

# CONVERSION OF CHLORINE INSTALLATIONS



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## ABSTRACT

With Occupational Health and Safety (OH&S) becoming a high priority in the work place, Gippsland Water's regional OH&S committees and work groups have been striving to change work practices and conditions to create a safer and healthier work place environment. To this end inefficiencies were recognised with the Chlorination system at the Warragul Water Treatment Plant.

This paper will explain the perceived risks and costs of the original system and what was done to improve it.

Improvements included:-

- converting to 920kg bulk supply.
- Changing the method of Transportation of Chlorine
- Costs - labour, downtime, materials

## KEY WORDS

Occupational Health and Safety, costs

## 1.0 INTRODUCTION

Warragul Water Treatment Plant supplies treated water to the towns of:

Warragul	Drouin
Darnum	Nilma
BulnBuln	Rokeby

These towns have a combined population of approximately 16,000 people. Additional demands on the system are two milk factories, numerous schools and light industry.

Gaseous chlorine has been used for 30 years at Warragul Water Treatment Plant for Disinfection. There were two separate systems housed in the one building, the Warragul System and the Drouin transfer System.

The Warragul system had four 70 kg Cl<sub>2</sub> cylinders in a duty/stand-by arrangement. Flow through this system varied with demand, the chlorine dosage is flow paced and varies from 5 to 15 kg/day.

The Drouin transfer main Chlorination system, had two 70kg chlorine cylinders in a duty stand-by arrangement. The consumption of chlorine in this system was fixed at 5 kg/day due to the constant pumped flow.

For many years it had been recognised by operation staff that there had to be a safer and more cost effective system of chlorination.

With up to 20kg per day of chlorine being used from the 70kg cylinders there was a need for a cylinder change over every 4 to 7 days. In addition to the six cylinders that were in use there were a

further twelve cylinders in storage to keep up to demand. Transportation of the 70kg cylinders from I.C.I (Orica) to and from our installations were being carried out by our own Licensed staff.

The use of the Gippsland Water truck, the staff hours required and perceived OH&S risks led to a preliminary report being submitted in May 1996. Funding for changing/upgrading of the chlorination facility was sought, Approval was gained and the process of changing the Warragul and Drouin systems began.

## 2.0 DISCUSSION

### 2.1 Costs

#### Installation Costs of the new System

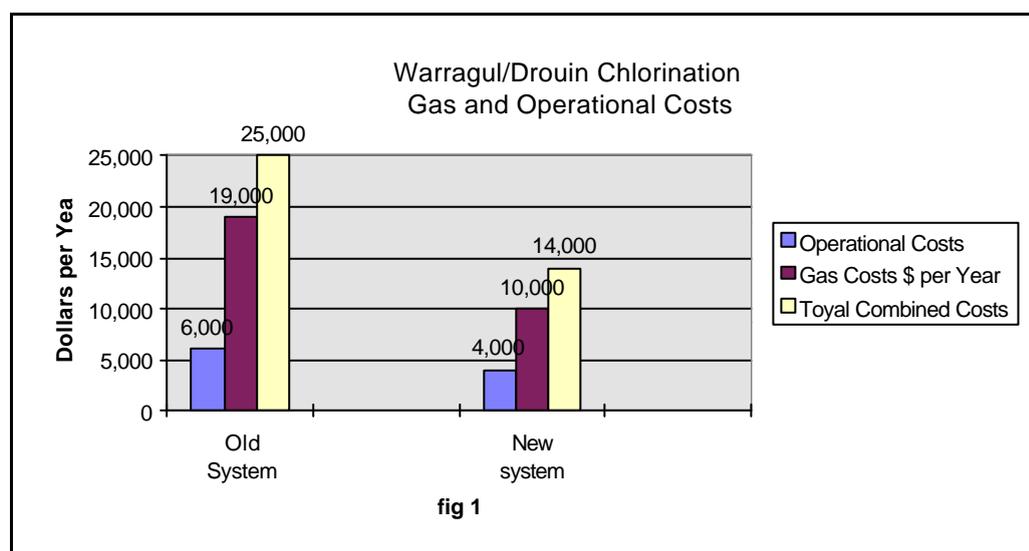
Platform Scales	\$3,000
ChlorGaurd Unit	\$7,000
Lifting Beam	\$2,000
Ventilation	\$2,000
Labour Costs	\$2,000
Extras	\$2,000

**Total** **\$18,000**

Operational Costs of the new system	\$ 4,000 a year
Operational costs of the old system	\$ 6,000 a year

70kg Cl <sub>2</sub> Cylinder gas price	\$ 200
920kg Cl <sub>2</sub> Drum gas price	\$ 1,500

70kg Cl <sub>2</sub> Cylinder rental	\$1.00 per day
920kg Cl <sub>2</sub> Drum rental	\$4.00 per day



### 2.2 Health and Safety Concerns

The most likely time for a chlorine leak to develop is when the process of a cylinder or drum change

over is being done. Seeing that we were carrying out a changeover at least every week, this presented a potential exposure risk, and at a frequency considered to be unacceptable. By changing over to a 920kg system the number of cylinder change overs reduced from 50+ a year to 4 per year, a reduction of 90%.

AS 2927 “The storage and handling of liquefied chlorine gas”, and the Dangerous Goods (Storage and Handling) Regulations 1989 were used as our guide , to make sure we met all safety requirements.

One such regulation , Location of Chlorine storage areas (AS2927 2.3) determines that the minimum separation should be 15 metres from a public place. As this requirement could not be met, special exemption from the Statuary Authority was gained.

Requirements of the special exemption were:-

- ◆ Installation of a leak detector with auto shutdown
- ◆ Mechanical Ventilation installed in the Cl<sub>2</sub> storage area
- ◆ Installation of Safety shower and eye wash.
- ◆ Wind indicator installed
- ◆ Emergency Plan prepared.

### 2.3 Equipment

A leak detection unit with auto shutdown was required. To meet these requirements a ChlorGuard Unit was purchased from I.C.I (Orica) .Within 20 seconds of being triggered, this unit is designed to shut off the flow of chlorine at the drum/cylinder on the detection of a chlorine leak. The unit is battery backed-up to guard against power failure and the actuator is pneumatically operated. On detection of a leak the unit will alarm, which can either be linked to an alarm dialler or telemetry system.

Fan and ducting capable of meeting the AS2927 2.5.5.3 ventilation requirements were installed by local contractors. Some of the requirements included, being able to providing at least 15m<sup>3</sup> of air per minute, having a safety switch located outside the building and having an exhaust stack of sufficient height to permit safe dispersal of chlorine vapours.

The use of a 920kg drum presented its own problems. The overhead gantry did not have sufficient clearance for delivery vehicles to unload. This was seen to be a major stumbling block, because to redesign the gantry was going to be expensive. With the conversion to 920kg drums it was not possible for us to continue to transporting the chlorine. Orica now deliver to site using their cartage contractor. This has freed up staff and equipment time, and eliminated the need for Gippsland Water staff to be transporting dangerous goods. Having discussions with the transport company proved fruitful, as they informed us that with some minor changes to our access gates, their transport vehicles were fitted with self loading cranes and would be able to place the drums under our lifting system. A 2 tonne SWL lifting beam was purchased from A.Noble and Son Pty Ltd. This was used in conjunction with our existing chain block and trolley system.

Knowing how much chlorine you have left is vital to providing a continuous Disinfection system. The Ultra Model CHL Non Trade Platform Scale was installed. This consisted of a platform and load cell mounted on the floor to suit the chlorine drum, and a digital readout which can display daily and total chlorine use.

A high volume safety shower and eye irrigator with quick acting valves were installed as the primary

treatment for skin or eye irritations caused by chlorine liquid or gas. A wind sock was installed on top of the building to give an indication of wind direction as an aid to the emergency services in an evacuation.

Instead of having individual chlorine supplies for the two systems we used a common vacuum line from which each chlorinator drew its chlorine. The conversion to this system was quite simple and inexpensive.

## **2.4 Emergency Plan**

An Emergency Plan was formulated in conjunction with the Emergency Services and Gippsland Water. Included in the plan are:-

- ◆ alarm procedures
- ◆ possible evacuations required
- ◆ safety data sheets
- ◆ site plans and layout
- ◆ emergency contact numbers

This information was formulated and distributed to all relative parties, and copies were placed in the manifest box which was installed at the entrance to the installation. This then provides vital information to the emergency services first on site.

## **3.0 CONCLUSIONS**

Though the total cost of \$18,000 may seem high, the benefits have far exceeded the costs. Health and safety risks have been minimised, and procedures put in place so if the unthinkable happens and we experience a loss of gas we have a system in place to counteract and reduce the impact.

Previously there were six (6) cylinders in use at one time with up to twelve (12) extras in storage. This has been able to be reduced to one (1) 920kg Drum in service and two (2) 70kg cylinders as stand-by. Savings to be made on the purchase of the chlorine gas amounts to approximately \$5,000 per year and a saving of \$4,000 a year rental (fig.1). With these savings it can be seen that this conversion has paid for itself and continues to cost less to run and maintain.

More importantly than the cost savings, is the fact that this installation is now a very safe workplace, for both the employees and the public.

## **4.0 REFERENCES**

Australia Standard "the storage and handling of liquefied chlorine gas" AS 2927

Victorian Dangerous Goods (Storage and Handling) Regulations 1989