

## IOT-ENABLED VALVE MONITORING SYSTEM CAN EASE VALVE INSPECTION BURDEN

A new wireless valve monitoring system, which recently earned the FM Approvals certification, promises to help organizations lower the cost of monitoring critical sprinkler control (and isolation) valves and make it easier to receive alerts and other information from anywhere, anytime via the Internet of Things (IoT).

The new system combines a wireless mesh network module and application software from Marchwood Integrated Ltd. of Verwood, England, with an anti-tamper valve monitoring device (VMD) from Amtron Valve Monitoring Device Pty Ltd., of Melbourne, Australia. The system is available for new and retrofit applications and offers easy 'plug-and-play' installation thanks to its compact, battery-powered design.

### **The human challenge**

Human error is the leading cause of automatic fire protection system failure in the United States, according to a report by the National Fire Protection Association (NFPA) entitled U.S. Experience with Sprinklers.

Among the reasons for these failures were inappropriate system design, lack of maintenance, manual intervention (e.g., firefighters or staff shut off system during a fire), and system shut off (e.g., building vacant, construction, system problem). The NFPA estimates that human error from all these factors account for more than 90 percent of fire protection system failures.

It is not surprising that FM Global field engineers find more than 1,200 improperly closed valves (ICVs) annually during on-site risk assessment visits. The company also makes more than 30,000 recommendations each year to help clients improve fire system valve inspection, testing and maintenance.

"Unfortunately, the ICVs that we find are probably the tip of the iceberg," notes Stephanie Thomas, staff engineering specialist in FM Global's chief engineer's group. "There are valid reasons for a fire prevention system control valve to be closed—such as the need to replace a sprinkler, construction and so on. Sometimes valves get closed by mistake or the wrong valve is closed and forgotten. That's why we have always required weekly visual inspections and monthly physical checks of all control valves."

## IOT-ENABLED VALVE MONITORING SYSTEM CAN EASE VALVE INSPECTION BURDEN

FM Global client locations around the world manage more than 1.8 million fire protection valves of all types at a cost of about US\$450 million annually in inspection labor alone.

According to FM Global Loss Prevention Data Sheet 2-81, Fire Protection System Inspection, Testing and Maintenance loss history involving ICVs shows that an impairment management program alone is not enough. Additional safeguards should be put in place to help prevent ICVs, including visual inspections and physical testing of control valves and supervisory alarms (tamper switches). This combination can help reduce the likelihood of an ICV and the consequences of a large shut-valve fire.

Supervisory alarm systems do not prevent malicious tampering of control valves but do detect and notify when a valve has been tampered with. In order for a supervisory alarm to defend against malicious tampering during an arson or other fire event, the supervisory alarm system itself must be tamper resistant. Tamper alarm signals also must be monitored and responded to by onsite personnel.

### Tech opportunity

“We’ve asked our clients for the past 180 years to confirm that their fire protection systems are in working order by visually and physically inspecting each of those systems,” says Rick Smith, manager of operations engineering for FM Global. “With the technology we have today, that practice seems a little antiquated now. About ten years ago, we began investigating ways in which new technologies could be applied to fire protection systems—the Internet of Things, AI, machine learning...you name it.”

Smith notes that representatives of FM Global and FM Approvals have conducted workshops with a range of businesses and organizations to understand their specific challenges and gauge the level of interest in new technology to solve long-standing problems. Webinars were also held with leading fire protection system manufacturers to exchange ideas and emphasize that there’s a need in the market for new ways to reduce risk and improve efficiency.

FM Global research has championed the development and testing of SMART (Simultaneous Monitoring, Assessment

## IOT-ENABLED VALVE MONITORING SYSTEM CAN EASE VALVE INSPECTION BURDEN

and Response Technology) sprinkler systems that can help to protect buildings using multiple sensors and programmable logic.

FM Approvals has also helped advise and encourage the development of new technologies across the loss prevention landscape. “Our early vision was for a wireless technology for monitoring fire protection systems that could be installed without running wires and provide easy access to device status,” notes David Waite, operations vice president and approvals group manager for FM Approvals electrical group.

In 2017, FM Approvals updated Approval Standard 3135, Sprinkler Valve Supervisory Devices to include “Enhanced Security” to encompass wireless valve monitoring systems that provided greater tamper resistance and status reporting.

“We began working with Amtron and Marchwood, independently of each other and soon realized there was a synergy between the two,” Waite explains. “The Amtron system had the space for the Marchwood module, which provides a wireless mesh network for fault-tolerant communications to any FM Approved fire alarm panel. They are experts in wireless communications, and we provide the expertise in codes and regulations for fire alarm signaling.”

### IoT comes to fire protection

The Amtron VMD with the Marchwood IoT-enabled, wireless mesh network operating system is capable of monitoring one or hundreds of valves across an enterprise installation. The system requires three components for a complete network:

- Amtron VMD unit with Marchwood wireless mesh module uses magnetic proximity sensing to detect valve movement and status. These battery-powered units provide line-of-site range of more than 3,200ft/975m and an obstructed range of 300ft/91m. Each device is ‘plug and play’, automatically synching with the network once powered.
- Marchwood Site Controller is a 24-volt DC IoT-enabled, wireless mesh network module that collects and manages supervisory and trouble information from multiple VMD units and transmit that information to a Fire Panel Interface. The Site Controller receives and forwards VMD node identification, state change and signal type. It also

## IOT-ENABLED VALVE MONITORING SYSTEM CAN EASE VALVE INSPECTION BURDEN

provides the gateway to IoT applications.

- Marchwood Fire Panel Interface provides the communication link between the wireless mesh network and any compatible FM Approved fire alarm control panel.

The Marchwood IoT-enabled mesh network allows the user to take full advantage of valve status and other data via internet cloud connectivity. Supplemental applications, including the Marchwood Webserver and Marchwood in Motion (MIM) provide a customizable and scalable solution for managing large installations and/or multiple sites from a central location.

The application of IoT-enabled sensors for facility management, including fire protection systems, is a rapidly growing trend with enormous benefits. In this pandemic-tempered world, remote monitoring is a critical benefit. The integration of the Amtron/Marchwood valve monitoring system was successfully demonstrated last year in the SimZone, a dedicated FM Global training center located in Norwood, Massachusetts, USA.

“We believe the level of integration, IoT connectivity and control, and valve monitoring focus makes this newly Approved system unique in the market,” notes Waite. “The goal is to reduce valve inspection and testing frequency to annually in accordance with U.S. code or a frequency stipulated by other regional codes or AHJs. The fact that this new system has the potential to reduce the labor required to manage a large installation and reduce the impact of human error on fire protection systems is a distinct advantage.”

A complete FM Approved Amtron/Marchwood valve monitoring system requires individual battery-powered modules for each valve, a site controller to collect and transmit the valve status data in a given area, and a fire panel interface for communication with any FM Approved fire alarm panel.