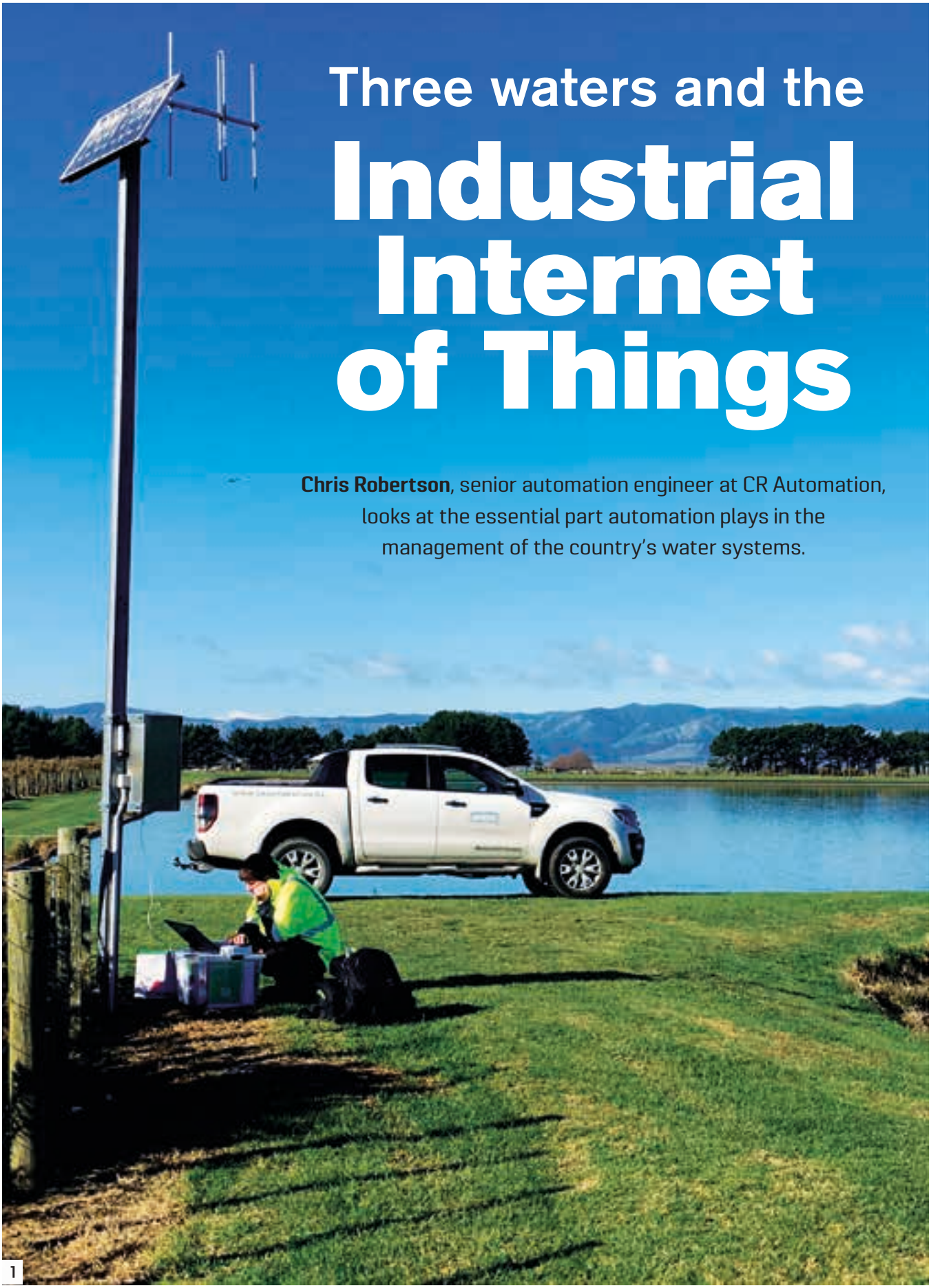
Three waters and the Industrial Internet of Things

Chris Robertson, senior automation engineer at CR Automation, looks at the essential part automation plays in the management of the country's water systems.



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With water becoming an ever-increasingly hot topic, councils are looking to have near real-time monitoring and control of their three waters assets.

The ability to be immediately informed of any issues or potential issues and respond to them immediately is now more possible, and more cost viable than ever, thanks to the Industrial Internet of Things (IIoT). The IIoT effectively delivers vast amounts of information to a user via a smart device, enabling them to respond to issues from anywhere at any time.

The concept of the IIoT is not possible without the interconnection of SCADA (Supervisory Control & Data Acquisition) servers and remote sites. Telemetry, or the remote monitoring and control of sites, is becoming a major focus of councils around the country.

While most councils have some existing degree of telemetry, this is often monitoring via slow and antiquated communication mediums. The level of control of these assets is generally minimal, as is the visibility into what went wrong, when and why.

Modern communication advancements with the likes of broadband fibre, cellular, and ethernet radios means that far more information and control can be achieved with a relatively small investment.

CR Automation, together with its telemetry alliance integration partner Schneider Electric, has provided telemetry solutions to a number of councils in New Zealand, including Wanganui, Horowhenua and Taupo District Councils.

The solution in each case had to be scalable and sufficiently flexible, allowing the implementation of a mixture of completely new systems and the replacement or integration of legacy systems. One of the key challenges of installing a telemetry system is the terrain and accessibility into sites. In each of the cases above very different solutions have been implemented.

For smaller assets such as pump stations and small treatment plants ethernet radio is the preferred solution. Here a council would look to build its own network infrastructure utilising its own suitably positioned assets such as reservoirs. Often co-leased repeater sites are available, but these come with ongoing rental costs. The benefit of owning your own ethernet radio network is that you are not dependent on other service providers for the up time of your network.

Ethernet also offers a number of advantages over traditional serial networks, especially with network diagnostics and traffic monitoring. These networks have been achieved with Schneider's Trio Q series of radios throughout Horowhenua and Taupo.

To supplement the Trios, Ubiquiti WiFi bridges have also been rolled out. These have been used specifically around Wanganui where the close density of sites and smart infrastructure meant it was an easy roll out to the

1. Marek implementing a 3G solution for pond level and flow monitoring at the Foxton Ponds for Horowhenua District Council.
2. Taking advantage of Taupo District Council's Acacia Bay Blueridge Reservoir for an ethernet radio repeater site
3. An iPad gives operators and service engineers remote control of plant while at a remote panel at Horowhenua District Council's Levin Water Treatment Plant.

30 odd pump stations and water assets around the city. With Taupo's vast terrain, a number of repeater stations are being installed around the lake to facilitate a district wide communications network. In all cases council assets have been used, such as that of Blueridge in Acacia Bay (picure 2) offering extremely good coverage of Taupo township.

Cellular technology offers a low-cost alternative where installing ethernet radios is not practical or has a long lead time to install.

This may be an outlying site that is not efficient to get radio comms to. Simple SMS units can be used for measuring flow and levels. 3G and 4G technologies can be used for smaller treatment plants, offering full remote control at near real time.

Cellular is a quick and cheap roll out, but comes with the disadvantages of being dependent on the cellular provider and monthly fees. One of the initial schemes that CR Automation upgraded for Taupo District Council was the Mangakino Water Intake and Water Treatment Plant. Due to the remote location of the sites, and the especially challenging terrain around the water intake, getting a reliable and cost-effective ethernet radio connection was not possible within the timeframes. Conveniently, a brand new 4G tower had been installed next to the water treatment plant. Utilising this infrastructure Taupo District Council now has near real-time control and monitoring of these very remote sites.

As has long been the case, broadband technology, including copper and fibre, offers real-time high-speed communications between plants.

Generally these sites are larger treatment plants with local SCADA machines and PLCs. Likewise with cellular you are dependent on the network provider and monthly fees (short of installing your own fibre network). However, broadband technology means that sites can be fully integrated into an overall control system. In the case of Taupo District Council some of these broadband sites have served as data aggregation hubs for outlying sites.

One of the major advancements is smartphone technology. The ability for an operator to receive an SMS alert and then immediately respond via their smart device allows operators to make informed decisions, and in a lot of cases avoid the site trip that would have to be made otherwise. This has obvious benefits with health and safety, employee downtime and vehicle maintenance.

During weather events an operator can view all the assets at once and respond to where they are most needed without the need to physically check every site as they once had to. With smartphone technology, and the high level of remote control available, comes increased risk with cyber security. It is also important that the system is fully compliant with security policies and is resilient to cyber threats. **WNZ**