Success Story

Winning the Race

Rangitata Diversion Race Management Ltd (RDR)

Location: **Canterbury Plains region, New Zealand**
Completion: **2018**
Industry: **Water, Renewable Energy (Hydro)**

About RDR

When Rangitata Diversion Race (RDR) Management took steps to improve visibility and performance for their historic irrigation scheme in New Zealand's South Island, they selected a Yokogawa solution comprising FAST/TOOLS SCADA and STARDOM RTU's as platforms upon which operational excellence for future could be established.

New Zealand has been considered an agricultural country since the 19th century, when the introduction of refrigerated transport allowed its sheep and dairy industries to expand providing meat, wool, butter, and other agricultural products both locally and overseas. Throughout the 20th and into the 21st century agricultural imports have remained important to the New Zealand economy, contributing about two-thirds of exported goods.

The Canterbury Plains region of New Zealand's South Island is an area of braided rivers and pastoral perfection between the Southern Alps and the Pacific Ocean. Almost as flat as a billiard table, the plains are a patchwork of agricultural activity and produces more than 80% of New Zealand's grains, crops and seeds.

With a growing population and increasing international demand for produce, New Zealand's Public Works Department initiated a project in 1937 to divert water from the Rangitata River on to the Rakaia River crossing the Canterbury Plains. This was a dream come true for the regions pioneering farmers who had struggled with water management and drought for decades.

Aerial of Canterbury Plains, South Island, New Zealand

Water offtake point, Rangitata river, New Zealand

When officially opened in 1945, the 67km long Race (Race meaning an occurrence where a fast-moving tide moves through a constriction) provided water to over 600 farms via a canal network and would improve their production five or six-fold. Taking water from three rivers (Rangitata, Rakaia and Ashburton), the system is gravity fed with an average fall of around 200mm per km across the entire distance of the Race. Although the land from the Rangitata river is fairly flat, there is a mountainous section from the Rakaia river which requires water to be pumped uphill to link into the Race. This is the only non-gravity fed section, with around 28 MW of power provided for pumping and other use in the region by two hydropower stations which are part of the overall scheme.

Taking 20 years to reach full capacity it has since transformed farming in the district and is now considered their most important piece of infrastructure. Since its initial implementation it has continued to grow, now covering more than 110,000 square hectares (around 1,100 square kilometers).

Managing growth of the Race

RDR Management Ltd are a user-owned limited company consisting of five core shareholders. It is responsible for the effective operations and maintenance of the Race including environmental management, forecasting and future planning and development activities.

RDR Management Ltd are a lean and highly effective organization managing all the operational and maintenance requirements of the Race with a team of only five employees. This is quite an achievement considering the wide geographical dispersion of the Race. It also places greater significance on the operational effectiveness and reliability of the control and visualization tools they employ.

As a consequence, when reviewing their future requirements for control and visualization in the late 2000's, after an extensive and detailed evaluation process they selected Yokogawa's FAST/TOOLS SCADA and STARDOM RTU's implemented by their partner Industrial Controls South Canterbury Ltd.

"The Race was going through a period of evolution as we prepared for growth, adapting to the changing requirements of farmers while also remaining environmentally sensitive" according to RDR Management's Chief Executive Ben Curry.

"We needed a platform which not only provided us with accurate and reliable real-time operational information, but one which was simple to use and highly intuitive. Although our operations and maintenance team are highly skilled, running lean requires tools to support their activities in the most efficient way."

Rangitata River South Island, New Zealand

RDR Management Ltd were also conscious of the remoteness of their application and the need to ensure continuous operation. Their choice of FAST/TOOLS and STARDOM was not solely based on technological advantage for wide area operations, but also considered their vision for future and local support requirements. Yokogawa are one of a limited number of control and automation vendors to maintain an ongoing presence on the South Island, celebrating their 20th anniversary in the region during 2019. Location also being a prime consideration in the selection of Industrial Controls to integrate the Yokogawa solution, whose locality and reputation for engineering excellence made them an ideal partner.

STARDOM RTU panel at the river offtake station

The Race comprises over six-hundred farm and twenty-five main gates and take-off's, connected via a radio network back to the FAST/TOOLS central monitoring station at Ashburton. Covering an area of over 110,000 square hectares, this is an undertaking of enormous proportions and an area which is prone to extremes of weather (with temperatures dropping as low as -10 in winter).

With the scheme in operation all year round (more for power generation in winter) it is imperative that any equipment deployed must maintain the highest levels of reliability at all times and in all conditions. This is something the STARDOM RTU's are renowned for, providing not only high levels of availability, but also advanced functionality allowing local web services for in-field activities as well as connectivity back to the FAST/TOOLS operations center for overall performance monitoring.

Delivering an adaptable solution for the Race

Industrial Controls specializes in industrial electrical automation systems, providing control solutions for industry. Founded in 1996 it is one of the South Islands foremost providers of industrial electrical and automation solutions. Having worked with Yokogawa for around twenty years, they have developed a strong and mutually beneficial partnership. When it came to selecting a FAST/TOOLS and STARDOM solution for RDR, both parties knew the eventual outcome would be a highly effective and reliable control and visualization solution.

According to Jeph Burns, Principal Automation Engineer at Industrial Controls, "When RDR's upgrade requirements for wide area SCADA and RTU's were issued, it was a clear choice which platform was most suited. We saw that RDR was looking for quality local support and FAST/TOOLS plus STARDOM were the perfect fit for all parties, but more specifically RDR. The support process is much more straight-forward when you have reliable SCADA and RTU platforms designed to operate in-line with industry standards. This allows you to focus on optimizing and improving the performance of the overall system rather than trouble-shooting a solution which was not designed for this type of application. With FAST/TOOLS both flexible and straight forward to configure, with well documented software, creating an operations environment which is intuitive and easy to use has long-term benefits to the client."

When developing and implementing such a geographically dispersed project, Industrial Controls used their experience in manufacturing industries to advantage.

"We didn't have the same mindset as other integrators working in telemetry" says Jeph. "Instead we combined our familiarity with real-time operations with our multi-disciplined team and a desire to provide the best technologies to our clients. This provided RDR with a real-time operations system that continues to meet their needs. Our approach led us to a wireless ethernet networking solution, made possible by the proximity of RDRs system to the mid-Canterbury foothills. We also engineered mobile based software solutions to account for the SCADA system not being manned 24/7 with the RDR lean approach, something FAST/TOOLS enabled through its integration API's."

STARDOM RTU's proved to be particularly well suited to the application, not only due to their ruggedness, but also their low power consumption and tight integration with FAST/ TOOLS for 'store and forward' of data. This complimented the wireless networking approach, providing data security for when the network was unavailable.

The web HMI client provided by FAST/TOOLS reduced the administrative overhead of maintaining client software within RDR's operations team, with its graphics system allowing the finishing touch of a modern interface that was eye catching and intuitive.

Responsible management of the environment

RDR Management Ltd also understand that they play an increasingly important and proactive role in managing the environment within which they operate. Managing fish and sediment related issues in the Race are part of their day to day operational challenges, as is carefully monitoring the amount of water they draw from the river.

Ben Curry comments; "The eco-system in this part of the South Island is particularly sensitive. Draw off too much water from the rivers to feed the farms via the Race and this can lead to unacceptable consequences down river. We have strict upper and lower thresholds of water that we are allowed to draw from the river network and we ensure we strictly abide by these. In times of drought this can be particularly challenging when river flow drops. Although the farmers are less than pleased when offtakes and supply to their farms fall, they understand the same way we do that environmental management is the responsibility of us all."

As part of their long-term goals for improving their already high standards of environmental management, RDR are working on a number of initiatives to bolster the system to the benefit of all. The Race is currently just a 'Run of River' system and lacks storage. This presents issues during summer when river flows fall leading to challenges for the farmers.

As such, RDR have plans to build storage reservoirs at select locations along the Race which when completed will hold up to 53 million cubic meters of water. This will provide a higher degree of resilience and reduce dependency on the river during low flow periods. They are also working with farmers to reduce leakage levels, with pipe systems become far more prevalent and reducing leakage by around 40%.

Balancing for the long term

Managing growth expectations, operational effectiveness and environmental requirements can be a daunting balancing act, especially in one of the most naturally beautiful regions on the planet. Doing so with a highly skilled but small team on an application which covers 110,000 square hectares is even more so.

Yet this challenge is accepted and delivered on by the dedicated team at RDR Management Ltd, supported by a highly reliable Yokogawa solution and engineering excellence from Industrial Controls. This three-way partnership has helped deliver water to the farmers of the Canterbury Plains for over ten years and continues to adapt with the recently installed R10 version of FAST/TOOLS. This further increases web client support providing additional functions for operational and maintenance activities. With a system which continues to grow and evolve to meet evolutionary needs of the Rangitata Diversion Race, FAST/ TOOLS and STARDOM continues to be one constant upon which firm foundations for operations and maintenance can be built upon.

Large center pivot irrigation system running on a farm in Canterbury, New Zealand

For more Information and Contact

SCADA System

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