

<b>Project Title:</b>	<b>CD2 and MSD2 Water Recovery</b>
<b>Smart Water Fund Application No.:</b>	<b>42R-2044</b>

**Executive Summary**

In recent years due to the drought and other factors water usage had become a contentious issue. Tatura Milk Industries Ltd is a co-operative dairy company with close links to the dairy farmers which hold shares in the company. These close links and reliance on the agricultural industry have ensured a company focus on water usage reduction and water recycling.

In 2004 Tatura Milk Industries Ltd in partnership with Goulburn Valley Water, EPA's Business Sustainability Team and Dairy Australia (via UNEP Working Group for Cleaner Production), completed a salt and water audit of the site. The results of the salt and water audit were used to identify areas of the plant where water usage could be reduced or recycled. A number of areas were identified and projects with a return on investment of 2 years were implemented. Two other projects in the CD2 dryer and MSD2 dryer were identified as having a return on investment of 4 years. Due to the potential water savings it was decided to peruse the project with additional help from external funding.

The project aimed to implement a water capture and distribution system for pump, vacuum pump and homogeniser seal water. The capture and distribution system was installed in CD2 and MSD2 and currently captures seal water and cooling water from 33 pumps, 9 vacuum pumps, 3 MVR's and 1 homogeniser. This has resulted in total town water savings of 41.69ML/year and trade waste discharge savings of 115.2 ML/year.

**1.0 Introduction**

**1.1 Tatura Milk Industries**

Tatura Milk Industries is a public unlisted company with shareholding held both by supplying dairy farmers and Bega Cheese. The company was established in 1907 and is located in Tatura in Northern Victoria.

From humble beginnings in 1907 with less than 100 tonnes of butter manufactured in its first year of operation, Tatura Milk has grown into a fully automated, modern complex with the ability to produce a wide range of dairy products to exacting specifications.

Today Tatura Milk is supplied by approximately 330 dairy farms and processes approximately 450 million litres of milk each year. Tatura Milk is a single site manufacturing complex with access to fresh, quality milk from best practice dairy farms.

Tatura Milk manufactures quality Australian dairy ingredients for the global market. Approximately 70,000 tonnes of manufactured products are produced per annum using state of the art technologies and systems. More than 60% of the total production is exported to Japan, Korea, Malaysia, Singapore, Indonesia, China, Philippines, Thailand, Taiwan, Hong Kong and Europe.

Tatura Milk aims to deliver innovative solutions to its customers, by supplying the highest quality nutritional products, ingredients and foods.

### 1.2 Tatura Milk and water use

Tatura Milk, as dairy processor, is required to comply with various guidelines that specify the requirements for national and international food safety standards. Included in many of these guidelines and standards are requirements for the use of potable water to ensure food safety is maintained at all times during the manufacturing process.

Tatura Milk uses potable water both during manufacturing (ie. rehydration of ingredients, diafiltration in ultrafiltration plants, flushing product out of lines at the completion of a batch) and for services (ie. CIP final rinse, cooling of pump seals, chilled water).

Tatura Milk also generates non potable water through evaporation (known as milk condensate or 'cow' water) and membrane processes (known as RO permeate), and this water is used for boiler feed, CIP solution make-up, cleaning of floors and walls, cooling towers etc.

During the 2005-2006 season, Tatura Milk used 997 ML of town water, and recycled an estimated 130 ML. Most of this water was discharged as trade waste to Goulburn Valley Water's Tatura Waste Management Plant, where it is treated and used to irrigate pasture.

### 1.3 Water Smart Project Proposal

In partnership with Goulburn Valley Water, EPA's Business Sustainability Team and Dairy Australia (via UNEP Working Group for Cleaner Production), Tatura Milk completed a water and salt audit in 2004. The aims of this project were to identify areas using town water and discharging salt (sodium) to trade waste. The results of the audit were then used to focus on areas which could recycle water or reduce discharge to trade waste

The water and salt audit identified that there were town water saving opportunities in both pump, vacuum pump and homogeniser seal water.

The Tatura Milk Process Engineering team reviewed the audit recommendations and then measured the seal water use for various installations across the site. The cost of using condensate as the water supply or installing a water recycling system was then estimated, and a plan developed. The identified water savings with return on investments of less than 2 years were implemented. Two other projects associated with CD2 and MSD2 dryers

were submitted to the Smart Water Fund, as the improvements could not be justified using Tatura Milk’s capital project guidelines.

Tatura Milk’s water saving proposal for CD2 and MSD2 involved the installation of a collection, monitoring and distribution system for pump seal water, so that the water could be re-used via the existing condensate distribution systems.

Tatura Milk’s proposal was to install a water capture and return distribution system to collect and transfer pump seal water to other onsite reuse applications, eg. Cooling towers and Cleaning in Place (CIP) equipment. This initiative resulted from a company focus on reducing the volume of water consumed on site, driven by external factors such as the drought and the requirement to maximize the water supply infrastructure without unnecessary capital upgrade.

**2.0 Opportunity review**

The salt and water audit conducted in 2004 was one of the main drivers in identifying and implementing water reduction and reuse projects. The audit aimed to identify and quantify the amount of water entering the site and the distribution of the water around the site. See table 2.1 for a breakdown of water entering and exiting the site over the 2003-2004 financial year. The distribution of water to various processes was then determined, see table 2.2 for site distribution of water.

**Table 2.1: Site water balance for the fiscal year 2003-2004<sup>1</sup>**

Water IN		Water OUT	
Town water	920 ML	Evaporation	90 ML
Rainfall	19 ML	Trade waste	1,047 ML
CIP	1 ML	Solid waste (fat)	< 1 ML
Raw materials (incl milk)	423 ML	Products	48 ML
		Stormwater	Unknown
<b>TOTAL</b>	<b>1,363 ML</b>	<b>TOTAL</b>	<b>1,184 ML</b>
		Unaccounted water	179 ML

MSD2 was identified as a major user of water on site. Steps were then taken to identify areas within MSD2 where water could be reduced. It was determined that the pump, vacuum pump and homogeniser seal water could be captured and recycled. As CD2 contains very similar operations to MSD2 the same water reuse installation could be applied in this area as well.

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<sup>1</sup> DPEC audit

**Table 2.2: Breakdown of water usage between production areas.<sup>2</sup>**

<b>Production area</b>	<b>Town water consumption</b>	<b>Sodium discharge</b>
Tanker Bay	4.6%	4.7%
Separator area	7.0%	8.3%
Lactoferrin plant	4.5%	11.0%
Cheese room	10.3%	8.2%
CD 2	0.6%	5.0%
MSD 2	5.1%	9.8%

### **3.0 Capital Funding**

Funding to support the proposal was applied for to the Smart Water Fund Round 4 and a Capex application to the TMI Capital committee.

Prior to receiving the funding approval from the Smart Water Fund, the capital committee recommended that the Capex request should be approved. The Boards position was that whilst the projects payback hurdles would not be achieved without external financial support, they supported all water saving initiatives as part of ensuring the sustainability of dairy process industry. The board approved the capital spend and requested immediate project implementation in order to achieve maximum water saving potential in the drought year.

### **4.0 Design Process**

Glenn Welch was assigned as the Project Engineer for the installation in both MSD2 and CD2 process plants.

The Project Engineering phase at TMI includes the following:

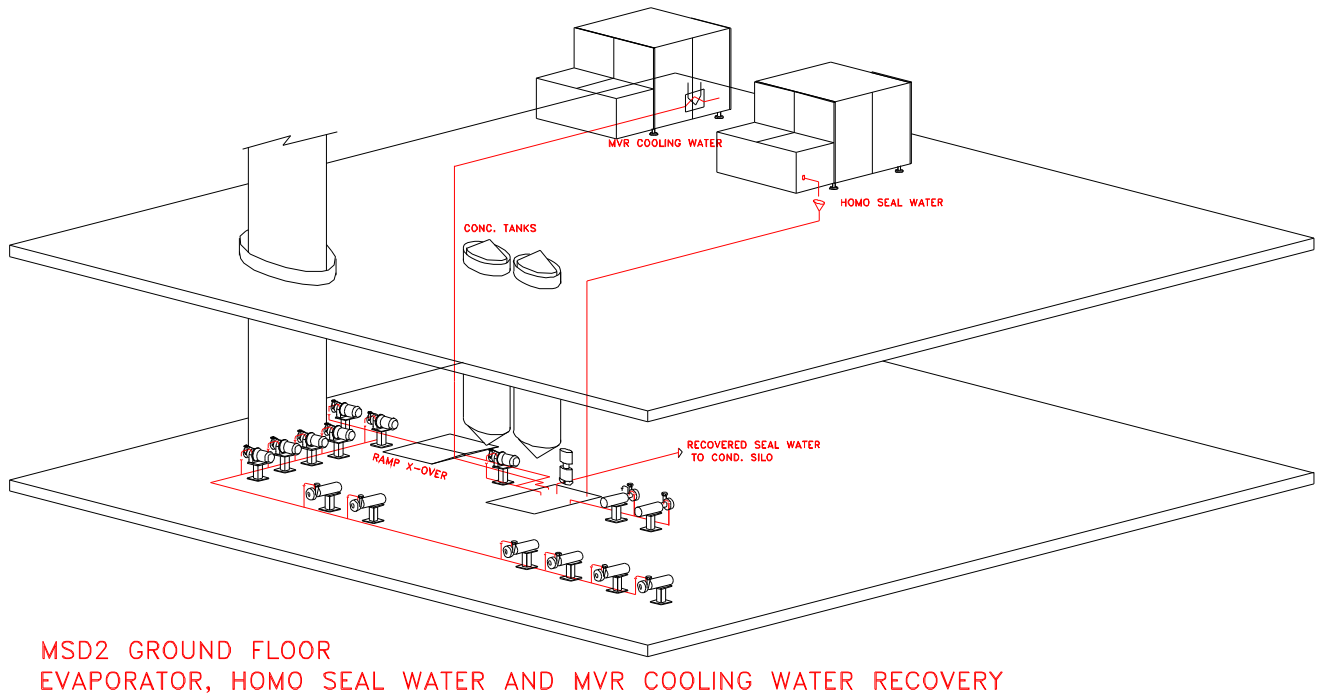
- Scope revision and clarification
- Consultation with all parties, in this case they were:
  - Technical
  - Quality
  - Maintenance
  - Production Management
  - Production Operators
- Production of isometric drawings for installation guidance
- Equipment list development
- Project timeline (installed as per timeline included in Smart Water Funding application)
- Project supervision
- Budget management.

<sup>2</sup> Irwin, D. Water and Salt Audit at TMI September 2004

- Project follow up and review of installations.

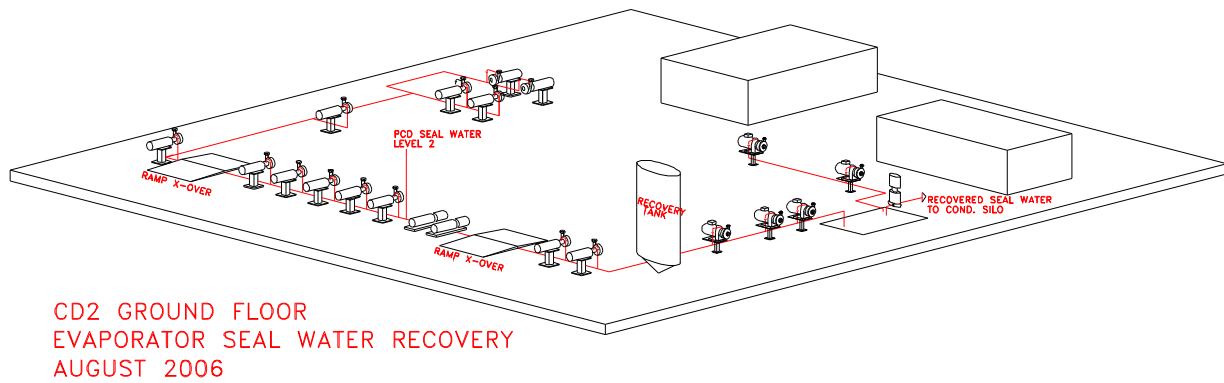
**5.0 Installation Drawings**

**5.1 MSD2 Installation Drawings.**

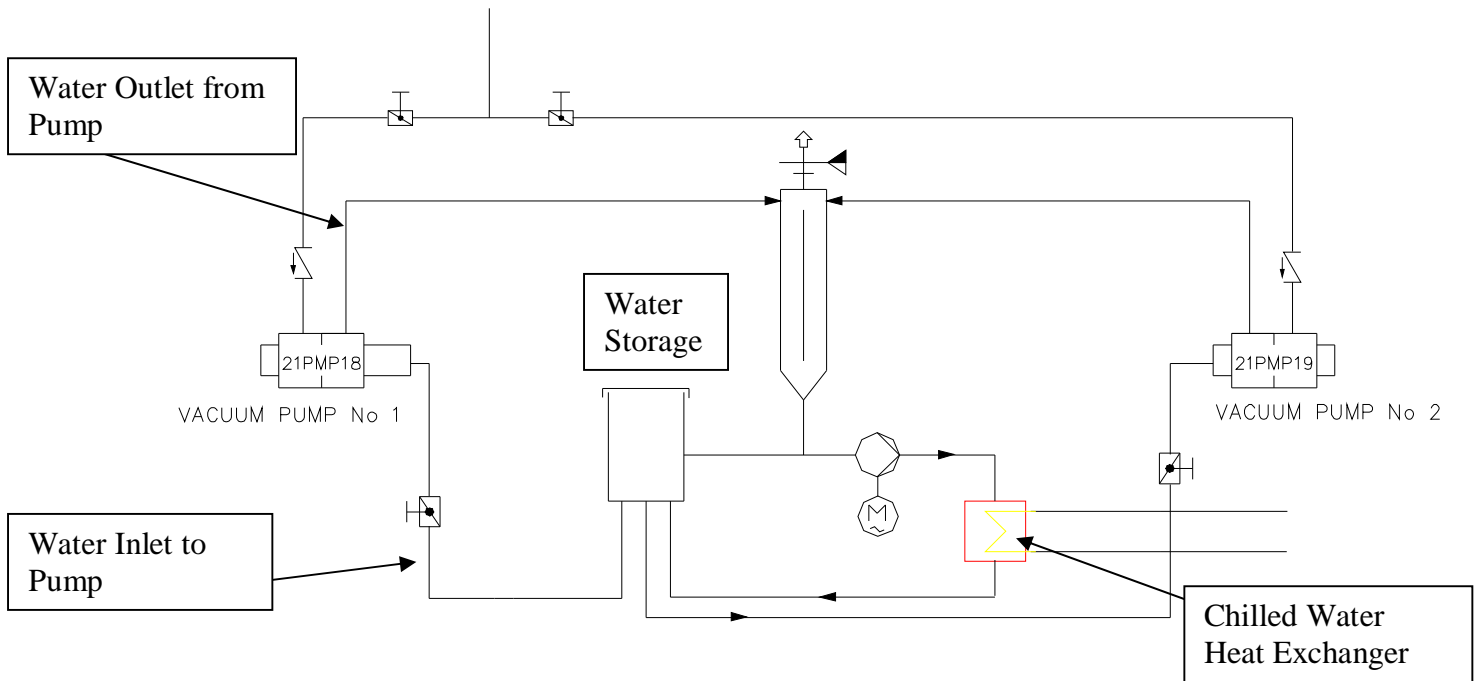


**Figure 5.1.1: Installation drawing for MSD2 evaporator pumps seal water and homogenizer cooling water recovery.**

**5.2 CD2 Installation Drawings**



**Figure 5.2.1: Installation drawing for CD2 evaporator pump seal water recovery.**



**Figure 5.2.2: Closed chilled water loop for vacuum pumps. Note this is one example of a closed chilled water system for vacuum pumps. Three such systems are in place, each with slight variations from the shown figure.**

**6.0 Projects Costs.**

**Table 6.1: Project Budget**

<i>Description</i>	<i>Cost</i>	<i>Water saving (Town water)</i>	<i>Trade Waste saving</i>	<i>Saving \$ pa.</i>	<i>Return on investment</i>
<i>Pump &amp; Homogeniser seals</i>	\$52,200		33.48ML	\$12,595	
<i>MVR cooling water</i>	\$5,500	26.57ML	26.57ML	\$23,541	
<i>Additional chilled water used</i>				-\$20,000	
<i>Powder filling m/c vacuum pump cooling</i>	\$80,000	25.2ML	18.00 ML	\$19,623	
<i>Evaporator vacuum pump cooling</i>	\$22,300	Milk Condensate	35.00ML	\$13,160	
<i>Distribution system alteration (included in above)</i>					



<i>Engineering Design &amp; Project Management (6 weeks)</i>	\$24,000				
<i>Other Project costs</i>	\$14,800				
<i>Total</i>	\$198,800	51.77 ML	113.05ML	\$48,919	4.06 years

Note: the above budget cost was submitted for Capex approval via two Capex applications, i.e. For MSD2 capex request no. 1416 and approval no. CEC277, for CD2 capex request no. 1426 and approval no. CEC275.

### 6.2 Actual Spend report.

**Table 6.2.1: Actual spend report for MSD2 excluding project engineering labor costs.**

Supplier/ Item	Name/ Description	Order No.	Date	Amount
<b>CEC277</b>	<b>MSD2 WATER SAVING</b>			
<b>Manual Invoice</b>				
12960	TMI - CLEARING		1/09/2006	\$2,630.80
12960	TMI - CLEARING		1/10/2006	\$8.14
<b>Invoice Price Variance</b>				
20174	TATURA MILK		1/12/2006	-\$814.00
<b>General Journal</b>				
			31/10/2006	\$1,824.30
<b>Purchase Order Receipt</b>				
8203	PL & DA JAMES P/L	230484	23/05/2006	\$144.00
6450	O & P GREGORY PTY LTD	230548	26/05/2006	\$150.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$100.00
8203	PL & DA JAMES P/L	231518	10/08/2006	\$200.00
8203	PL & DA JAMES P/L	231518	10/08/2006	\$150.00
8203	PL & DA JAMES P/L	231518	10/08/2006	\$200.00
8203	PL & DA JAMES P/L	231518	10/08/2006	\$200.00
8203	PL & DA JAMES P/L	231569	15/08/2006	\$125.00
8203	PL & DA JAMES P/L	231569	15/08/2006	\$125.00
8203	PL & DA JAMES P/L	231569	15/08/2006	\$100.00
8203	PL & DA JAMES P/L	231569	15/08/2006	\$100.00

**Project Completion Report**

8203	PL & DA JAMES P/L	231569	15/08/2006	\$150.00
6450	O & P GREGORY PTY LTD	231691	24/08/2006	\$100.00
6450	O & P GREGORY PTY LTD	231692	24/08/2006	\$1,131.00
8203	PL & DA JAMES P/L	231735	25/08/2006	\$100.00
8203	PL & DA JAMES P/L	231735	25/08/2006	\$200.00
8203	PL & DA JAMES P/L	231735	25/08/2006	\$200.00
6450	O & P GREGORY PTY LTD	231716	25/08/2006	\$175.00
6450	O & P GREGORY PTY LTD	231717	25/08/2006	\$675.00
8215	MIDDENDORP ELECTRIC CO PTY LTD	231727	28/08/2006	\$225.00
20174	TATURA MILK	231682	28/08/2006	\$814.00
20174	TATURA MILK	231682	31/08/2006	\$814.00
8203	PL & DA JAMES P/L	231876	6/09/2006	\$200.00
12538	RODNEY COE	231849	6/09/2006	\$176.00
8203	PL & DA JAMES P/L	231876	6/09/2006	\$150.00
8203	PL & DA JAMES P/L	231876	6/09/2006	\$250.00
8203	PL & DA JAMES P/L	231876	6/09/2006	\$300.00
8203	PL & DA JAMES P/L	231883	6/09/2006	\$125.00
8203	PL & DA JAMES P/L	231883	6/09/2006	\$200.00
8203	PL & DA JAMES P/L	231883	6/09/2006	\$100.00
6450	O & P GREGORY PTY LTD	231886	6/09/2006	\$1,305.00
6450	O & P GREGORY PTY LTD	231948	11/09/2006	\$2,437.00
8203	PL & DA JAMES P/L	231971	12/09/2006	\$100.00
8203	PL & DA JAMES P/L	231971	12/09/2006	\$200.00
8203	PL & DA JAMES P/L	231971	12/09/2006	\$150.00
8203	PL & DA JAMES P/L	231971	12/09/2006	\$200.00
8203	PL & DA JAMES P/L	231971	12/09/2006	\$100.00
8203	PL & DA JAMES P/L	231971	12/09/2006	\$200.00
6450	O & P GREGORY PTY LTD	232024	15/09/2006	\$1,930.00
8203	PL & DA JAMES P/L	232042	18/09/2006	\$200.00
8203	PL & DA JAMES P/L	232042	18/09/2006	\$200.00
8203	PL & DA JAMES P/L	232042	18/09/2006	\$300.00
8203	PL & DA JAMES P/L	232042	18/09/2006	\$200.00
20458	T & M AUTOMATION	232043	18/09/2006	\$130.00
20174	TATURA MILK	231560	18/09/2006	\$763.60
10215	SHEPELEC INSTRUMENTATION	231681	19/09/2006	\$260.00
10215	SHEPELEC INSTRUMENTATION	231681	19/09/2006	\$20.00
2140	BIOLAB (AUST) LTD	231407	19/09/2006	\$7,335.00
2140	BIOLAB (AUST) LTD	231407	19/09/2006	\$590.00
6450	O & P GREGORY PTY LTD	232132	25/09/2006	\$1,022.00
8203	PL & DA JAMES P/L	232238	4/10/2006	\$200.00
8203	PL & DA JAMES P/L	232238	4/10/2006	\$300.00
8203	PL & DA JAMES P/L	232238	4/10/2006	\$200.00
8203	PL & DA JAMES P/L	232238	4/10/2006	\$200.00
6450	O & P GREGORY PTY LTD	232265	5/10/2006	\$2,282.00
20077	G.V. CONCRETE SAWING	232317	9/10/2006	\$300.00
8203	PL & DA JAMES P/L	232352	11/10/2006	\$150.00
8203	PL & DA JAMES P/L	232352	11/10/2006	\$150.00
8203	PL & DA JAMES P/L	232352	11/10/2006	\$200.00
20089	LINCOT INSULATION	232351	11/10/2006	\$920.00
8203	PL & DA JAMES P/L	232352	11/10/2006	\$200.00
8215	MIDDENDORP ELECTRIC CO PTY LTD	232196	11/10/2006	\$7.00

**Project Completion Report**

20081	FAGERSTA STEEL P/L.	232371	16/10/2006	\$157.80
8203	PL & DA JAMES P/L	232419	17/10/2006	\$200.00
8203	PL & DA JAMES P/L	232419	17/10/2006	\$250.00
8203	PL & DA JAMES P/L	232419	17/10/2006	\$200.00
8203	PL & DA JAMES P/L	232419	17/10/2006	\$200.00
8203	PL & DA JAMES P/L	232419	17/10/2006	\$200.00
6450	O & P GREGORY PTY LTD	232439	18/10/2006	\$1,800.00
6450	O & P GREGORY PTY LTD	232562	30/10/2006	\$3,464.00
6185	GOULBURN VALLEY MAINTENANCE SYSTEMS	232565	30/10/2006	\$1,100.00
8203	PL & DA JAMES P/L	232606	2/11/2006	\$250.00
8203	PL & DA JAMES P/L	232606	2/11/2006	\$200.00
8203	PL & DA JAMES P/L	232606	2/11/2006	\$200.00
8203	PL & DA JAMES P/L	232606	2/11/2006	\$375.00
8203	PL & DA JAMES P/L	232606	2/11/2006	\$275.00
6450	O & P GREGORY PTY LTD	232611	2/11/2006	\$1,281.00
6450	O & P GREGORY PTY LTD	232611	2/11/2006	\$80.00
8203	PL & DA JAMES P/L	232735	15/11/2006	\$300.00
8203	PL & DA JAMES P/L	232735	15/11/2006	\$150.00
8203	PL & DA JAMES P/L	232851	27/11/2006	\$200.00
8203	PL & DA JAMES P/L	232851	27/11/2006	\$150.00
6450	O & P GREGORY PTY LTD	232857	27/11/2006	\$532.00
6450	O & P GREGORY PTY LTD	232856	27/11/2006	\$275.00
8203	PL & DA JAMES P/L	233465	24/01/2007	\$100.00
3961	CHALLENGER VALVES & ACTUATORS	233648	14/02/2007	\$189.00
3961	CHALLENGER VALVES & ACTUATORS	233704	16/02/2007	\$313.50

**Issue from Inventory**

	25mm 90deg 304 POL BEND		8/05/2006	\$85.12
SF00155	25mm BSM UNION COMP		8/05/2006	\$45.00
SF00065	3/4" BSP TOE NIPPLE S/S		8/05/2006	\$7.80
SF00519	25mm 304 POL TUBE		8/05/2006	\$176.00
SF00705	25mm TUBE CLAMP PLAIN		8/05/2006	\$14.25
SF00635	51mm 90deg 304 POL BEND		8/05/2006	\$57.00
SF00159	3/4" BALL VALVE 3PCE ST/ST		10/05/2006	\$114.40
SF02013	101mm LKB B/FLY VALVE MAN 304		26/06/2006	\$238.57
SF00941	50mm CIP BSM UNION COMP		3/08/2006	\$176.00
SF00077	38mm 90deg 304 POL BEND		3/08/2006	\$65.00
SF00157	38mm 304 POL TUBE		3/08/2006	\$266.40
SF00709	51mm 304 POL TUBE		3/08/2006	\$525.60
SF00711	50x10mm S/S FLAT (4mtr)		7/08/2006	\$190.00
SF00758	51mm 90deg 304 POL BEND		9/08/2006	\$240.00
SF00159				

**Project Completion Report**

SF00711	51mm 304 POL TUBE	9/08/2006	\$438.00
SF00921	101mm LKB B/FLY VALVE ACT 304	10/08/2006	\$1,153.16
SF00641	51mm TUBE CLAMP PLAIN	10/08/2006	\$11.40
SF03031	63mm BSM-CIP MALE PART 316	14/08/2006	\$14.40
SF00157	38mm 90deg 304 POL BEND	22/08/2006	\$39.00
SF00757	50x6mm S/S FLAT (4mtr)	22/08/2006	\$116.00
SF00075	25mm CIP BSM UNION COMP	22/08/2006	\$117.00
SF00933	38mm LKB B/FLY VALVE MAN 304	22/08/2006	\$241.52
SF00155	25mm 90deg 304 POL BEND	22/08/2006	\$104.00
SF00076	38mm CIP BSM UNION COMP	22/08/2006	\$83.70
SF00076	38mm CIP BSM UNION COMP	25/08/2006	\$27.90
SF00077	50mm CIP BSM UNION COMP	25/08/2006	\$70.40
SF00303	51x38mm CONCENTRIC REDUCER	25/08/2006	\$16.40
SF00305	63x25mm CONCENTRIC REDUCER	25/08/2006	\$35.60
SF00309	63x51mm CONCENTRIC REDUCER	25/08/2006	\$30.40
SF00477	2" BSP SOCKET S/S	25/08/2006	\$49.80
SF00519	3/4" BSP TOE NIPPLE S/S	25/08/2006	\$3.90
SF00523	1-1/4" BSP TOE NIPPLE S/S	25/08/2006	\$8.00
SF00525	1-1/2 BSP TOE NIPPLE	25/08/2006	\$18.00
SF00075	25mm CIP BSM UNION COMP	25/08/2006	\$23.40
SF00159	51mm 90deg 304 POL BEND	25/08/2006	\$48.00
SF00249	51mm POL 304 TEE	25/08/2006	\$18.50
SF00769	16mm S/S ROUND BAR (4mtr)	25/08/2006	\$36.84
SF00157	38mm 90deg 304 POL BEND	25/08/2006	\$32.50
SF00159	51mm 90deg 304 POL BEND	28/08/2006	\$192.00
SF00067	50mm BSM UNION COMP	28/08/2006	\$176.00
SF00017	BSM 51mm LINER	29/08/2006	\$3.90
SF02053	1-1/4" SWING CHECK VALVE ST/ST	31/08/2006	\$72.05
SF00547	1-1/4"BSP HEX NIPPLE S/S	6/09/2006	\$9.00
SF00009	BSM 38mm LINER	6/09/2006	\$6.40
SF00523	1-1/4" BSP TOE NIPPLE S/S	6/09/2006	\$4.00

**Project Completion Report**

SF00647	101mm TUBE CLAMP PLAIN	6/09/2006	\$11.20
SF00641	51mm TUBE CLAMP PLAIN	6/09/2006	\$15.20
EL09613	1 ENCL.MOUNT S/S 100x125mm	7/09/2006	\$7.35
EL09621	3 ENCL.MOUNT S/S 110x320mm	7/09/2006	\$26.50
SF00639	38mm TUBE CLAMP PLAIN	7/09/2006	\$6.80
SF00045	BSM 101mm MALE PART	11/09/2006	\$12.45
SF00155	25mm 90deg 304 POL BEND	11/09/2006	\$5.20
SF00641	51mm TUBE CLAMP PLAIN	12/09/2006	\$7.60
SF00643	63mm TUBE CLAMP PLAIN	12/09/2006	\$9.00
EL09613	1 ENCL.MOUNT S/S 100x125mm	12/09/2006	\$7.35
SF00639	38mm TUBE CLAMP PLAIN	12/09/2006	\$6.80
SF00647	101mm TUBE CLAMP PLAIN	12/09/2006	\$11.20
SF00001	BSM 25mm LINER	14/09/2006	\$2.65
SF00003	BSM 25mm HEX NUT	14/09/2006	\$4.20
SF02545	51mm DIAM x 1.5 DISC 304 S/S	14/09/2006	\$8.00
SF00303	51x38mm CONCENTRIC REDUCER	25/09/2006	\$16.40
SF00635	25mm TUBE CLAMP PLAIN	27/09/2006	\$11.40
SF00155	25mm 90deg 304 POL BEND	27/09/2006	\$36.40
SF03001	25mm BSM-CIP MALE PART 316	28/09/2006	\$3.90
EL01200	GLANDS PVC 16mm	28/09/2006	\$3.00
EL01200	GLANDS PVC 16mm	29/09/2006	\$3.00
SF00635	25mm TUBE CLAMP PLAIN	29/09/2006	\$28.50
SF00705	25mm 304 POL TUBE	29/09/2006	\$176.40
SF00769	16mm S/S ROUND BAR (4mtr)	29/09/2006	\$73.68
SF00935	51mm LKB B/FLY VALVE MAN 304	29/09/2006	\$257.54
SF00155	25mm 90deg 304 POL BEND	29/09/2006	\$156.00
SF00065	25mm BSM UNION COMP	29/09/2006	\$117.00
WS10037	WELDING ARGON E SIZE CYL.	2/10/2006	\$102.75
AF01001	6mm TUBE.LDPE BLACK (MTR)	6/10/2006	\$63.00
AF00452	SMC 24V DC VALVE 1/4	11/10/2006	\$112.00
SF03032	63mm BSM-CIP LINER 316	11/10/2006	\$19.80

**Project Completion Report**

SF00161	63mm 90deg 304 POL BEND	11/10/2006	\$13.85
SF00013	BSM 38mm MALE PART	11/10/2006	\$14.55
AF00132	6x1/4bsp STRAIGHT FESTO	12/10/2006	\$24.71
AF00440	SMC 24V AC SOLENOID VALVE 1/4	12/10/2006	\$125.00
AF00126	ELBOW 6x1/8bsp FESTO	16/10/2006	\$5.03
SF00065	25mm BSM UNION COMP	16/10/2006	\$70.20
SF00081	BSM 25mm BLANK CAP 316L	16/10/2006	\$12.00
SF00159	51mm 90deg 304 POL BEND	16/10/2006	\$76.80
SF00477	2" BSP SOCKET S/S	16/10/2006	\$33.20
SF00701	13mm 304 POL TUBE	16/10/2006	\$25.50
SF02533	25mm DIAM x 1.5 DISC 304 S/S	16/10/2006	\$12.00
SF00935	51mm LKB B/FLY VALVE MAN 304	17/10/2006	\$257.54
SF00517	1/2" BSP TOE NIPPLE S/S	17/10/2006	\$5.10
SF00243	25mm POL 304 TEE	18/10/2006	\$46.20
			\$53,968.40

Electrical

**Invoice Price Variance**

3966		27/10/2006	\$0.01
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**General Journal**

31/10/2006	\$138.50
31/10/2006	\$372.50

**Purchase Order Receipt**

10215	SHEPELEC INSTRUMENTATION	231681	31/08/2006	\$1,230.00
5900	REXEL AUSTRALIA	231985	15/09/2006	\$500.00
12245	YOKOGAWA AUSTRALIA PTY LTD	231860	15/09/2006	\$402.00
20458	T & M AUTOMATION	232043	18/09/2006	\$195.00
3966	LASER ELECTRICAL SHEPPARTON	232126	25/09/2006	\$207.75
20458	T & M AUTOMATION	232131	25/09/2006	\$130.00
12491	HYGENELEC	232150	2/10/2006	\$223.50
3966	LASER ELECTRICAL SHEPPARTON	232224	3/10/2006	\$1,506.75
3966	LASER ELECTRICAL SHEPPARTON	232306	9/10/2006	\$812.25
8215	MIDDENDORP ELECTRIC CO PTY LTD	232196	11/10/2006	\$32.00
3966	LASER ELECTRICAL SHEPPARTON	232401	16/10/2006	\$1,294.25

**Project Completion Report**

20458	T & M AUTOMATION	232421	17/10/2006	\$260.00
5900	REXEL AUSTRALIA	232032	20/10/2006	\$31.00
20458	T & M AUTOMATION	232499	24/10/2006	\$130.00
20458	T & M AUTOMATION	232555	30/10/2006	\$130.00
3966	LASER ELECTRICAL SHEPPARTON	232556	30/10/2006	\$971.00
12245	YOKOGAWA AUSTRALIA PTY LTD	232557	30/10/2006	\$220.59
3966	LASER ELECTRICAL SHEPPARTON	232578	31/10/2006	\$395.25
12245	YOKOGAWA AUSTRALIA PTY LTD	232586	31/10/2006	\$306.08
3966	LASER ELECTRICAL SHEPPARTON	232646	7/11/2006	\$579.75
12245	YOKOGAWA AUSTRALIA PTY LTD	232695	10/11/2006	\$181.61
12245	YOKOGAWA AUSTRALIA PTY LTD	232695	10/11/2006	\$254.25
12245	YOKOGAWA AUSTRALIA PTY LTD	232696	10/11/2006	\$262.46
20458	T & M AUTOMATION	232739	15/11/2006	\$195.00
10602	SHIMMA PTY LTD	232848	27/11/2006	\$360.00
12245	YOKOGAWA AUSTRALIA PTY LTD	233025	8/12/2006	\$626.23
12245	YOKOGAWA AUSTRALIA PTY LTD	233025	8/12/2006	\$294.70
12245	YOKOGAWA AUSTRALIA PTY LTD	233025	8/12/2006	\$589.40
12245	YOKOGAWA AUSTRALIA PTY LTD	233025	8/12/2006	\$1,473.50
12245	YOKOGAWA AUSTRALIA PTY LTD	233025	8/12/2006	\$810.42
3966	LASER ELECTRICAL SHEPPARTON	233163	20/12/2006	\$1,427.00
3966	LASER ELECTRICAL SHEPPARTON	233581	7/02/2007	\$46.50
3966	LASER ELECTRICAL SHEPPARTON	233672	14/02/2007	\$46.50
20458	T & M AUTOMATION	233711	16/02/2007	\$130.00
3966	LASER ELECTRICAL SHEPPARTON	233771	21/02/2007	\$93.00
3966	LASER ELECTRICAL SHEPPARTON	233771	21/02/2007	\$69.75

**Issue from Inventory**

			14/09/2006	\$45.76
EL09177	GLANDS PVC 20mm		18/09/2006	\$2.58
EL01204	LAN LUG 8x25mm		18/09/2006	\$4.00
EL00548	TE.SCREW EARTH TERMINAL 6mm		28/09/2006	\$10.60
EL02533	CABLE TIES 200mm BLACK		28/09/2006	\$8.00
EL04137	GLANDS PVC 20mm		29/09/2006	\$3.44
EL01204	RTD 1-1/2 TRICLOVER 50x9.6T		17/01/2007	\$115.00
EL21014	HOCKEY PUK 4-20MA 0/200C		14/02/2007	\$90.00
EL21502	SMC 24V AC SOLENOID VALVE 1/4		27/02/2007	\$125.00
AF13015				
				<hr/>
				\$17,332.88

**MSD2 WATER SAVING Total:**

**\$71,301.28**

**\$71,301.28**

**Table 6.2.2: Actual spend report for CD2 excluding project engineering labor costs.**

Supplier/ Item	Name/ Description	Order No.	Date	Amount
<b>CEC275</b>	<b>CD2 WATER SAVING</b>			
General				
<b>General Journal</b>				
			1/01/2007	\$94,711.93
			1/01/2007	-\$94,711.93
				\$0.00
Engineering				
<b>Manual Invoice</b>				
12960	TMI - CLEARING		1/09/2006	\$796.66
12960	TMI - CLEARING		1/10/2006	\$28.40
<b>Invoice Price Variance</b>				
4669				
4669	SGS ECONOMICS & PLANNING		30/08/2006	-\$0.02
20174	TATURA MILK		1/12/2006	-\$724.40
<b>Purchase Order Receipt</b>				
8203	PL & DA JAMES P/L	230484	23/05/2006	\$144.00
6450	O & P GREGORY PTY LTD	230548	26/05/2006	\$850.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$150.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$150.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$250.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$225.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$200.00
4669	SGS ECONOMICS & PLANNING	231346	31/07/2006	\$4,545.40
8203	PL & DA JAMES P/L	231362	31/07/2006	\$150.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$100.00
8203	PL & DA JAMES P/L	231362	31/07/2006	\$100.00
20081	FAGERSTA STEEL P/L.	231478	8/08/2006	\$27.80
6450	O & P GREGORY PTY LTD	231469	8/08/2006	\$2,270.00
4669	SGS ECONOMICS & PLANNING	231488	8/08/2006	\$4,398.20
6450	O & P GREGORY PTY LTD	231512	9/08/2006	\$1,568.00
6450	O & P GREGORY PTY LTD	231512	9/08/2006	\$6,226.00



**Project Completion Report**

8203	PL & DA JAMES P/L		231518	10/08/2006	\$100.00
8203	PL & DA JAMES P/L		231518	10/08/2006	\$150.00
3966	LASER ELECTRICAL SHEPPARTON		231585	15/08/2006	\$116.25
8203	PL & DA JAMES P/L		231569	15/08/2006	\$150.00
8203	PL & DA JAMES P/L		231569	15/08/2006	\$200.00
8203	PL & DA JAMES P/L		231569	15/08/2006	\$100.00
8203	PL & DA JAMES P/L		231569	15/08/2006	\$225.00
6450	O & P GREGORY PTY LTD		231693	24/08/2006	\$3,483.00
6450	O & P GREGORY PTY LTD		231691	24/08/2006	\$5,565.00
8203	PL & DA JAMES P/L		231735	25/08/2006	\$100.00
8203	PL & DA JAMES P/L		231735	25/08/2006	\$200.00
8203	PL & DA JAMES P/L		231735	25/08/2006	\$200.00
20077	G.V. CONCRETE SAWING		231737	25/08/2006	\$220.00
6450	O & P GREGORY PTY LTD		231716	25/08/2006	\$5,297.00
20174	TATURA MILK		231682	28/08/2006	\$724.40
10215	SHEPELEC INSTRUMENTATION	\$1,230.00			
8203	PL & DA JAMES P/L		231883	6/09/2006	\$200.00
8203	PL & DA JAMES P/L		231883	6/09/2006	\$75.00
6450	O & P GREGORY PTY LTD		231886	6/09/2006	\$1,830.00
6450	O & P GREGORY PTY LTD		231886	6/09/2006	\$127.00
6450	O & P GREGORY PTY LTD		231948	11/09/2006	\$2,778.00
8203	PL & DA JAMES P/L		231971	12/09/2006	\$200.00
8203	PL & DA JAMES P/L		231971	12/09/2006	\$150.00
8203	PL & DA JAMES P/L		231971	12/09/2006	\$100.00
8203	PL & DA JAMES P/L		231971	12/09/2006	\$200.00
11320	TETRA PAK MARKETING PTY LTD	\$2,217.00			
6450	O & P GREGORY PTY LTD		232024	15/09/2006	\$3,626.00
6450	O & P GREGORY PTY LTD		232025	15/09/2006	\$2,818.00
11320	TETRA PAK MARKETING PTY LTD		231389	18/09/2006	\$5,173.00
8203	PL & DA JAMES P/L		232042	18/09/2006	\$100.00
8203	PL & DA JAMES P/L		232042	18/09/2006	\$100.00
20458	T & M AUTOMATION		232043	18/09/2006	\$130.00
2140	BIOLAB (AUST) LTD	231407	19/09/2006	\$7,335.00	
2140	BIOLAB (AUST) LTD	231407	19/09/2006	\$590.00	
6450	O & P GREGORY PTY LTD		232132	25/09/2006	\$2,498.00
6450	O & P GREGORY PTY LTD		232265	5/10/2006	\$216.00
20089	LINCOT INSULATION		232351	11/10/2006	\$1,990.00
8203	PL & DA JAMES P/L		232352	11/10/2006	\$150.00
8203	PL & DA JAMES P/L		232352	11/10/2006	\$200.00
8203	PL & DA JAMES P/L		232352	11/10/2006	\$100.00
6450	O & P GREGORY PTY LTD		232418	17/10/2006	\$1,182.00
8203	PL & DA JAMES P/L		232419	17/10/2006	\$150.00
8203	PL & DA JAMES P/L		232419	17/10/2006	\$200.00
20458	T & M AUTOMATION		232421	17/10/2006	\$260.00
11320	TETRA PAK MARKETING PTY LTD	\$2,465.00			
8203	PL & DA JAMES P/L		232606	2/11/2006	\$150.00
8203	PL & DA JAMES P/L		232606	2/11/2006	\$200.00
6450	O & P GREGORY PTY LTD	232640	6/11/2006	\$160.00	
6450	O & P GREGORY PTY LTD		232824	24/11/2006	\$400.00
3961	CHALLENGER VALVES & ACTUATORS	233648	14/02/2007	\$189.00	
3961	UATORS	16/02/2007	\$313.50		

### Issue from Inventory

SF00155	25mm 90deg 304 POL BEND	8/05/2006	\$53.20
SF00065	25mm BSM UNION COMP	8/05/2006	\$67.50
SF00705	25mm 304 POL TUBE	8/05/2006	\$176.00
SF00243	25mm POL 304 TEE	8/05/2006	\$62.40
SF00635	25mm TUBE CLAMP PLAIN	8/05/2006	\$17.10
SF00769	16mm S/S ROUND BAR (4mtr)	8/05/2006	\$36.84
SF00737	50x50x3.0 S/S RHS	8/05/2006	\$163.00
SF00711	51mm 304 POL TUBE	8/05/2006	\$175.00
SF00159	51mm 90deg 304 POL BEND	8/05/2006	\$95.00
SF00705	25mm 304 POL TUBE	8/05/2006	\$88.00
SF00155	25mm 90deg 304 POL BEND	8/05/2006	\$53.20
SF00635	25mm TUBE CLAMP PLAIN	8/05/2006	\$22.80
SF00635	25mm TUBE CLAMP PLAIN	27/07/2006	\$11.40
SF00033	BSM 76mm LINER	31/07/2006	\$12.00
SF00035	BSM 76mm HEX NUT	31/07/2006	\$19.00
SF00037	BSM 76mm MALE PART	31/07/2006	\$9.50
SF00041	BSM 101mm LINER	31/07/2006	\$16.00
SF00163	76mm 90deg 304 POL BEND	31/07/2006	\$18.95
SF00249	51mm POL 304 TEE	31/07/2006	\$18.50
SF00249	51mm POL 304 TEE	2/08/2006	\$18.50
SF00019	BSM 51mm HEX NUT	8/08/2006	\$6.20
SF00017	BSM 51mm LINER	8/08/2006	\$3.90
SF00021	BSM 51mm MALE PART	8/08/2006	\$6.60
SF00525	1-1/2 BSP TOE NIPPLE	8/08/2006	\$9.00
SF00915	51mm LKB B/FLY VALVE ACT 304	9/08/2006	\$1,015.26
SF00915	51mm LKB B/FLY VALVE ACT 304	10/08/2006	\$1,015.26
SF00523	1-1/4" BSP TOE NIPPLE S/S	11/08/2006	\$4.00
SF00641	51mm TUBE CLAMP PLAIN	11/08/2006	\$7.60
SF03051	101mm BSM-CIP MALE PART 316	11/08/2006	\$35.40

**Project Completion Report**

SF00011	BSM 38mm HEX NUT	11/08/2006	\$5.10
WS00501		15/08/2006	\$46.10
WS00505	RAMSET MIX NOZZLE	15/08/2006	\$7.86
WS00127		21/08/2006	\$18.10
SF00515	3/8" BSP TOE NIPPLE S/S	21/08/2006	\$2.20
SF00519	3/4" BSP TOE NIPPLE S/S	21/08/2006	\$3.90
SF03001	25mm BSM-CIP MALE PART 316	21/08/2006	\$23.40
SF03002	25mm BSM-CIP LINER 316	21/08/2006	\$5.00
SF03002	25mm BSM-CIP LINER 316	21/08/2006	\$10.00
SF03002	25mm BSM-CIP SEAL RING EPDM	21/08/2006	\$2.80
SF03003	63mm BSM-CIP SEAL RING EPDM	21/08/2006	\$22.00
SF03033	25mm TUBE CLAMP PLAIN	21/08/2006	\$2.85
SF00635	BSM 101mm BLANK CAP 316L	21/08/2006	\$72.00
SF00091	25mm 90deg 304 POL BEND	21/08/2006	\$5.20
SF00155	25mm 90deg 304 POL BEND	21/08/2006	\$20.80
SF00155	BSM 25mm LINER	21/08/2006	\$5.30
SF00001	38mm POL 304 TEE	21/08/2006	\$16.50
SF00247	BSM 25mm LINER	22/08/2006	\$2.65
SF00001	BSM 25mm HEX NUT	22/08/2006	\$4.20
SF00003	BSM 25mm MALE PART	22/08/2006	\$4.10
SF00005	25mm 90deg 304 POL BEND	22/08/2006	\$41.60
SF00155	6x1/4bsp STRAIGHT FESTO	22/08/2006	\$7.06
AF00132	3/4" BSP TOE NIPPLE S/S	22/08/2006	\$7.80
SF00519	3/4" BSP TOE NIPPLE S/S	25/08/2006	\$3.90
SF00519	1" BSP TOE NIPPLE S/S	25/08/2006	\$5.00
SF00521		25/08/2006	\$16.40
SF00303	63x25mm CONCENTRIC REDUCER	25/08/2006	\$35.60
SF00305	63x51mm CONCENTRIC REDUCER	25/08/2006	\$30.40
SF00309	1-1/4" BSP TOE NIPPLE S/S	25/08/2006	\$8.00
SF00523	2" BSP SOCKET S/S	25/08/2006	\$66.40
SF00477	2" BSP SOCKET S/S	25/08/2006	\$16.60
SF00477			

**Project Completion Report**

SF00525	1-1/2 BSP TOE NIPPLE	25/08/2006	\$18.00
SF00758	50x10mm S/S FLAT (4mtr)	25/08/2006	\$95.00
SF00157	38mm 90deg 304 POL BEND	25/08/2006	\$32.50
SF00159	51mm 90deg 304 POL BEND	25/08/2006	\$48.00
SF00159	51mm 90deg 304 POL BEND	25/08/2006	\$19.20
SF00075	25mm CIP BSM UNION COMP	25/08/2006	\$23.40
SF00076	38mm CIP BSM UNION COMP	25/08/2006	\$27.90
SF00077	50mm CIP BSM UNION COMP	25/08/2006	\$70.40
FAS1001	DYNABOLT S/S 10x80mm	29/08/2006	\$10.15
SF00469	3/4" BSP SOCKET S/S	29/08/2006	\$2.60
SF00527	2" BSP TOE NIPPLE	31/08/2006	\$12.30
SF02025	1-1/2" BALL VALVE 3PCE ST/ST	31/08/2006	\$138.60
SF02025	1-1/2" BALL VALVE 3PCE ST/ST	31/08/2006	\$138.60
SF02053	1-1/4" SWING CHECK VALVE ST/ST	31/08/2006	\$72.05
FAS1001	DYNABOLT S/S 10x80mm	5/09/2006	\$10.15
SF00641	51mm TUBE CLAMP PLAIN	5/09/2006	\$3.80
EL09613	1 ENCL.MOUNT S/S 100x125mm	6/09/2006	\$7.35
FAS0999	DYNABOLT S/S 10x50mm	6/09/2006	\$7.20
EL09621	3 ENCL.MOUNT S/S 110x320mm	7/09/2006	\$26.50
SF02541	38mm DIAM x 1.5 DISC 304 S/S	7/09/2006	\$9.00
SF03012	38mm BSM-CIP LINER 316	7/09/2006	\$6.00
SF03022	51mm BSM-CIP LINER 316	7/09/2006	\$3.70
SF00011	BSM 38mm HEX NUT	7/09/2006	\$10.20
SF00019	BSM 51mm HEX NUT	7/09/2006	\$12.40
SF00155	25mm 90deg 304 POL BEND	7/09/2006	\$20.80
SF00157	38mm 90deg 304 POL BEND	7/09/2006	\$13.00
AF00156	8x1/4bsp STRAIGHT FESTO	7/09/2006	\$16.24
AF01001	6mm TUBE.LDPE BLACK (MTR)	7/09/2006	\$63.00
SF00249	51mm POL 304 TEE	7/09/2006	\$18.50
SF00463	1/4" BSP SOCKET S/S	7/09/2006	\$2.60
SF00523	1-1/4" BSP TOE NIPPLE S/S	7/09/2006	\$8.00

**Project Completion Report**

SF00155	25mm 90deg 304 POL BEND	11/09/2006	\$20.80
SF00027	BSM 63mm HEX NUT	11/09/2006	\$8.20
SF00087	BSM 63mm BLANK CAP 316L	11/09/2006	\$9.00
EL09613	1 ENCL.MOUNT S/S 100x125mm	12/09/2006	\$7.35
SF00003	BSM 25mm HEX NUT	12/09/2006	\$12.60
SF00641	51mm TUBE CLAMP PLAIN	12/09/2006	\$15.20
SF00161	63mm 90deg 304 POL BEND	12/09/2006	\$27.70
WS00501	RAMSET INJECT.TUBE 400ml ISCP	14/09/2006	\$23.05
WS00505	RAMSET MIX NOZZLE	14/09/2006	\$13.10
EL09613	1 ENCL.MOUNT S/S 100x125mm	14/09/2006	\$14.70
SF00641	51mm TUBE CLAMP PLAIN	14/09/2006	\$11.40
EL09185	CLIP SURFACE SWITCH 500V-32A	15/09/2006	\$107.36
VL00005	38mm B/FLY VALVE RUBBER LKB	29/09/2006	\$31.61
WS10037	WELDING ARGON E SIZE CYL.	2/10/2006	\$102.75
AF01001	6mm TUBE.LDPE BLACK (MTR)	25/01/2007	\$63.00
			\$83,259.13

Electrical

**Manual Invoice**

3966	LASER ELECTRICAL SHEPPARTON	1/12/2006	\$660.50
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**Invoice Price Variance**

3966	LASER ELECTRICAL SHEPPARTON	31/10/2006	-\$660.50
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**General Journal**

		30/11/2006	\$153.75
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**Purchase Order Receipt**

3966	LASER ELECTRICAL SHEPPARTON	230747	15/06/2006	\$93.00	
3966	LASER ELECTRICAL SHEPPARTON	230794	19/06/2006	\$348.75	
10602	SHIMMA PTY LTD	231360	31/07/2006	\$1,170.00	
3966	LASER ELECTRICAL SHEPPARTON		231358	31/07/2006	\$660.50
3966	LASER ELECTRICAL SHEPPARTON		231457	7/08/2006	\$417.25

**Project Completion Report**

10602	SHIMMA PTY LTD		231485	8/08/2006	\$405.00
10602	SHIMMA PTY LTD		231587	15/08/2006	\$210.00
5900	REXEL AUSTRALIA		231868	7/09/2006	\$800.00
5900	REXEL AUSTRALIA		231898	8/09/2006	\$440.00
5900	REXEL AUSTRALIA		231898	8/09/2006	\$190.00
5900	REXEL AUSTRALIA		231898	8/09/2006	\$159.03
5900	REXEL AUSTRALIA		231898	8/09/2006	\$106.02
5900	REXEL AUSTRALIA		231898	8/09/2006	\$30.78
5900	REXEL AUSTRALIA		231898	8/09/2006	\$21.60
5900	REXEL AUSTRALIA		231898	11/09/2006	\$85.50
5900	REXEL AUSTRALIA	11/09/2006	\$41.90		
3966	LASER ELECTRICAL SHEPPARTON	231944	11/09/2006	\$1,842.50	
5900	REXEL AUSTRALIA		231898	11/09/2006	\$147.45
5900	REXEL AUSTRALIA		231898	15/09/2006	\$85.50
5900	REXEL AUSTRALIA		231898	15/09/2006	\$120.28
5900	REXEL AUSTRALIA		231898	15/09/2006	\$60.14
20458	T & M AUTOMATION		232043	18/09/2006	\$195.00
3966	LASER ELECTRICAL SHEPPARTON	232126	25/09/2006	\$61.50	
20458	T & M AUTOMATION		232131	25/09/2006	\$130.00
12245	YOKOGAWA AUSTRALIA PTY LTD	9/10/2006	\$329.00		
3966	LASER ELECTRICAL SHEPPARTON	232401	16/10/2006	\$93.00	
12245	YOKOGAWA AUSTRALIA PTY LTD		232557	30/10/2006	\$294.12
12245	YOKOGAWA AUSTRALIA PTY LTD		232557	30/10/2006	\$441.18
12245	YOKOGAWA AUSTRALIA PTY LTD		232586	31/10/2006	\$306.08
12245	YOKOGAWA AUSTRALIA PTY LTD		232695	10/11/2006	\$217.93
12245	YOKOGAWA AUSTRALIA PTY LTD		232695	10/11/2006	\$254.25
12245	YOKOGAWA AUSTRALIA PTY LTD		232695	10/11/2006	\$181.61
12245	YOKOGAWA AUSTRALIA PTY LTD		232695	10/11/2006	\$217.93
12245	YOKOGAWA AUSTRALIA PTY LTD		232696	10/11/2006	\$299.96
12245	YOKOGAWA AUSTRALIA PTY LTD		232696	10/11/2006	\$224.97
3966	LASER ELECTRICAL SHEPPARTON	233163	20/12/2006	\$909.75	
3966	LASER ELECTRICAL SHEPPARTON	233581	7/02/2007	\$93.00	
5900	REXEL AUSTRALIA		233552	8/02/2007	\$180.00
3966	LASER ELECTRICAL SHEPPARTON		233672	14/02/2007	\$116.25
3966	LASER ELECTRICAL SHEPPARTON	233771	21/02/2007	\$664.75	

**Issue from Inventory**

EL01201	GLANDS PVC 12mm			11/08/2006	\$15.00
EL06014	OMRON RELAY S/LINE 24V AC			11/09/2006	\$22.20
EL01508	CLIP SCREW RED. PVC 25-20mm			15/09/2006	\$1.76
EL01204	GLANDS PVC 20mm			15/09/2006	\$5.16
EL01204	GLANDS PVC 20mm			15/09/2006	\$0.86
EL01204	GLANDS PVC 20mm			15/09/2006	\$0.86
EL01204	CLIP SCREW RED. PVC 25-20mm			15/09/2006	\$10.56
EL01508	CLIP SINGLE GANG SHALLOW ENCL.			15/09/2006	\$17.74
EL09093					

**Project Completion Report**

EL09701	CLIP.HIGH PREASURE GASKETS	15/09/2006	\$11.72
YOK2001	YOK.CURRENT/VOLTAGE INPUT MOD	18/09/2006	\$187.21
EL21014	RTD 1-1/2 TRICLOVER 50x9.6T	17/01/2007	\$115.00
EL70501	BRADY DURA SLEEVE 30x3.93mm	21/02/2007	\$310.08
AF13040	SMC 24V DC VALVE 1/4	27/02/2007	\$112.00
			\$13,609.38
			\$96,868.51

**Table 6.2.3: Total budget for water saving project.**

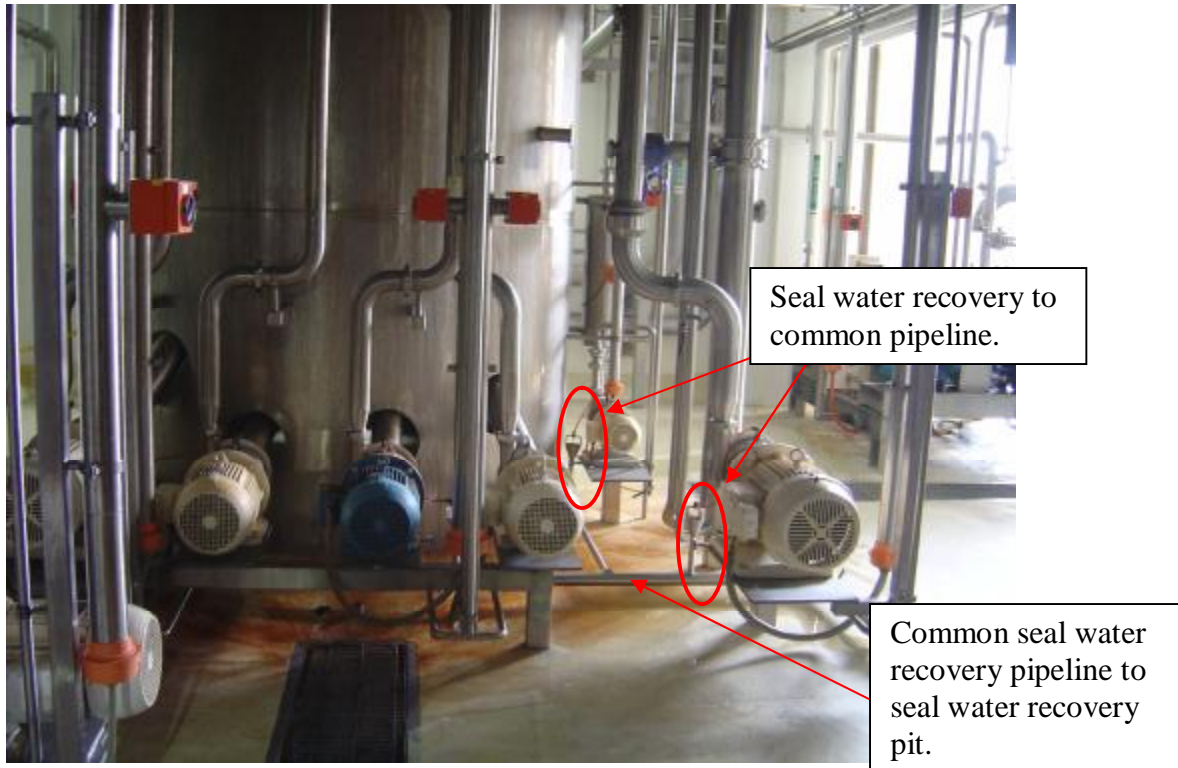
<b>MSD2 Cost</b>	<b>\$71,301.28</b>
<b>CD2 Cost</b>	<b>\$96,868.51</b>
<b>Project Engineering</b>	<b>\$24,000.00 (Project Management time allowed).</b>
<b>Total Spend</b>	<b>\$192,169.79</b>

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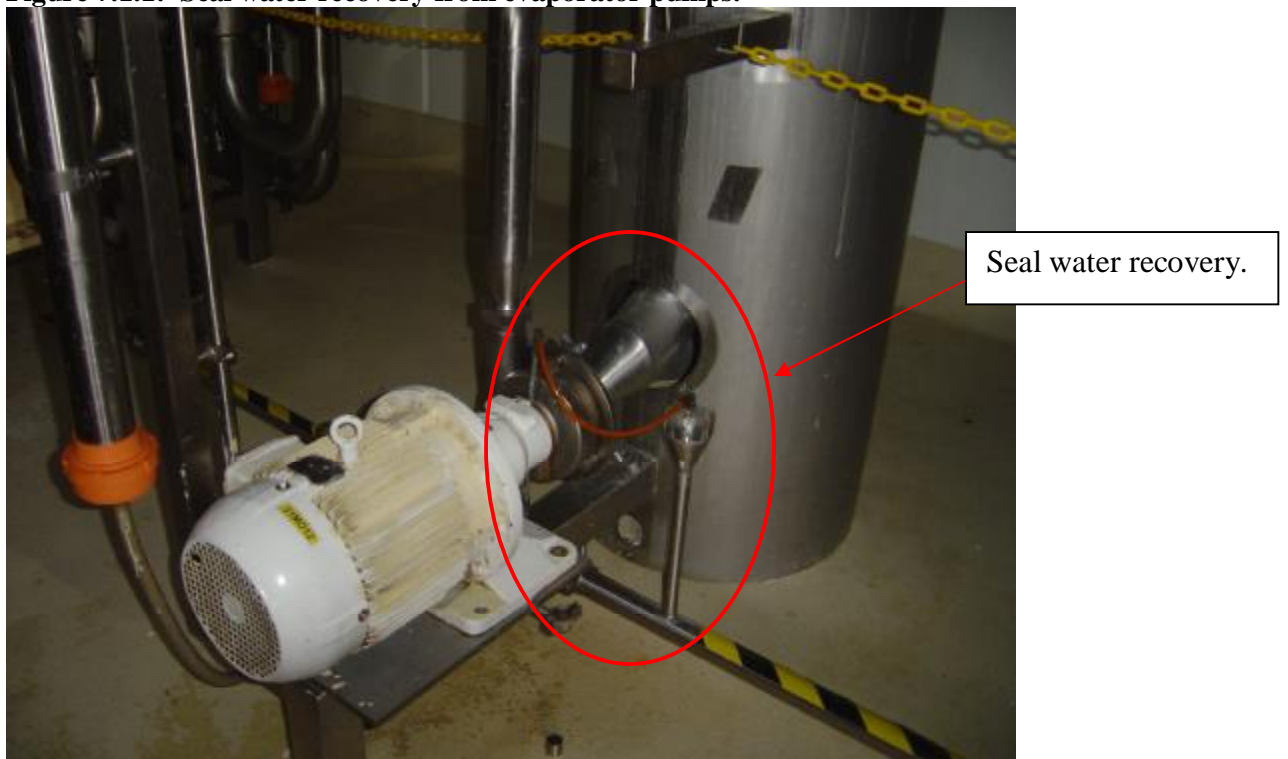


**7.0 Installation Photos:**

**7.1 MSD2 Installation Photos**

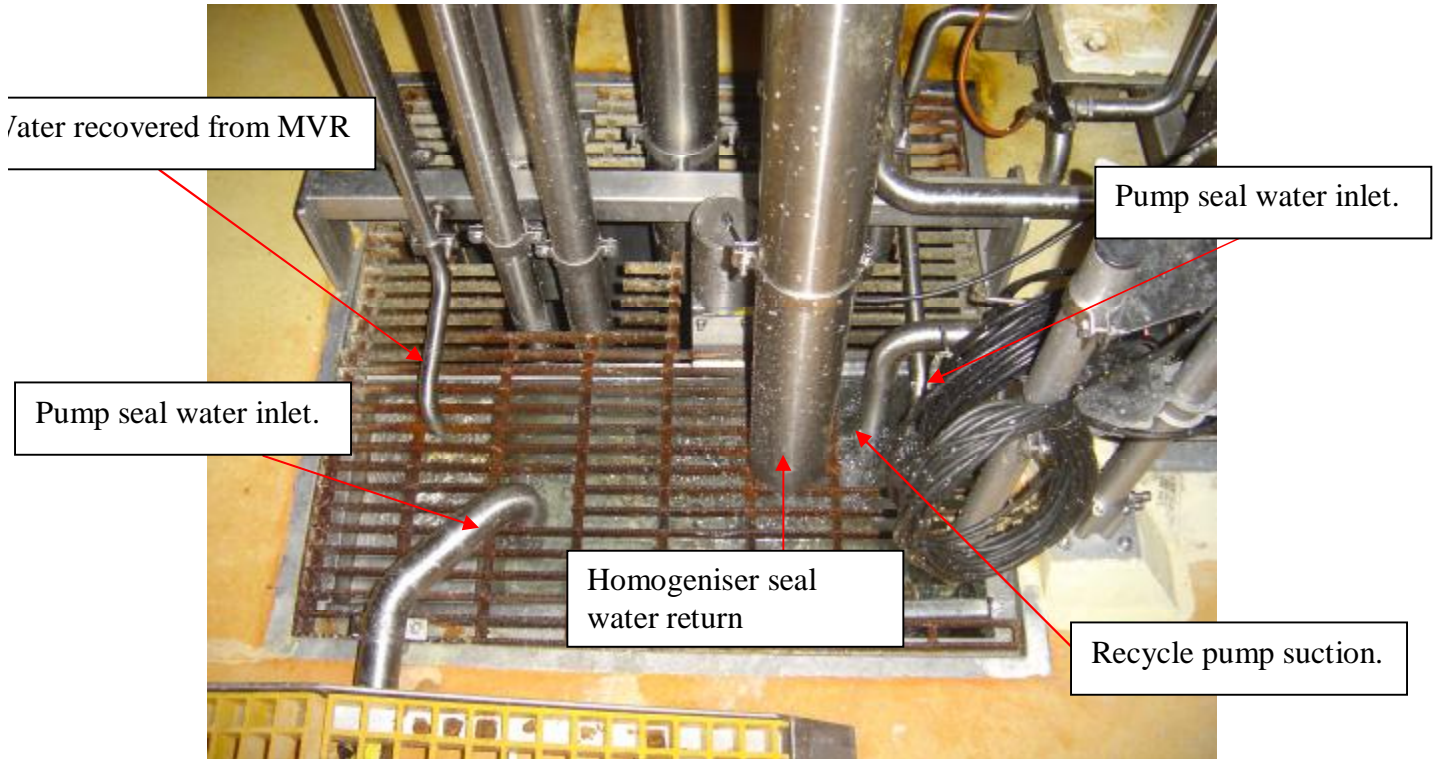


**Figure 7.1.1: Seal water recovery from evaporator pumps.**

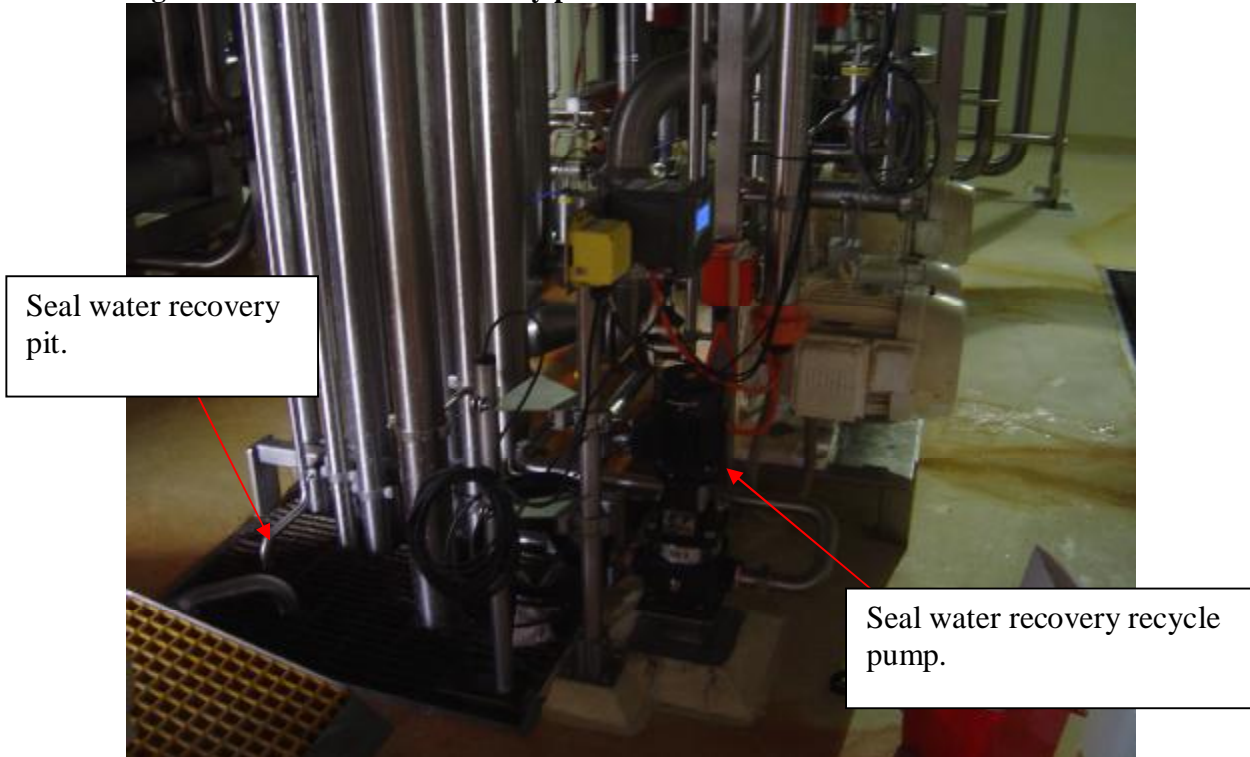




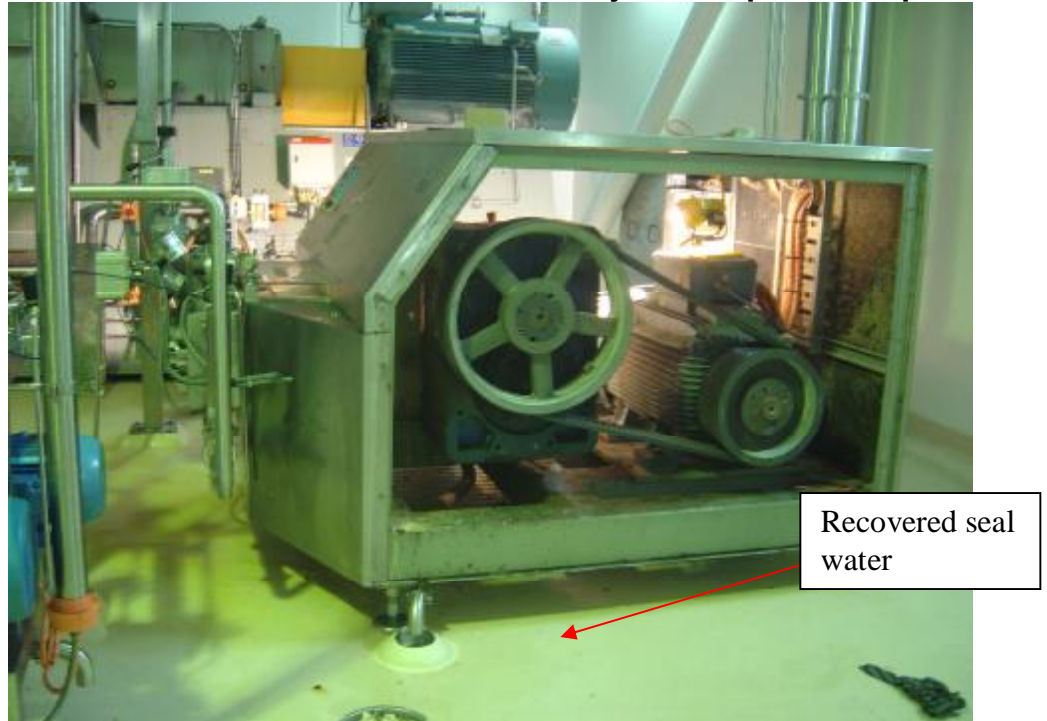
**Figure 7.1.2: Seal water recovery from a calandria pump.**



**Figure 7.1.3: Seal water recovery pit.**



**Figure 7.1.4: Seal water recovery pit and recycle pump.**



**Figure 7.1.5: Cooling water recovery from homogeniser. Note recovered water is sent to water recovery pit as shown in figure 7.1.4.**



**Figure 7.1.5: MSD2 MVR fan, oil cooling system, showing the inlet and outlet of water from the plate heat exchanger. Note the MSD2 MVR cooling water is recovered to the water recovery pit shown in figure 7.1.4, the CD2 MVR's cooling water has been placed on a closed chilled water loop.**

**7.2 CD2 Installation Photos**

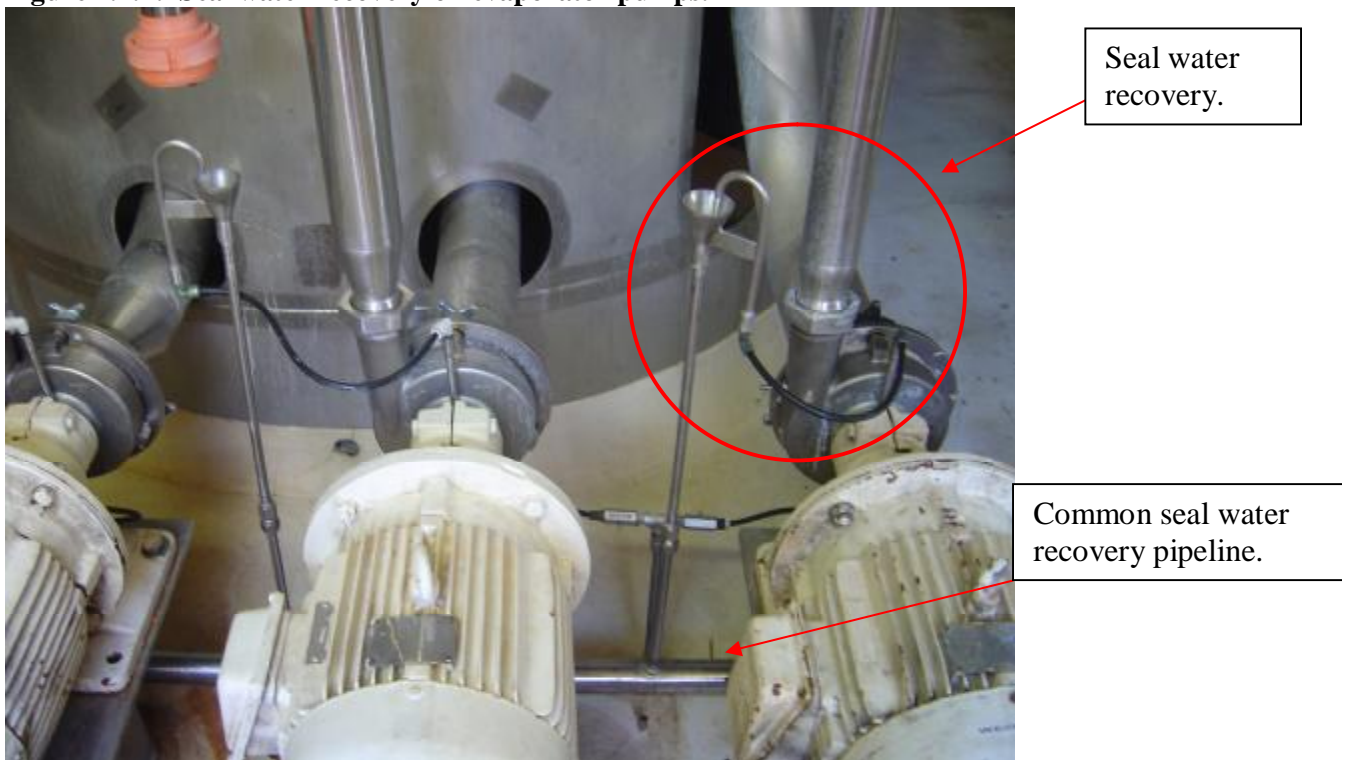


**Figure 7.2.1: Closed chilled water loop on CD2 vacuum pumps.**

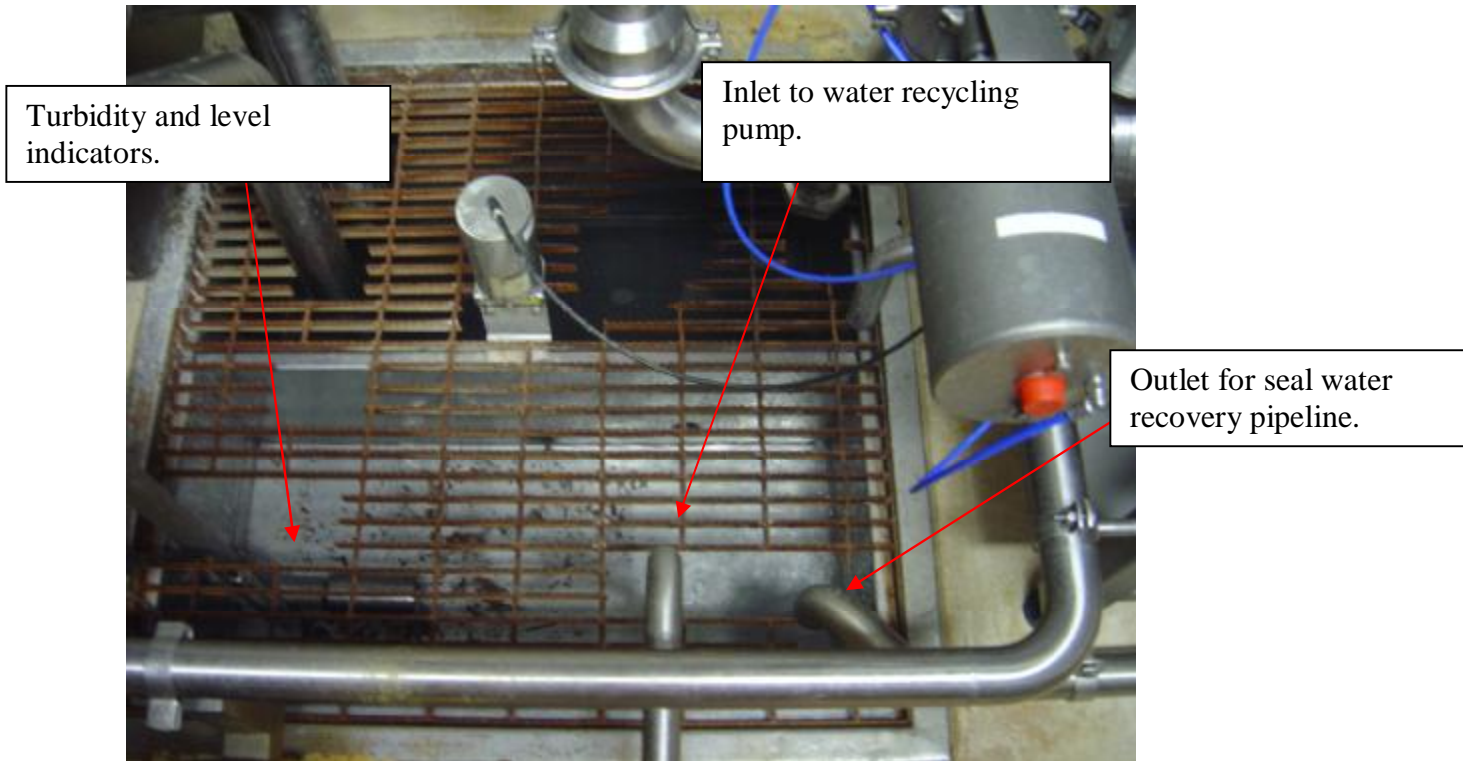




**Figure 7.2.2: Seal water recovery on evaporator pumps.**



**Figure 7.2.3: Seal water recovery on evaporator pumps and common seal water return pipe.**



**Figure 7.2.4: Evaporator pump seal water recovery pit. Also shown inlet to water recycling pump and turbidity and level indicators.**



**Figure 7.2.5: Water recycling pump. Returning seal water to xxx.**

## 8.0 Operational performance validation.

### 8.1 MSD2 Operational Performance Validation

#### 8.1.1 MSD2 Homogeniser cooling water.

To determine the amount of cooling water recovered from the homogeniser a volume of water was measured over a given time. The test was repeated 3 times to reduce error and the results converted into mega liters per year of water recovered. It was determined that the new system was recovering 14.26 ML/year of water from the homogeniser. Note the yearly calculation is based on a 300 day operational year. See figure 7.1.5 for photograph of homogeniser and cooling water recovery.

**Table 8.1.1: Flowrates for recovered Cooling water from the MSD2 homogeniser.**

Test	Time (s)	Volume (L)	Flowrate (L/s)	Flowrate (L/hr)
1	16	7.9	0.49	1777.50
2	18.44	10.55	0.57	2059.65
3	18.13	10.6	0.58	2104.80
<b>Average</b>			<b>0.55</b>	<b>1980.65</b>
<b>Total (ML/Year)</b>				<b>14.26</b>

#### 8.1.2 Vacuum pump cooling. 100% replaced with closed chilled water loop.

Seal water for the vacuum pumps is recycled via a closed chilled water loop. Water exiting the vacuum pumps is stored in a small tank. To ensure the temperature of the water is suitable for reuse within the vacuum pumps a small chilled water heat exchanger removes water from the storage tank, cools it and returns it to the tank. It is then possible to recycle the water back through the vacuum pumps. As this system is a closed loop it can be assumed that all the water used by the vacuum pumps is recovered and losses are negligible. See figures 5.2.2 and 7.2.1 for installation drawings and photograph of the closed chilled water loop.

#### 8.1.3 Process pump seal water recovery.

To determine the total water savings the flowrate of the recovered seal water from the pumps was measured. Table 7.1.3 shows the time taken to collect a given volume of water. These measurements were then converted to flowrate in L/hr. The yearly water saving was then determined to be 11.30 ML/year. Note this calculation is based on a 300 day operational year. See figures 7.1.1 and 7.1.2 for photographs of seal water recovery.

**Table 8.1.3: Flowrates for recovered seal water from MSD2 evaporators.**

Pump ID	Time (s)	Volume (L)	Flowrate (L/s)	Flowrate (L/hr)
1	184.8	3	0.02	58.44
2	145.2	4.5	0.03	111.57

3	188.4	4.42	0.02	84.46
4	310.8	0.95	0.00	11.00
5	91.8	4.5	0.05	176.47
6	131.4	4.7	0.04	128.77
7	129.6	4.45	0.03	123.61
8	127.2	4.6	0.04	130.19
9	93.6	4.8	0.05	184.62
10	124.2	4.15	0.03	120.29
11	123.6	1	0.01	29.13
12	191.4	4.175	0.02	78.53
13	154.8	3.95	0.03	91.86
14	122.4	1.4	0.01	41.18
15	83.4	3.45	0.04	148.92
16	121.8	1.7	0.01	50.25
<b>Total (L/hr)</b>				<b>1569.27</b>
<b>Total (ML/Year)</b>				<b>11.30</b>

#### **8.1.4 MVR fan cooling water.**

The cooling water for the MVR fan in MSD2 is captured by the same system that recovers the pump seal water and the homogeniser cooling water. The MVR fan uses 10.08ML per year of cooling water. This results in a water recovery of 10.08ML per year and a saving to trade waste discharge of the same amount. See figure 7.1.5 for photograph of MVR cooling water recovery and figure 5.1.1 for installation drawing.

## **8.2 CD2 Operational Performance Validation**

### **8.2.1 Evaporator vacuum pump cooling. 100% replaced with closed chilled water loop.**

Refer to section 8.1.2 for details of closed chilled water loop.

### **8.2.2 Vacuum pump cooling. 100% replaced with closed chilled water loop.**

Refer to section 8.1.2 for details of closed chilled water loop.

### **8.2.3 MVR fan cooling water. 100% replaced with closed chilled water loop.**

Cooling water is required by both MVR fans within CD2. Previously both cooling systems were run on town water eg town water was taken from the main line, used to cool the fans and then disposed of to trade waste. This setup was using 43.2 kl/day of water or 15.77 ML/year (based on a 365 day operational year). As part of the water saving project the cooling system for the fans was taken off town water and placed on the chilled water system. The chilled water system recovers all water from the fans and recycles it back through the cooling towers for further use. This results is a 100% water saving for the MVR fans, equivalent to a 15.77 ML/year saving on town water use and a 15.77ML/year saving on discharge to trade waste.



**8.2.4 Process pump seal water recovery.**

To determine the total water savings the flowrate of the recovered seal water from the pumps was measured. Table 7.2.4 shows the time taken to collect a given volume of water. These measurements were then converted to flowrate in L/hr. The yearly water saving was then determined to be 10.07 ML/year. Note this calculation is based on a 250 day operational year. See figures 7.2.1, 7.2.2, 7.2.3 and 5.2.1 for photographs and drawings of installations.

**Table 8.2.4: Flowrates for recovered seal water from CD2 evaporators.**

Pump ID	Time (s)	Volume (l)	Flowrate (l/s)	Flowrate (l/hr)
1	243.6	1.6	0.01	23.65
2	120.6	4.95	0.04	147.76
3	89.4	4.9	0.05	197.32
4	188.4	4.2	0.02	80.25
5	84.6	5	0.06	212.77
6	300.6	2.6	0.01	31.14
7	273.6	2.6	0.01	34.21
8	246.6	3	0.01	43.80
9	138.6	4.45	0.03	115.58
10	244.8	3	0.01	44.12
11	249.6	2.7	0.01	38.94
14	180	4.6	0.03	92.00
15	140.4	4.5	0.03	115.38
16	95.4	5	0.05	188.68
17	241.2	3.3	0.01	49.25
18	243.6	2.8	0.01	41.38
19	93	5	0.05	193.55
20	190.2	1.55	0.01	29.34
			<b>Total (l/hr)</b>	<b>1679.11</b>
			<b>Total (ML/Year)</b>	<b>10.07</b>

**9.0 Summary of Results**

The water saving initiative installed by Tatura Milk achieved slightly better results than predicted due to a better recovery of seal water. The success of the initiative has encouraged Tatura Milk to seek out further water saving opportunities and will encourage others in the industry to follow Tatura Milk's lead. See table 9.1 for a comparison of predicted water savings vs actual water saved.

**Table 9.1: Comparison of predicted water savings vs actual water savings.**

<i>Description</i>	<i>Water saving; Predicted (Town water)</i>	<i>Trade Waste saving; Predicted</i>	<i>Water saving; Actual (Town water)</i>	<i>Trade Waste saving; Actual</i>



<i>Pump &amp; Homogeniser seals</i>		33.48ML		35.63ML
<i>MVR cooling water</i>	15.77ML	26.57ML	15.77ML	26.57ML
<i>Powder filling m/c vacuum pump cooling</i>	25.2ML	18.00 ML	25.2ML	18.00ML
<i>Evaporator vacuum pump cooling</i>	Milk Condensate	35.00ML	Milk Condensate	35.00ML
<b>Total</b>	41.69 ML	113.05ML	41.69ML	115.2ML

### **10.0 Further Monitoring and Evaluation**

As the water savings have been validated by determining the flowrate of seal water through the pumps and homogeniser it can be assumed that these flowrates will remain the same for the life time of the plant. However a maintenance program is to be implemented to ensure the system continues to function with in it's design parameters. The maintenance program will involve the following:

- 1/ The recovery system will be assessed for each pump and homogeniser during the regular maintenance program already active on site. Each pump and homogeniser undergoes regular maintenance either annually or biannually.
- 2/ During the annual shutdown of the MSD2 and CD2 plant the entire water recovery system will be reviewed to ensure there are no losses and the optimum amount of water is being captured.
- 3/ The quality of the water collected is to be constantly monitored by the turbidity meters installed in the collection pit. If the quality of the water drops to an unusable level the recycle pump will be shut down and an alarm will triggered. Following the alarm the source of the problem will be identified by reviewing the system and any required maintenance will be performed to ensure the system functions correctly.
- 4/ The water level in the collection pits is monitored by a level indicator. If the water level drops below 5% in CD2 and 15% in MSD2 the recycle pump will shut down and an alarm will trigger. Following the alarm the source of the problem will be identified by reviewing the system and any required maintenance will be performed to ensure the system functions correctly.

### **11.0 Communication and Promotion Plan**

Tatura Milk Industries Ltd understands the importance of communicating the outcomes of projects such as these to all stakeholders and the community. The following plan outlines the stakeholders and community members with whom the project will be communicated to:

- 1/ Tatura Milk Employees: Tatura Milk will aim to send out a brief description of the project via email and the notice board system. This will communicate the project to all employees on site.
- 2/ Farmers and Shareholders: Tatura Milk will release an article detailing the project results in the monthly newsletter, TMI Insight, distributed to all farmers and shareholders.
- 3/ The General Community: Tatura Milk will aim to release an article in the Tatura Guardian and the local Shepparton newspapers to communicate the success of the project to the general community.
- 4/ Industry Representatives: Tatura Milk will endeavor to communicate the project to similar industries via the regular major customers meetings conducted by Golbourn Valley Water. Tatura Milk will also endeavor to communicate with the wider Dairy Industry via the Dairy Sustainability Council.