



# HEALTH, SAFETY & ENVIRONMENT REPORT 2007

## Kwinana Chlor Alkali, Australia

Nufarm Coogee, Kwinana in Western Australia operates a modern membrane plant supplying chlorine to Tiwest for the manufacture of titanium dioxide.

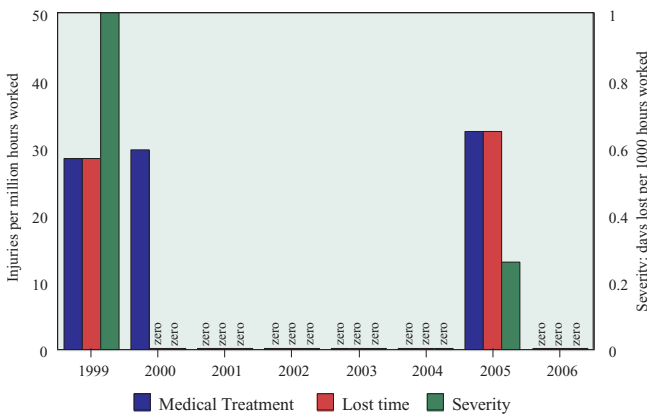
### The plant

produces and stores liquid chlorine for supply to a neighbouring manufacturer of titanium dioxide. In addition, caustic soda, hydrochloric acid and sodium hypochlorite are produced for sale.

### Health and Safety Performance

We are pleased to report that there were no lost time or medical treatment injuries in 2006. There has only been one lost time injury in the last seven years. Continued effort by everyone is needed to maintain this good performance.

#### Injury Frequency Rates



Note: All lost time injuries are also counted as medical treatment injuries

### Waste Reduction

The site produces almost no production wastes, other than a large amount of salt which needs to be bled from our circuit to safeguard the operation of our chlorine cells. This bleed is to remove impurities contained in the purchased salt; if we did not do so, the efficiency of the cells would deteriorate. The impurities are ultimately returned to the sea, from which they came. Small amounts of packaging waste are sent from site. This originates from a small volume of chemicals we purchase to treat our salt circuit. We use concentrated sulphuric acid to remove traces of water vapour from the chlorine we make. Over time the sulphuric acid strength drops due to absorption of water. In 2006, some 820 tonnes of this material was returned to the original supplier for use in the production of other chemicals.

Caustic soda and hydrochloric acid are added to various stages

of the brine purification system in order to adjust the alkalinity or acidity of brine (salt water) used in the process for production of chlorine and caustic soda. The amount of caustic or acid to be added is automatically adjusted using a pH control system.



A small stream of brine is passed through an instrument that measures the pH and adjusts the flow of caustic or acid as required to maintain the desired pH of the brine. Traditionally, the small flow of brine passing out of these instruments has flowed to the plant effluent system with a consequent loss of salt and water. A flow indicator and some new pipes were installed to direct brine from the pH instrument back to an earlier stage of the process allowing most of the salt and water to be recycled. The cost of the changes were soon recovered through savings in salt and water.



Liquid chlorine storage



Liquid chlorine being evaporated for export to Tiwest as gaseous chlorine

### Energy Performance

Power consumption per tonne of product and associated carbon dioxide emissions have essentially been stable for the last 9 years despite trials of different membranes, electrode coatings and other energy efficiency measures. Major improvements to our technology require significant capital expenditure and these have not been justified. A major capacity expansion of the plant is planned and it opens up the opportunity to invest in new higher energy efficient equipment that can produce chlorine and caustic soda at around 8 % lower power consumption and use about half as much steam to produce a tonne of 50% caustic soda than our current unit.

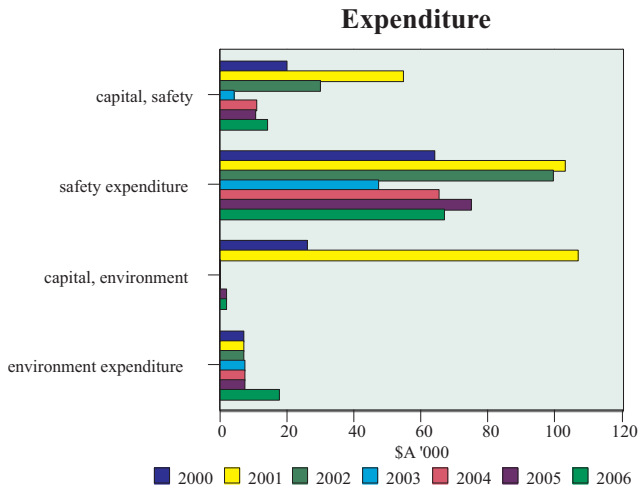
|      | Total energy CO <sub>2</sub> | ton CO <sub>2</sub> | CO <sub>2</sub> per ton product |
|------|------------------------------|---------------------|---------------------------------|
| 1998 |                              | 54,980              | 1.50                            |
| 1999 |                              | 57,723              | 1.52                            |
| 2000 |                              | 59,225              | 1.56                            |
| 2001 |                              | 58,324              | 1.61                            |
| 2002 |                              | 60,579              | 1.59                            |
| 2003 |                              | 59,395              | 1.57                            |
| 2004 |                              | 53,158*             | 1.41                            |
| 2005 |                              | 51,680*             | 1.41                            |
| 2006 |                              | 54,234*             | 1.43                            |

|      | Electricity MWhr | Production | MWhr per ton product |
|------|------------------|------------|----------------------|
| 1998 | 53,413           | 36,690     | 1.46                 |
| 1999 | 56,075           | 38,028     | 1.47                 |
| 2000 | 57,585           | 37,851     | 1.52                 |
| 2001 | 54,483           | 36,234     | 1.50                 |
| 2002 | 56,433           | 38,138     | 1.48                 |
| 2003 | 55,276           | 37,733     | 1.46                 |
| 2004 | 55,032           | 37,670     | 1.46                 |
| 2005 | 53,501           | 36,556     | 1.46                 |
| 2006 | 56,146           | 38,028     | 1.48                 |

\* Actual, rather than calculated, values for CO<sub>2</sub> emissions from cogeneration of steam and electricity.

## Expenditure

There has been an increase in capital expenditure over the last few years on essential safety related items that have reached the end of their useful life. Despite being regularly inspected, well maintained and rarely used, compressed air cylinders used for emergency breathing apparatus have a maximum statutory life of 15 years and required replacement in 2006. The laboratory fume extraction system also required replacement recently.



## Community

Nufarm Coogee provides a scholarship to an upper school science student at a local high school (\$500). Nufarm Coogee were presented with a certificate of appreciation by the Kwinana Industries Education Partnership for sponsorship of the INTERACT Education Conference held at Rockingham in 2006. Nufarm Coogee helps sponsor the holding of the Bayliss Youth Lecture in chemistry in the Rockingham area. Nufarm Coogee funded female students and teachers from a local high school to attend a lecture entitled "Women of Vision". Nufarm Coogee hosted plant tours for 3 groups of high school students, one group of Environmental Science students, one group of cadet journalists and a group of science teachers from the local area.

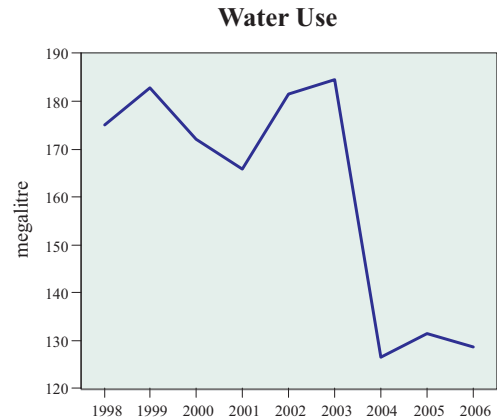
## Major Hazard Facility

Nufarm-Coogee is a major hazard facility and are full members of the Kwinana Industries Council (KIC). Communities and Industries Forum (C&IF) meetings are held with the support of KIC. Meetings are generally held every second month and are advertised in the local press. Nufarm-Coogee is regularly represented at these meetings. The subjects discussed are also frequently reported in the local press. The meetings are open to anyone, including residents of the community, representatives of local industries and government agencies.

These meetings provide a means for consulting with the community about the type of information that they would like to receive, and for community members to ask questions of industry and government representatives. C&IF meetings also provide a forum to present relevant information on significant site changes, amendments to safety measures and emergency plans prior to implementation. Consultation on issues associated with public and environmental health and safety and how they are dealt with are addressed through C&IF meetings.

## Water Use

The graph shows the significant reduction in water use during 2004 mainly due to the reuse of waste water from our Reverse Osmosis water treatment plant. Unfortunately reductions of this magnitude are unlikely to be repeated but our efforts to reduce consumption where practical through the implementation of other water saving projects will continue as detailed below.



## Seal Water Savings

There are two pumps in the tank farm area used to transfer 32% and 50% caustic soda to our customers through pipelines. The same pumps are used to load road tankers for smaller customers. These pumps were originally fitted with double mechanical seals using a water flush. The seals prevent caustic soda leaking from the pump but require a small continuous flow of pressurized water to cool the seal and are designed so that some of this water flows into the pump rather than letting caustic soda leak out in the rare event of a seal failure. The seal water has to be of high purity and is consequently of high value. The flows are small but continuous and amount to around \$2,000 per year for each seal. Added to this is the cost of pumping away the waste water to effluent.

Various options were considered in an effort to save water and money without risking damage to the seal or shortening its life. Simple Intelli-Flow water savers were chosen and fitted to each pump at a cost of under \$1,000 each. These devices will release a small amount of water if needed to cool the seal but this is a rare event. By the time you read this, the cost of these devices has been recouped and real savings in water and money have been made and will continue into the future.



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