driven onsite electric power generation in sizes up to 30 kW to 15 MW



Combined heat and power systems providing electric or shaft power and thermal heat recovery



Fueling the Future of Industry

Energy Efficiency, Emissions and the Future of Energy Decisions

The electric power industry is in transition with the intended outcome leading to competition in a formerly restricted and regulated environment. In time, numerous benefits can be expected from a competitive electricity market; however, the transition will require rethinking electric delivery system design to accommodate the nation's future economic, environmental and reliability needs.

Combined heat and power "CHP" systems (either direct drive systems with heat recovery like Miller or onsite electric generation systems with heat recovery) have the potential to eliminate costly transmission and distribution bottlenecks, reduce electric peak demand, improve power reliability and power quality. Technology exists today that can be integrated into successful CHP systems. Smaller sized and advanced CHP systems are on the horizon.

Be sure to consult your local gas utility for economics of refrigeration systems, CHP systems and other natural gas based industrial products in your area as rates vary widely across the nation.

In the future, when peak demand is expected to rise, when improved integrated devices are made and when CO₂ emission reductions are valued, then even with low electric rates gas engine driven compressors with heat recovery systems will have vastly improved pay backs.

For further information contact

Industrial Center Inc..

The Industrial Center supports the commercial introduction of new technologies to help build value-added markets for natural gas in North America.



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The Industrial Center then coordinates market development programs to move specific products from R&D success to market acceptance and ultimate commercial success. The goal of each program is to achieve stand-alone sales for each supported technology within 5 years of its first market demonstration.



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