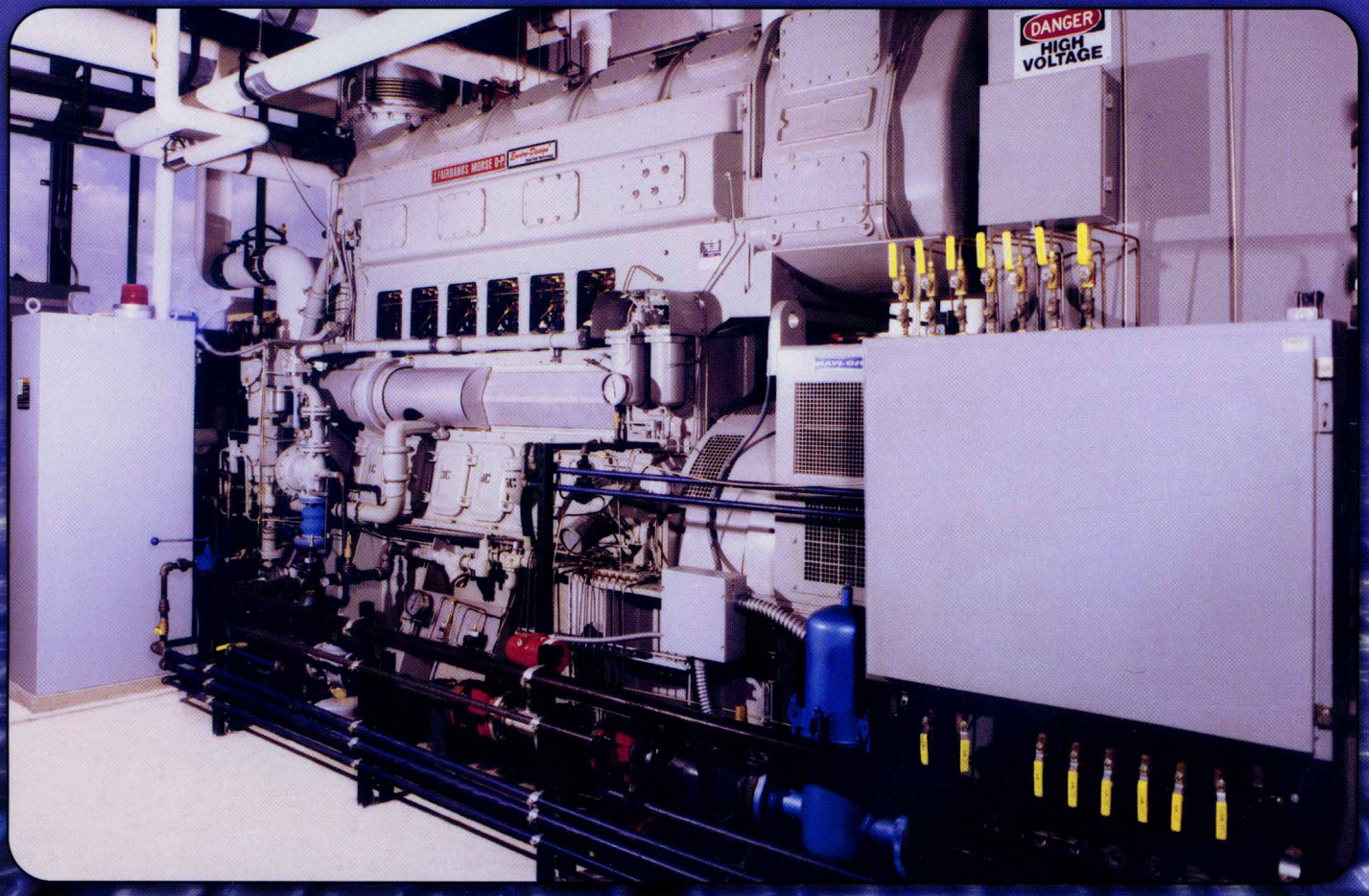
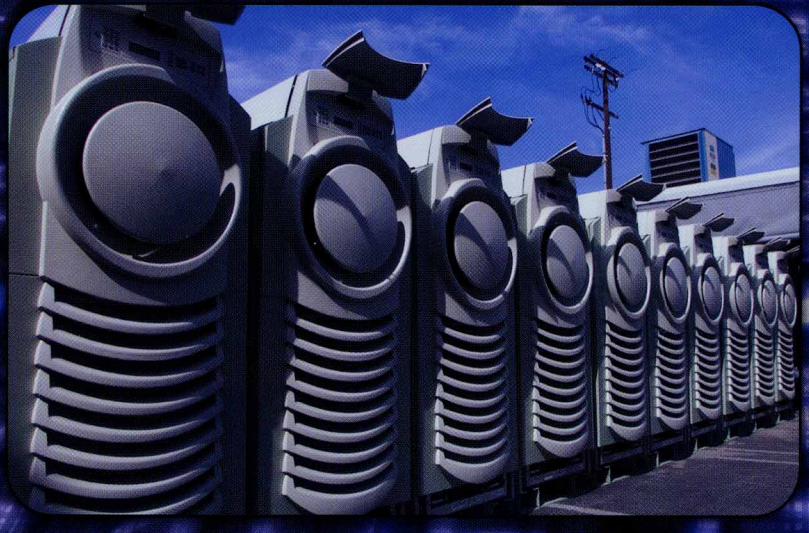
# DISTRIBUTED POWER

Distributed Generation Systems & Technologies

November/December 2000



## Microturbine Interconnection

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# HOSPITAL COGENERATES FOR SAVINGS, RELIABILITY

***Fairbanks Morse engines help facility meet peaking and emergency power needs***

**by Mark McNeely**

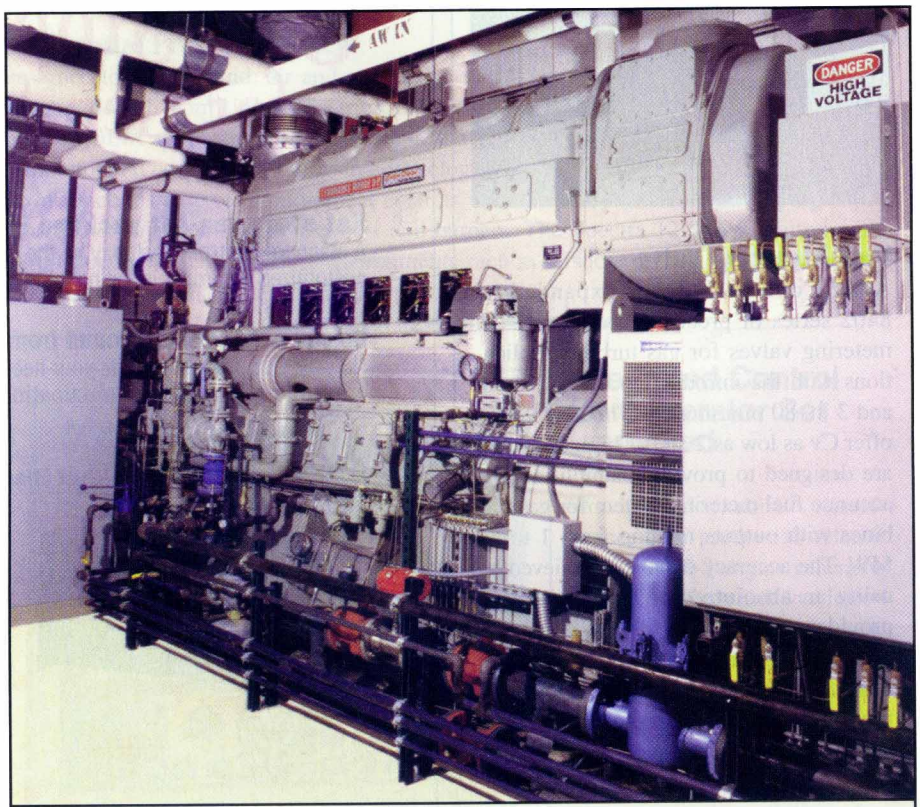
As each of the 50 individual states in the United States marches down its own path to electricity deregulation, more and more private and public institutions are making decisions to ensure their future supply of energy. Various facilities, given their load profiles and energy requirements, lend themselves ideally to the energy efficient use of cogeneration. Whether it is steam or hot water produced as a byproduct, cogeneration plants offer the ability to maximize the given fuel's energy content.

Faced with the need to upgrade its electrical distribution system and address other energy capacity issues, Beloit Memorial Hospital in Beloit, Wisconsin, U.S.A., chose two Fairbanks Morse-powered generator sets as it planned its peak shaving and emergency power improvements. The power plant began operation in June 2000.

"We needed to modernize our electrical distribution system anyway and that was the first issue," explained Philip Larson, director of engineering for the hospital. "Plus I needed additional capacity to meet the hospital's air conditioning requirements."

The hospital's 3000 kW cogeneration plant is based on two Enviro-Design generator sets from Fairbanks Morse Engine Division, also based in Beloit. Two six-cylinder model 38TDD8-1/8 Turbo-Blower opposed piston dual-fuel engines produce 2100 hp (1566 kW) at 900 rpm to drive 480 V Baylor generators each with outputs of 1510 kWe.

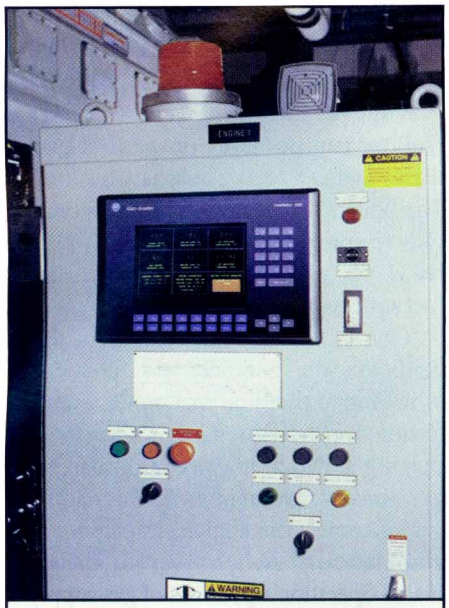
"The Fairbanks Morse engines act as both peaking and emergency power sources for the hospital," said Larson. "Also, we are able to sell electricity, roughly 1000 kW, back to the local utility as well as to help in production of the air conditioning for the facility in the summer and hot water heat for the buildings in the winter. We make our own 434 tons of air conditioning through 250° hot water via a Carrier absorption chiller.




*Beloit Memorial Hospital uses two Fairbanks Morse Enviro-Design generator sets to power the hospital's 3000 kW cogeneration plant. The two six-cylinder model 38TDD8-1/8 opposed piston dual-fuel engines produce 2100 hp (1566 kW) at 900 rpm to drive 480 V Baylor generators each with an output of 1510 kWe.*

"There were other issues why we did this. Retail competition is certainly on our horizon and when we deregulate my feeling is the quality of power will decrease and the cost will increase. California, this summer, would be a good example of that. There has not been enough electricity during peak demand times," Larson noted.

"The market for these types of installations is increasing due to commercial electricity customers looking for a lower cost energy supply," said Jay Burnette, director




*A view of the engine room generator set controls, which feature Allen Bradley PLCs.*

of marketing for Fairbanks Morse. "This particular application operates approximately 3500 to 4000 hours per year as a peaking facility, which seems to be the growth market. For our sized reciprocating engines, it is the hospitals, universities and medium-sized industrial companies that appear to be the best fit."

Burnette continued, "In this particular case, the hospital was proactive in recognizing that having their own power producing facility would provide options as electricity competition comes closer to reality. Using their engine generators, in conjunction with supplementing their hot water production, will put them in a tremendous negotiating position with the many potential power suppliers in an 'open access' marketplace."

The hospital's electrical distribution system consists of three electrical buses. There is a normal bus, an emergency power bus and the life safety bus. The buses are all supplied from the cogeneration plant, with 100% in back up capacity for the hospital's total needs.

GE-Zenith Controls supplied the paralleling switchgear for the installation. The switchgear is designed to parallel with the utility for peak shaving capability to allow the hospital to take advantage of the utility's curtailment rate. Additionally, the system is designed for automatic standby capability if the utility should fail. In the standby mode, the system automatically operates in two scenarios — it picks up the code-required emergency loads and then adds the entire facility.

The switchgear is supplied with Allen Bradley SLC 504 programmable logic controllers (PLCs) that interface directly between the system control, the generator control and the SCADA monitoring system on the A/B Data Highway. The 480 V system also features a custom utility metering cubicle designed specifically to meet the utilities requirements in order to run parallel with the grid. The 480 V power is stepped up to 12.4 kV.

"There is redundancy," said Larson. "The PLCs are in the engine controllers and switchgear cabinets. Fairbanks is connected to their equipment via a dedicated phone line and modem so they can make any necessary software changes, and as well the GE-Zenith gear is con-

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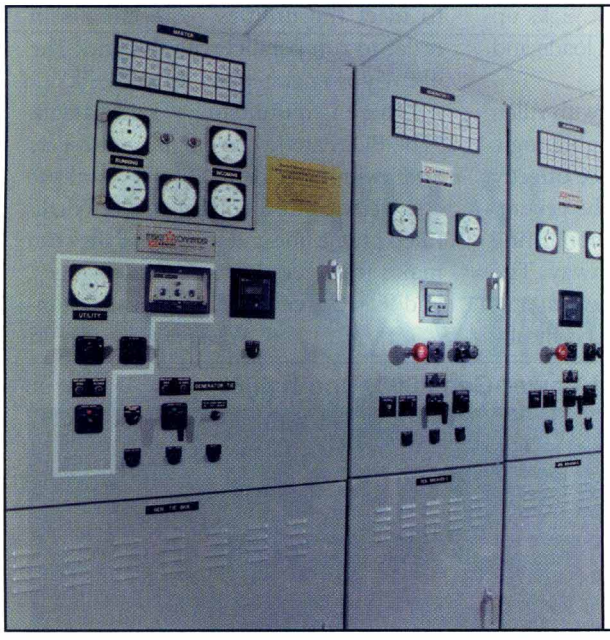


*The power plant's paralleling switchgear was supplied by GE-Zenith Controls. The switchgear is designed to parallel with the utility for peak shaving capability, as well as automatic standby capability if the utility should fail.*

nected by phone modem directly to Ballard Engineering so they too can make adjustments."

Other major components in the cogeneration plant include seven ITT Standard plate frame heat exchangers, two Universal silencers, engine intercoolers from Young Touchstone and two UTR1 series exhaust heat recovery units from Cain Industries.

Adjacent to the power generation facility, in an outside fenced area, are situated two Amercool horizontal radiator units for the residual engine jacket water and intercooler cooling requirements.

Larson noted, "We recover energy on these engines a little differently because we recover the lube oil, intercooler, jacket water and exhaust gas heat. We try to take all the generated heat in the engine and use that heat for a purpose. That's really what helps improve the payback.

"We added the absorption chiller as part of this project because the hospital was actually several hundred tons short of capacity," Larson continued. "We also make all of our domestic hot water for the building, five days a week, 52 weeks a year from the time we start, around 7:30 in the morning, until we shut down typically about 10:15 at night. That encompasses about 95% of the hot water usage of the buildings during those hours."

The hospital also has three boilers for additional hot water production for the building — two are 22,000 lb/hr (10,000 kg/hr) and one is 6000 lb/hr (2720 kg/hr).

While the dual-fuel Fairbanks Morse engines run primarily on natural gas, diesel fuel is also available as a backup. The boilers are also dual-fuel units typically running on natural gas. The facility has 20,000 gal. (75,700 L) of on-site diesel fuel storage.

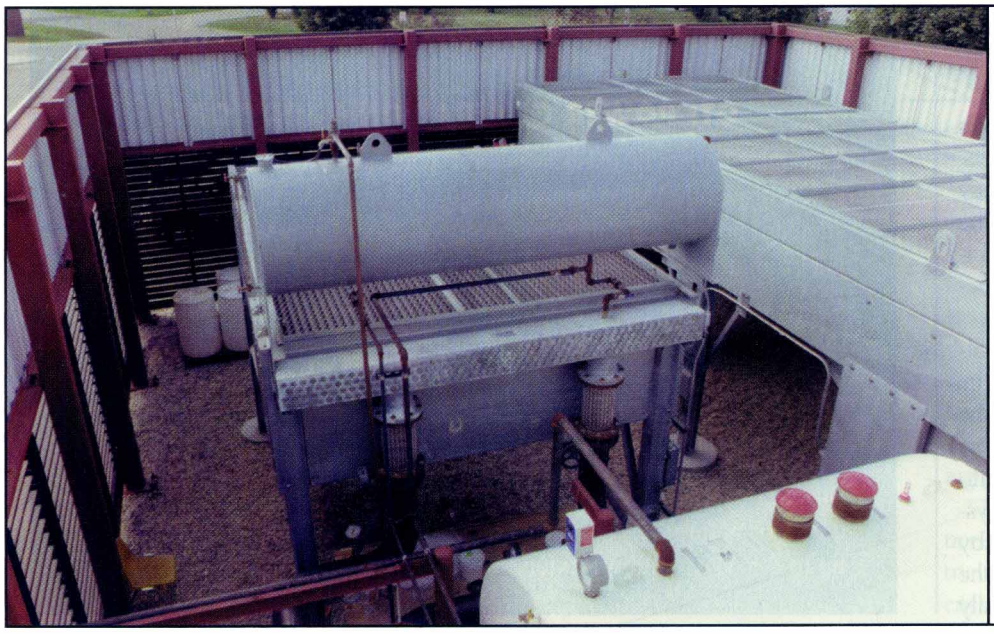
"One of things we liked about the Fairbanks Morse engines was the ease of switching in the dual-fuel mode. Transferring over to natural gas is a matter of turning a switch and we're on natural gas. Since we are an interruptible natural gas customer, the engine's capability to automatically switch over to diesel-fueled operation upon loss of gas supply is one of the large advantages," Larson commented.

Quarterly maintenance on the engines is provided through a service contract by Fairbanks Morse. Maintenance on the switchgear is through Ballard Engineering.

Burnette said, "We would project that these particular engines would operate between 35,000 and 40,000 hours before any major maintenance activities are required."

"We shut down and removed two old 440 kW engines that were part of our original standby power system. One of those was actually a Fairbanks Morse engine that dates some 32 or 33 years," Larson noted. A third engine was also recently taken out of service. ☆

**CIRCLE 73 ON READER SERVICE CARD**



*Adjacent to the cogeneration facility is a fenced area containing horizontal cooling units from Amercool that provide cooling for engine jacket water and intercoolers.*