



Motor Management Helps Toyota Maximize Effectiveness Of Headquarters Cooling System

General Industry Application Profile

"If we were to lose cooling functions to these buildings, effectively we would disrupt Toyota's operations in the United States."

That's why Bill Reinert, senior facilities engineer at the U.S. headquarters of Toyota in Torrance, California, believes motor management is so critical to cooling operations. Thus, Toyota uses Allen-Bradley Bulletin 150 SMC Dialog Plus™ Controllers to maximize the effectiveness of its cooling system.

The auto manufacturer's U.S. headquarters consists of a number of office buildings as well as a dining center and data center. When Toyota decided to replace old chillers that used R-11 CFC refrigerants, they installed a new cooling system that was efficient, flexible and most importantly, reliable.

The system cools nearly 30'000 square meter of space that comprises the eastern half of Toyota's campus. It consists of three McQuay gas-fired absorption chillers that supply 1,500 tons of cooling.

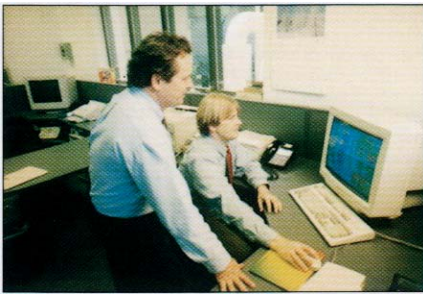


Rockwell Automation integrated control system monitors and manages three McQuay gas absorption chillers used to cool buildings, and especially the data center, at Toyota's U.S. Headquarters.

Large distribution pumps circulate the 6°C water throughout the campus, while secondary-loop feed pumps move the chilled water to fan-coil heat exchangers in each cooling zone. Heat absorbed by the chillers is removed through a condensing loop to a cooling tower. A large number of motors drive pumps and other components.

"We had to know what was happening within the system to be certain there would be no

unscheduled interruptions," Reinert says. After an extensive search for a suitable motor controller, Toyota selected the Bulletin 150 SMC Dialog Plus unit because, according to Reinert, "Allen-Bradley had the best of all options available and the Smart Motor Controller was consistent with what we used in all of our manufacturing plants throughout the world."



Bill Reinert, Toyota senior facilities engineer, (standing) and Lloyd Trick, MSO Technologies systems integrator, discuss control system solutions at the central control station for the cooling system.

Toyota worked with MSO Technologies, a local systems integrator, to design and install a distributed network of Allen-Bradley PLC - 5™/80E programmable controllers and remote I/O to execute control logic and monitoring capabilities. Bulletin 1336 Plus variable frequency drives completed the motor management installation and were used on pumps to provide the variable volume flow required by the cooling system.

Critical motors are controlled by the SMC Dialog Plus controllers that not only simplified control circuitry but also collect and report data on motor operations to PLC Controllers.



Bulletin SMC Dialog Plus Smart Motor Controllers provide start stop functions and overload protection of critical motors. They monitor and gather data on motor performance attributes.

"We wanted the soft start capability of the Smart Motor Controller because it limits the in-rush current to the motor and reduces demand charges," Reinert says. "It also gave us a lot of information: kilowatt hours, amperage, power factor, stop-starts, run times, and other data."

"If Toyota had gone with traditional electro-mechanical starters," adds Lloyd Trick, systems engineer with MSO Technologies, "they would have had to add other devices to the starter circuit to get the same information." Trick delineated those devices: a power monitor to check phases, voltmeter and current meter, along with overcurrent protection to monitor starter fault statuses. "By using the Bulletin 150 SMC Dialog Plus controller, Toyota combined all of that into one single package," he says.



Temperatures in spaces, such as this atrium, are maintained by zoned fan/coil units connected to the chilled water system. Smart Motor Controllers manage motor functions of critical motors used to drive pumps for variable volume flow control.

Motor management data are sent via a Data Highway Plus™ LAN to a central control point, where operators access the information on computers running RSView™ software. They use this data to continuously diagnose motor performance and to chart trends, which show when a motor might fail. This way, Toyota's facilities engineers can create a performance profile on each critical motor. Then, they can establish a predictive maintenance procedure to handle problems before equipment fails and shuts down their operations.

If, for example, a motor has an inordinate number of start-stops or suddenly draws more current than the engineers expect, they know they have a problem starting to occur in that motor. "Frankly," Reinert says, "we can diagnose all of that from the information we get through the SMC Dialog Plus controllers."

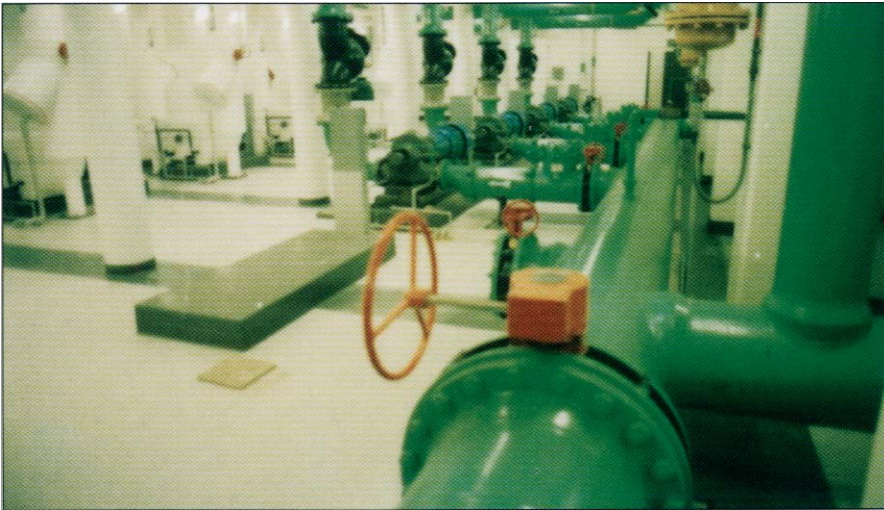
Because Toyota used the PLC-based platform, they extended its

capabilities to include power monitoring. With only a few additional components, easily integrated into the system, they can analyze power consumption and reduce energy costs by reducing peak demand loads.

By putting control and data acquisition directly on each critical motor, Toyota focused on the management of these motors and achieved the required level of system availability. They also gained more effective control of the cooling system with greater

flexibility as well as real-time information they can use to measure and increase performance while reducing the cost of maintaining the facility.

Relying on Rockwell Automation motor management technologies, Toyota's plant engineers continually seek ways to more efficiently provide a comfortable environment at its U.S. headquarters. Therefore, the people who work there can say with certainty, "Toyota, I love what you do for me."



Toyota focused on motor management and achieved the required level of system availability from their motors. This new focus gained them more effective control of cooling, increased performance and reduced costs.



Bulletin 150 SMC Dialog Plus Smart Motor Controllers are an integral component in these Allen-Bradley Bulletin 2100 Motor Control Centers.

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