

CHISHOLM INSTITUTE'S BOLD NEW WATER OPERATORS TRAINING CENTRE



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ABSTRACT

Chisholm Institute has established a National Water Resource Training Facility at their Cranbourne Campus. The establishment of this facility is a leading step when it comes to Water and Wastewater Operator Training. The facility will be fully accredited and offer numerous curriculum for the Water or Wastewater Operator.

Clean TeQ, as the technology partner, was proud to be a part of the development of this exciting new facility which puts a focus on water and wastewater recycling, sustainable management of water and water as a resource. The first stage of the facility development has been aimed at water treatment processes with a planned secondary development to focus on wastewater treatment. Water treatment is an area where technology is advancing rapidly due to ever increasing quality standards. New technology is more complex with more intensive instrumentation and control and so the training aspects are very important. Melbourne's Wonthaggi Seawater Desalination Plant is an example of the current state of the art in water treatment. This type of multi-process operation is a huge advance on the simple sedimentation / clarification and filtration plants that are still commonly found in rural Australia.

Clean TeQ has supplied a range of water treatment technologies that reflect the type of processes that a water treatment plant operator may need to have knowledge of, including:

Sedimentation & clarification

Multimedia filtration

Submerged ultrafiltration

Pressure ultrafiltration

Ion exchange

Reverse Osmosis

UV sterilisation

KEYWORDS: Water, Wastewater, Training, Ultra filtration, Ion Exchange, UV Sterilisation, Clarification, Reverse Osmosis.

1.0 INTRODUCTION

The National Water Resource Training Facility, established at the Chisholm Institute Cranbourne Campus has been designed to be a state of the art facility for the training of water and wastewater operators. The Facility provides some leading technologies in the field of water treatment and includes an undercover 36m x 6m sand pit for hands on training in excavation, civil construction skills, trenching, shoring and pipe laying.



Figure 1: *National Water Resource Training Facility at Chisholm's Water Center*

Clean TeQ's involvement as the technology partner, was focused on the water technologies including supply of equipment for training relating to sedimentation and clarification, multimedia filtration, submerged ultra-filtration, Ion exchange, Reverse Osmosis and UV sterilization. This facility presented itself as an exciting opportunity for Clean TeQ to provide some leading technologies whilst participating in a worthy installation that has the visionary outlook that recognizes the value of water in all forms within our society.



Figure 2: *The Sand Pit at the Water Center Chisholm.*

2.0 OBJECTIVE

Water treatment is an area where technology is advancing rapidly due to ever increasing quality standards. New technology is more complex with more intensive instrumentation and control and so the training aspects are very important. The Chisholm Water Factory project aims to provide a teaching environment for future water-industry workers where they can gain practical experience and learn about new and existing technologies. The site will be used to train people to work at desalination plants and other water authority facilities across Australia and internationally. Clean TeQ has contributed by supplying and installing the water treatment unit operations which will allow key process fundamentals to be demonstrated, whilst giving students a chance to interact with industry-equivalent unit operations. Equipment sizing is “light industrial”; a nominal flow rate of 20 m³/d was used as the basis of the equipment sizing. The equipment supplied also gives trainee operators a real sense for the equipments need for regular preventative maintenance, which is critical for reliable operation and high effective outputs.

3.0 SCOPE OF WORK

Clean TeQ provided a total of 8 different water processing modules that are commonly used for the treatment of Water and Wastewater. These are described below.

3.1 Activated Filter Media Module (AFM)

The Activated Filter Media can be used as either a prefiltration stage or a primary treatment stage depending on the type of water quality that the Trainee Operator is trying to achieve. Typically this system is used upstream of Reverse Osmosis (RO) or Ion Exchange. The unit works by simply pumping raw water down through an internal pipe

to the bottom of the vessel and allowing the pressurised water to travel up through the glass bead filter media which removes suspended solids.



Figure 3: *The Activated Filter Media Module*

3.2 Clarification and Flocculation Module (CLF)

The Flocculation and clarification process is used when raw water contains a large amount of fine suspended matter, for example silt or mud, which clog up downstream processes. Flocculent is added to the raw water and gently mixed to encourage ‘flocs’ to form which sink to the bottom of the clarifier. With the clarifier being made of Perspex, the trainee operator is able to actually see the separation taking place.



Figure 4: *Clarifier, Flocculation and Coagulant Module*

3.3 Reverse Osmosis Module (RO)

Reverse Osmosis is used to remove dissolved solids (e.g. sodium) and impurities (e.g. lead, arsenic) from water by forcing it under high pressure through a semi-permeable membrane. The unit contains two standard pretreatment steps. The first is a multimedia filter to mechanically remove solids, followed by an activated carbon filter to remove organic contaminants such as chlorine. Trainee operators learn first hand about the difference in pressure requirements between pretreatment and RO, and the benefits of using antiscalant.



Figure 5: *Reverse Osmosis Module*

3.4 Ion Exchange Module (IX)

The ion exchange system utilizes both an anionic and cationic resin bed to produce soft water by exchanging Ca^{++} and Mg^{++} ions for Na^+ or H^+ ions. Ion exchange is also used for water purification and decontamination. Caustic and acid are used to regenerate the beds and the trainee can learn to use either time or conductivity to initiate this process.



Figure 6: *Ion Exchange Module*

3.5 Ultra-filtration Module (UF)

The Ultra-filtration module is a submerged style UF which has the membranes submerged in a tank with the system pump exerting a vacuum on the membrane itself. Membranes, in their various forms are more and more commonly found in Water Treatment Facilities as they have the ability to produce very high quality water. This system gives the trainee operator first hand experience in the operation of an Ultra-filtration process and the opportunity to learn about the pro's and con's associated with this type of technology.



Figure 7: *Submerged Ultra-filtration module*
3.6 Sterilisation Module

The sterilisation module consists of 3 separate processes which include the Effluent Neutralisation System (ENS), the Chlorine Dosing System (CDS) and the Ultra Violet Disinfection System (UVDS). Each of these modules can act independently and provide the trainee with the basic principals required to ensure the correct management of the final stages of water treatment.



Figure 8: *Effluent Neutralisation System & Chlorine Dosing System with UV Sterilisation*

3.7 Pump Test Skid Module

The Pump Test Skid Module gives the trainee operator the opportunity to learn about the mechanics of a pumped system. The provision of analogue gauges and a digital download point allows the trainee operator to see how changes in system set up affect pressure and cause cavitation. A Perspex casing around the impeller allows them to see the physical changes in the water properties. This small but powerful module offers many ways to run tests and fault finding scenarios in order to gain a greater understanding of one of the most important mechanical devices in the water industry.

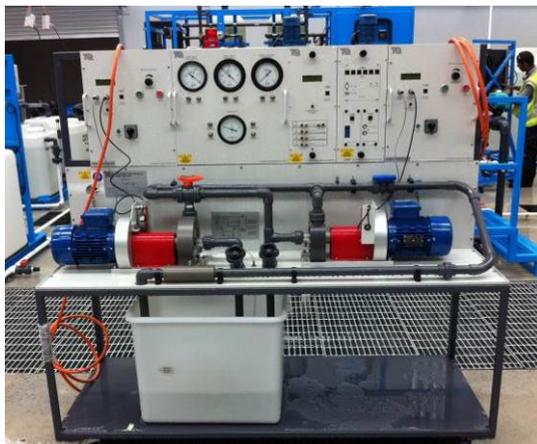


Figure 9: *Inside the National Water Resource Training Facility*

3.8 Water Quality Analysis Module

The Water Quality Analysis Module (supplied by HACH) serves to train the operator in the correct techniques for carrying out water analysis to Australian Standards and to meet Australian Drinking Water Quality Guidelines.

The apparatus is typical of equipment that can be found on many Water Treatment Plants and is capable of monitoring pH, ORP, Conductivity, UV Absorbance, Turbidity and Suspended Solids. All of these are displayed and logged via a multi parameter universal controller.



Figure 10: *Water Quality Analysis Module*

In keeping with Clean TeQ and The Chisholm Institute's commitment to the environment, water is recycled wherever practicable. Drain lines from each of the units are routed to the RO feed tank. After treatment, the water is then suitable to be used in the Chisholm Institute's horticulture department.

4.0 CONCLUSIONS

The National Water Resource Training Facility at Chisholm's Water Centre offers the water operator trainee a unique experience with exposure to numerous different processes in a single location. This alone makes this facility one of the most valuable educational tools on offer in Australia and further establishes the notion of how important water is in our society. A Trainee Operator can obtain real time experience in a safe and supportive environment over the period of their education. Once their training is complete, a water

operator will have many of the skills required to work on any water authority facility around Australian and internationally.



Figure 11: *Inside the National Water Resource Training Facility*