By Ken Kopp, Assistant General Manager; Water Rights / Source Water Protection Specialist

Kansas Operator Invents Low-Cost System Pressure Monitoring Device

While he already had the concept in mind, David Rinaldi, of Leavenworth County Rural Water District No. 7, finally put his plans into action following the Linwood tornado. The May 28, 2019, storm contained a mile-wide EF4 long-track tornado that left a track of devastation in Douglas and Leavenworth counties. The storm injured 18 people and left a 32-mile-long path of destroyed homes, mangled roofs, downed power lines and scattered debris. Fortunately, no lives were lost. But among the damage was Leavenworth RWD 7's water infrastructure. The system had to hire extra outside help to locate all the leaks, primarily the result of uprooted trees. If only there were an easy way to monitor line pressure at several points along the District's transmission lines to help isolate the likely problem areas.

The RPM20 pressure sensor can be deployed in just about any meter pit.

RPM20 Deployment in the field. This model has a solar module, a battery and battery charge controller. It can be deployed just about anywhere.

Enter the RPM20 Remote Water Pressure Monitor

Rinaldi has since invented a simple, yet cost-effective way to continuously monitor line pressure throughout water distribution systems. Not only does the device help monitor for occasional line leaks, but pressure management in pipe networks is fundamental to providing safe drinking water. The device provides a continuous record of accurate pressure data that allows system operators to reduce leakage volumes, energy costs, system maintenance costs, customer complaints, and water quality problems.

The RPM20 is a very simple and straight-forward device. There are two models. One consists of a solar module, a battery and battery charge controller. It can be deployed just about anywhere and because it is solar powered, it can operate independent of commercial power mains and is able to continue to operate for several days during an extended power outage. The second plugs into 120v receptacle and is for use inside. A small monthly fee is charged for each device to cover cellular data, data storage and any software updates that are needed. At the heart of the device is a Particle.io Board. Similar to the more popular Arduino or Raspberry Pi boards, these low-cost ARM chip-powered boards are specifically designed for deployment of the "internet of things" (iot) and require very little power consumption to operate.

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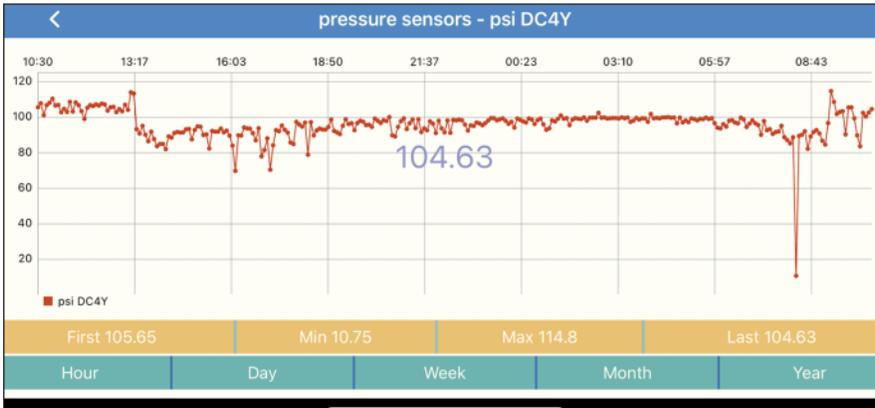
Graphical output of pressure data from the RPM20. Data is transmitted via a cellular data network to a cloud server, which can be viewed independently by using the app Thingview on any iPhone or Android phone. The information can also be streamed from the cloud by Micro-Comm Inc. for incorporation into an existing SCADA system.

Emergency deployment of the RPM20 at Leavenworth RWD 9 during the February cold spell provided them tank pressure data after the line to their SCADA froze.

The secret sauce to making the device function, however, is in the Particle.io Board code written by Rinaldi himself. The code records line pressure at preset intervals (generally five minutes) and then transmits that data via a cellular data network to a cloud server, which can be viewed independently by using the app Thingview on any iPhone or Android phone. The information can also be streamed from the cloud by Micro-Comm Inc. for incorporation into an existing SCADA system. The beauty of this design is that third-party data access can be granted to individuals without them actually having access to any of the SCADA controls. Pressure data is also viewable directly on the device's LCD display. You can find more information about the RPM20 at www.giskc.com/rpm20.

What's next? Rinaldi is also working on a version for sewer lift stations. The idea is to pull modbus data from sewer lift stations so that if a system already has its water SCADA system through Micro-Comm Inc. they could add a sewer lift station SCADA screen to view things like sump levels to track I and I and pump health for a more reasonable cost than installing an entire SCADA system.

Ken Kopp, P.G., Assistant General Manager; Water Rights/Source Water Specialist, joined KRWA as Water Rights/Source Water Specialist in early 2016. He previous worked for twenty-three years at the Kansas Dept. of Agriculture, Division of Water Resources and most recently was New Application Unit Supervisor.