



Calen Township Water Treatment Plant Upgrade

Customer: Mackay Regional Council

Location: Calen, QLD

Case Study ID: CS-133

Date: September, 2024

Overview

The Existing Calen/Kolijo Water Supply Scheme, constructed in 1993, consists of two raw water bores, a water treatment plant with a softener system, a chlorinator, and a reservoir that collectively serve approximately 146 consumers across Calen and Kolijo, treating around 140 kL of raw water daily.

Due to aging infrastructure and water quality issues, the plant's equipment has been replaced and upgraded to modern standards. Key upgrades included the installation of high-capacity water softeners with automated monitoring, improvements to the buildings, and significant enhancements to the chlorine gas dosing system with advanced safety features.

Additionally, a new Plant Control System with a PLC and remote access capabilities was implemented. It aims to ensure minimal operational oversight while maintaining a consistent water supply and quality. The project also involved site civil works, such as constructing a new salt storage shed and installing an overhead monorail crane while adhering to specific design constraints that ensured continuous water supply and safety during the upgrade process.

The deployment of SCADAPACK Remote Terminal Units across the Calen Water System enhanced communication capabilities, facilitating improved monitoring and control of the entire water supply.

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The Problem

The existing plant and associated equipment had reached the end of their useful life, resulting in frequent failures and ongoing water quality issues due to the unreliable equipment. These challenges made meeting operational demands and ensuring consistent performance increasingly difficult.

Additionally, the plant's outdated control system was primitive, lacking the advanced SCADA functionality standard in modern water treatment plants. This limited the ability to monitor and manage processes efficiently, further complicating operations and reducing overall reliability.

Our Solution

As a remote site, the design intent was to create a facility requiring minimal operation time and attention, with only one visit per week.

Water Softener Replacement

The existing dual 63" water softeners were replaced with new dual 48" high-capacity water softeners with advanced cation exchange resin. All regeneration, monitoring, and system-related functions, including comprehensive feedback and SCADA alarms from field devices, have been automated.

Upgrades to Buildings

The existing equipment in the softener and chlorine buildings were removed and disposed of to allow for complete remediation of both buildings, including:

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- Painting internally and externally
- Installation of new cyclone-rated roller doors
- Installation of new Colourbond fascia, gutters and roof re-screw.

Major Equipment Replacement

The following major equipment items were supplied and installed as part of the softening system:

- **Softener Vessels:** 2 x 48" PN10 softener vessels
- **Motorised Ball Valves:** 13 x 24VDC 2-Way
- **Motorised Ball Valves:** 2 x 24VDC 3-Way
- **Bulky Bag Handler:** 316 stainless steel
- **Pre-Cast Brine Storage Pit:** Epoxy-coated inground with aluminium lids
- **Storage Tank:** 25kL LLDPE for softened water
- **Modulating V-Port Ball Valve:** 240VAC for softener bypass blend
- **Flow Control Valves:** 2 x Maric
- **System Monitoring:** Pressure transducers and flowmeters
- **Total Hardness Analyser:** MODBUS TCP for hardness monitoring
- **Backwash Regeneration Pumpset:** Grundfos Hydro 1.5KW 415V
- **Other Equipment:** Strainers, manual ball valves and pipework, all SCH80 Grey uPVC



Site Civil Works

Site civil works included a new colourbond salt storage shed, an overhead monorail crane, concrete slabs for the surrounding brine pit, and a softened water tank. Dowden's staff installed all pipework, valving, and field devices as part of the upgrade, and a third-party contractor poured the concrete slab and erected the shed and crane.

Chlorine Gas Dosing System

The existing chlorine gas dosing system onsite was provided with additional automation and safety features, including:

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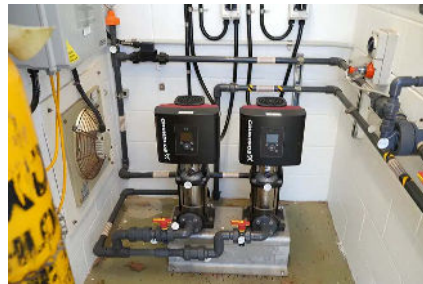
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- **Variable Speed Pumps:** 2 x Grundfos with CIM500 cards for EtherNet/IP (EIP) communication.
- **Automatic chlorinator:** An automatic chlorinator for flow-paced gas dosing.
- **Upgraded control system:** Upgrade to the control system for optional trim adjustment of dose rates based on feedback from the chlorine analyser.
- **Audible Alarm:** An audible and visual alarm external to the building tied into the gas detection system.
- **Operator entry safety alarm:** A SCADA alarm is generated if the operator enters the building before the Mechanical Extraction Countdown timer is completed and the green light is on.



Plant Control System

The Plant Control System consisted of a new control panel with the following equipment:

PLC: Allen Bradley CompactLogix

Remote Terminal Unit: SCADAPACK (RTU)

LCD Touchscreen: 10" Industrial HMI TFT

4G Modem: VPN for Remote Control / Access

Remote Control Access System: Geo SCADA Plant Pages



Remote Sites Control

Remote sites that form part of the Calen Water System (Raw Water Bores & Potable Reservoir) were also upgraded with new SCADAPACK Remote Terminal Units (RTUs) for improved communication.

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Project Design Philosophy

Our main goal was to minimise disruption to the water supply, allowing only a 48-hour shutdown for the chlorine dosing system upgrades. Safety was critical, especially in designing protections for the Raw Water Bore Pumps to prevent over-pressurisation during shut-head conditions, which helps safeguard the Water Treatment Plant's equipment.

We also faced electrical supply limitations, leading us to upgrade to a 3-phase 32A system through Ergon Energy. To ensure that water services remained uninterrupted, we carefully planned the staging of new plant cut-in activities. These strategies helped us meet operational, safety, and service continuity needs, reflecting a thoughtful approach to system design and implementation.

Design Overview

- **Shutdown Window:** Provide a maximum shutdown window for the Chlorine Dosing System of 48 Hours.
- **Safety Systems:** Provide a safety system for Raw Water Bore Pumps to prevent over-pressurisation of the Water Treatment Plant equipment during shut-head scenarios.
- **Upgrade Power Supply:** Limited Power Budget Available – MRC Upgraded Ergon Supply to 3Phase 32A.
- **Provide Continuous Supply:** We need to stage new plant cut-in works to provide a continuous water supply.

Brands used in this project



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