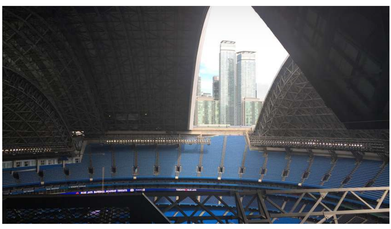
Toronto's Rogers Centre Retractable Roof Gets New Lease on Life



Massive OT network and control systems retrofit of the landmark major-league baseball stadium's dome roof shines light on modern technologies for Blue Jays and their fans.

By Sheila Kennedy, Contributing Writer

Toronto's Rogers Centre was christened in 1989 with the name SkyDome in honor of its greatest architectural asset: the world's first fully retractable, motorized roof. The immense dome-shaped roof covers eight acres and reaches a height of 282 ft. at its center. For more than two-and-a-half decades, three movable sections were opened and closed smoothly on command.

Inevitably, the combination of time and wear took its toll. The roof's maintenance and operation became extremely difficult, and its legacy control system had become increasingly unreliable. In fact, it eventually was necessary to operate the roof below full speed to avoid overtaxing the aging system. An overhaul would be required to preserve the iconic roof and restore it to secure, reliable, efficient operation – all the while maximizing uptime to avoid disrupting planned sports and entertainment events.

In 2015, an enormous retrofit of the roof infrastructure was commissioned, including a new operations technology (OT) network and modern control system. "A lot of the components and parts used to control and drive the roof were no longer being manufactured," says Dave McCormick, manager of engineering at Rogers Centre. "Basically, what this project was about was getting this structure and the operating system back to a state where it can be sustained for the next 15 to 20 years."

Rogers Centre selected the team of New Electric, acting as general and electrical contractor, and JMP Engineering, a Rockwell Automation Solution Partner. New Electric brought intimate knowledge of the facility and Rogers' best practices. JMP Engineering provided the necessary controls system design, engineering services and controls system/SCADA implementation.

Existing Challenges Inspire New Goals

When opening or closing, the roof had to be able to move 11,000 tons of steel quickly, reliably and precisely with up to 40-mph winds blowing from varying directions. The Rogers Centre project team needed a control system that could open and close the roof up to 400 times per year safely and consistently in less than 25 min. It had to be user-friendly, and it had to provide high availability, fault tolerance, self-diagnostics and a mobility solution for troubleshooting and exception-based reporting.

Minimizing skew differential is vital. Without the ability to control panel skew, the roof panels would become lodged, resulting in roof misalignment and the inability to close roof gaps effectively, leaving the stadium open to environmental elements.

The size, weight and height of the roof required precise mathematical calculations of the effect of wind while in motion to manage the skew properly. In addition, the drives, motors and braking resistors needed to be sized accordingly. The networking infrastructure also had to be secure, robust and reliable.

Access to immediate local support was essential, and the solution needed to be expandable and have a long product life cycle.

Timing was another concern. The Toronto landmark, home of the Blue Jays major-league baseball team, keeps a busy event calendar year-round. The project team needed to make every effort to avoid disrupting the events while installing, testing and commissioning the new roof control systems. Weather delays also were to be expected, as the roof needed to remain closed during unfavorable conditions.

Competitive Selection Reveals Optimal Solution

The Rogers engineering team developed a detailed functional specification for the roof controls architecture and evaluated proposed solutions.

New Electric teamed with engineering services company JMP Engineering to propose a Rockwell Automation-based solution. JMP Engineering designed a reliable and easy-to-maintain system based on Rockwell Automation technology products. Application and parts support would be provided by JMP Engineering and Rockwell Automation local distributor, Gerrie Electric.

The roof's opening and closing now can be performed faster and more reliably by a lone operator in the control room, where it previously would have required several operators. [CLICK TO ENLARGE]

The Rogers team selected New Electric and JMP Engineering because of their abilities to design, service, and support the system locally over the roof's life cycle and because of the proposed Rockwell Automation solution's suitability versus the legacy competitive brand.

"Careful review of the exacting requirements of the roof modernization project developed by the Rogers Centre engineering team showed that Rockwell Automation solutions met and exceeded all functional specifications," says Steve Szamocki, an executive vice president at JMP Engineering.

Sophisticated Technology and Services

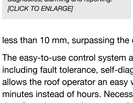
The massive retrofit addressed the complete roof controls architecture. The project team committed to:

- Deliver electrical and controls design for the entire system.
- Upgrade the 76 DC motors with new AC motors controlled by Allen-Bradley® PowerFlex® 750 variable-frequency drives.
- Replace an obsolete controls system with a redundant Allen-Bradley ControlLogix® system.
- Upgrade roof control pods with a Rockwell Automation 15-in. PanelView™ Plus 6 allowing graphical status viewing and control of all the roof panels.
- Supply a new computer supervisory system based on the Rockwell Automation FactoryTalk® View Site Edition (SE) system to provide a graphical interface, diagnostics, alarming and reporting and install it on a fault-tolerant server from Rockwell Automation Encompass™ Product Partner Stratus Technologies using redundant Cisco® switches.
- Provide wireless Microsoft Surface 3 clients that allow the Rogers team to view the roof status and operation from any location, through a Cisco ASA Security firewall.
- Provide mechanical design for the placement of Allen-Bradley DeviceNet™-based smart sensors, Ethernet-based laser and absolute encoders, and standard industrial field switches.
- Deploy Cisco core switching and Rockwell Automation Stratix® switches with Cisco network technology, in a redundant configuration across the four control rooms. This provided the high-reliability Ethernet network required to support the machines and equipment in this important machine.
- Deliver electrical and controls design for the entire system.

Notable Results

The enormous project, completed on time and within budget and while remaining in scope, has the retractable dome roof working like new.

The new equipment installation was completed primarily during the Blue Jays off-season in late 2015 and early 2016. A detailed start-up and test phase to commission the roof began in the spring of 2016. Weather was a constant challenge, but more than 60 opening and closing cycles were completed as part of the commissioning and site acceptance testing.



A new computer supervisory system based on the Rockwell Automation FactoryTalk Site Edition system provides a graphical interface, diagnostics, alarming and reporting. [CLICK TO ENLARGE]

Successful operational testing of the roof using the new system continued throughout the Blue Jays' 2016 baseball season. "There was no news or attention drawn to the new roof controls, as all systems operated as required," notes Mark Niesner, director of operations and organizational development at New Electric. "This is the greatest testament to the reliability of the Rockwell Automation products, which served as the backbone of the modernization."

While the roof's opening and closing still requires a full crew to operate safely, the control system now only needs one person, where it previously would have required several. The entire process now is faster and more reliable. Skew control for the two center panels, each weighing thousands of tons, averages less than 10 mm, surpassing the original specification requirement of a maximum of 50 mm.

The easy-to-use control system and its supporting OT network provides enhanced functionality, including fault tolerance, self-diagnostics and reporting, that weren't previously available. This allows the roof operator an easy way to troubleshoot and resolve any issues that may arise, within minutes instead of hours. Necessary information is viewable from a secured wireless tablet and therefore always at the operator's fingertips.

The modernized roof infrastructure and control system, powerful enough to move more than 11,000 tons of steel with great precision, continues to live up to its promise, observes Szamocki. "The Rogers Centre roof has regained the ability to open and close safely, reliably and with a performance greater than previously possible."

JMP Engineering is a Rockwell Automation Solution Partner based in Ontario, Canada, with 14 locations throughout North America. The company provides engineering services and turnkey solutions in the areas of process automation, control system integration, smart robotic applications, and information and analytic solutions. It holds four Rockwell Automation technical designations: Control, Process/PAx, Power Quality & Energy Management (PQ&EM), and Information & Enterprise Manufacturing Intelligence (EMI).

Solution Partner Program

When you're looking for a high-quality system integrator that knows Rockwell Automation technology and can expertly integrate that technology with your existing systems, Rockwell Automation can help. Rockwell Automation has identified and collaborated with a group of sophisticated system integrators. These are Rockwell Automation Solution Partners. For end users and OEMs, it means you can quickly find exactly the help you need. Find one near you.

Encompass Partner Program

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