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The Foster's Group experience with Energy Management/Water and approach to EEO

Winery Engineering Association National Conference 2008

Paul Brodie - Manager Site Services Yatala Operations

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The Foster's Group experience with Energy/Water Management

- The services we are interested in
- Some history
- Some numbers
- What EEO means to Foster's Group
- Metering and opportunities
- Questions

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Foster's Group Ltd.

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Brands:

Foster's, Crown Lager, Carlton Draught, Victoria Bitter, Mercury, Strongbow, Cascade, Torquay, Beringer, Wolf Blass, Penfolds, Rosemount, Saltram, etc.

Beer, Cider, Spirit, Soft Drinks,

Fruit Juice, Water, Wine

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Corporate HSE Policy

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Services we use

- Electricity
  - Refrigeration/Air Conditioning
  - Compressed Air
  - Material Conveying (pumping, blowing, conveying, etc)
  - CO2 Collection, Storage and Reticulation.
  - Process Monitoring, Control and Automation
  - Lighting (and Power)
- Fossil Fuel
  - Generation & reticulation of steam
    - Brewing
    - Pasteurisation
    - Process Heating & Cleaning
  - Forklifts
- Water
  - Beer and other products
  - Process and container cleaning
  - Pasteurisers
  - Lubrication
  - Pump seal water
  - Boiler Feed
  - Cooling Towers make up
  - Wash downs
  - Amenities
  - Effluent Treatment and Water Reclamation (Trade Waste)

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Typical Values at a Brewery

Consumption / Waste*	Good Practice 2002**	Yatala 2007
Water (hL)	4 - 10	2.3
Heat energy (MJ)	100 - 200	61.2
Electricity (kWh)	8 - 12	8.5
Wastewater (hL)	1.3 - 1.8 less than water ratio	0.9

* Resource consumption / waste generation per 100L beer

** Breweries of Europe guidance note on BAT Oct 2002

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Water in Brewing

Brewery	Country	Usage (L H_2O/L Beer)	Source
Foster's – Abbotsford	Australia	3.5	Fosters.com.au (Factsheet)
Foster's - Cascade	Australia	6.03	Cascade Brewery Case Study (http://www.environment.gov.au/settlements/industry/corporate/eecp/case-studies/cascade-brewery.html)
Lion-Nathan – Swan	Australia	7 (not specific)	Swan Brewery Case Study
Lion-Nathan – XXXX	Australia	4-5	News.com.au (http://www.news.com.au/couriermail/story/0,,21122668-5005340,00.html)
	Worldwide	4-5	Fosters.com.au (Factsheet)
	Germany	4-8	World Bank Group (Pollution Prevention and Abatement Handbook)
InBev - Curitiba	Latin America	3.37	InBev Citizenship Report (http://www.inbev.com/citizenship/4__2__6__water_use.cfm)
InBev – General	Various	5.2	InBev Key Indicators (http://www.inbev.com/citizenship/Key_Indicators.cfm)
	Europe	5-7	Brewers of Europe (http://www.inbev.com/citizenship/Key_Indicators.cfm)
Heineken	Various	5.5	Heinekein Sustainability Report (2005)
Carlsberg	Various	4.7	Carlsberg Environmental Report (2003-2004)

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Yatala's 20 year History

- In 1988 we produced 1 product, Power's Bitter, and put it in a bottle, a can or a Keg. In other words 3 skus. We had about 50 employees.
- We now produce about 16 Brewstreams and over 25 blended products and put them in big and little bottles with all sorts of shapes and colours as well as cans and kegs. We now have 360 employees.
- In addition we have recently installed a new packaging line to bottle spirits and RTD's.
- We are producing 20 times the volume and 30 or 40 times the complexity.

How much water- Yatala

- "Industry Rule of thumb" in 1988 was 7:1 Water to Beer.
- Power Brewing ratio about 5.5 – 6.5 : 1.
- Site upgrade in 1993 following CUB involvement required the installation of a Primary Effluent Treatment Plant – UASB - Anaerobic system. Water to Beer ratio about 5:1 – Effluent flow rate about 75% of capacity.
- Continuous capacity upgrade to 2003 forced a reduction to a ratio of 3.5:1, in order to remain within the capacity of our waste treatment plant.

Water for Yatala now

- Water use ratio for 2006 was 2.5:1.
- We produce nearly double the beer with only 10-15% more water consumption.
- Flow on savings from using recycled water.
- Ratio last financial year was 2.3:1.
- Non product consumption is ~ 1/4 of 2002.
- We believe Foster's Yatala is World's Best Practice for Water Management.

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Foster's Involvement in Greenhouse Challenge

- Signed up for Greenhouse Challenge in 1997
- Significant support from senior management
- Significant capital invested
  - Split chilled water Yatala
  - Refrigeration Optimisation Yatala
  - Refrigeration Optimisation Abbotsford
  - Water Reclamation Centre Yatala
  - Process area Automation optimisation Yatala
  - Boiler and Accumulator systems Yatala
  - Major Water recycling Abbotsford
  - Consolidation of Production Facilities
- Reduction in energy usage by 18% (F03 vs F97).
- Reduction in energy usage by 30% (F07 vs F97)
- Significant reduction in utilities cost per unit production

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Refrigeration Example

- Biggest electrical load in brewery is the refrigeration system
- Split Load in 1997
- Variable Speed Drives installed on compressors and condensers in 2002
- Optimise Drive Size.
- Load profile and matching
- ‘G2’ Monitoring

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New Equipment Selection

- Dual stream brew house
- Heat recovery system from kettle vapour
- Wort chillers recover hot water for use in process
- Fully automatic operation
- Reduced power, water and heat load

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CO2

- Breweries use CO2 for carbonating product and oxygen exclusion
- CO2 is produced as a by-product of the fermentation process
- CO2 recovery system installed in 1998
- Significant contribution to our site's costs

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Economic Benefits Yatala Plant pa

- If we still consumed now what we did 10 years ago:
- Electricity would cost an extra $290,000 for an extra 4300 mWh
- Natural Gas would cost an extra $1,500,000 for an extra 134,590 GJ
- We would import 11,100 tonnes of CO2 at a cost of $2,000,000
- We would use 903 megalitres more water at a cost of $1,260,000 with significant headworks charges
- Effluent discharge would be 774 megalitres more with 215 tonnes of COD and a cost of $2,550,000

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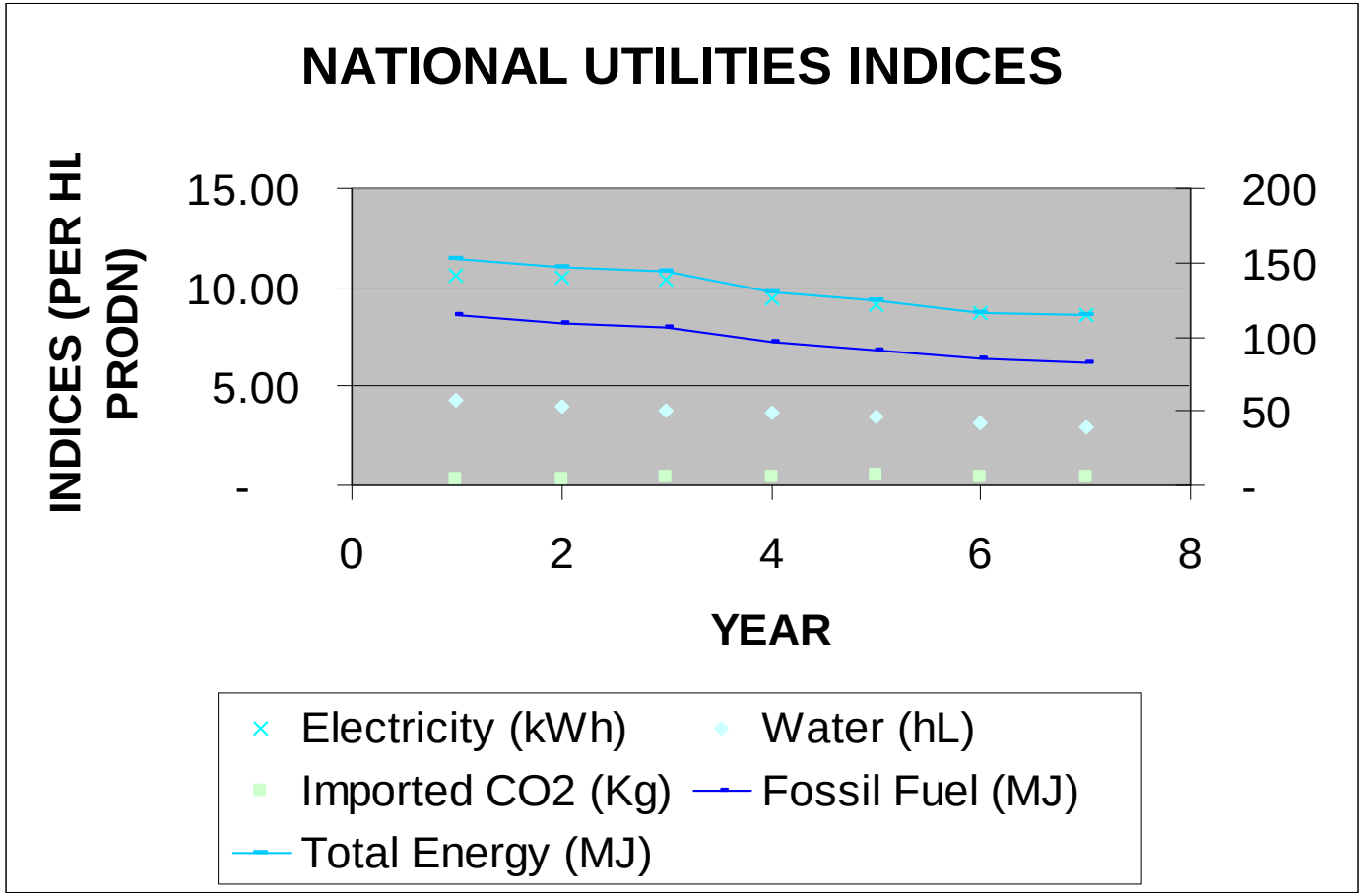
Utilities



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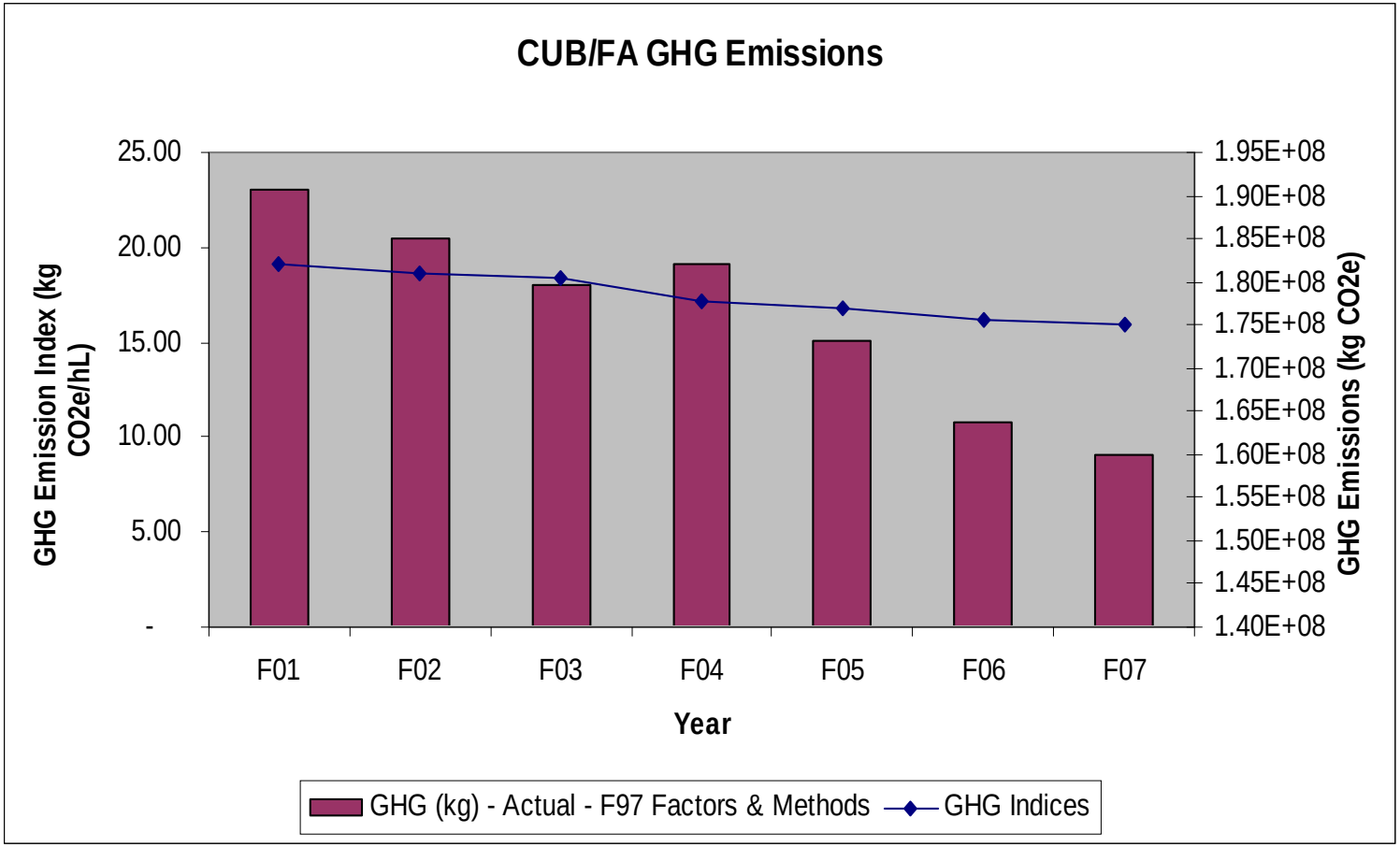
Greenhouse Emissions



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Environmental efficiency Opportunity drivers

- Our environmental strategy – public actions in Sustainability Report
- Foster's commitment – 10% reduction in energy and water by F11
- The changing goal posts – many federal and state government programs

  → *Both our commitments and government programs align*

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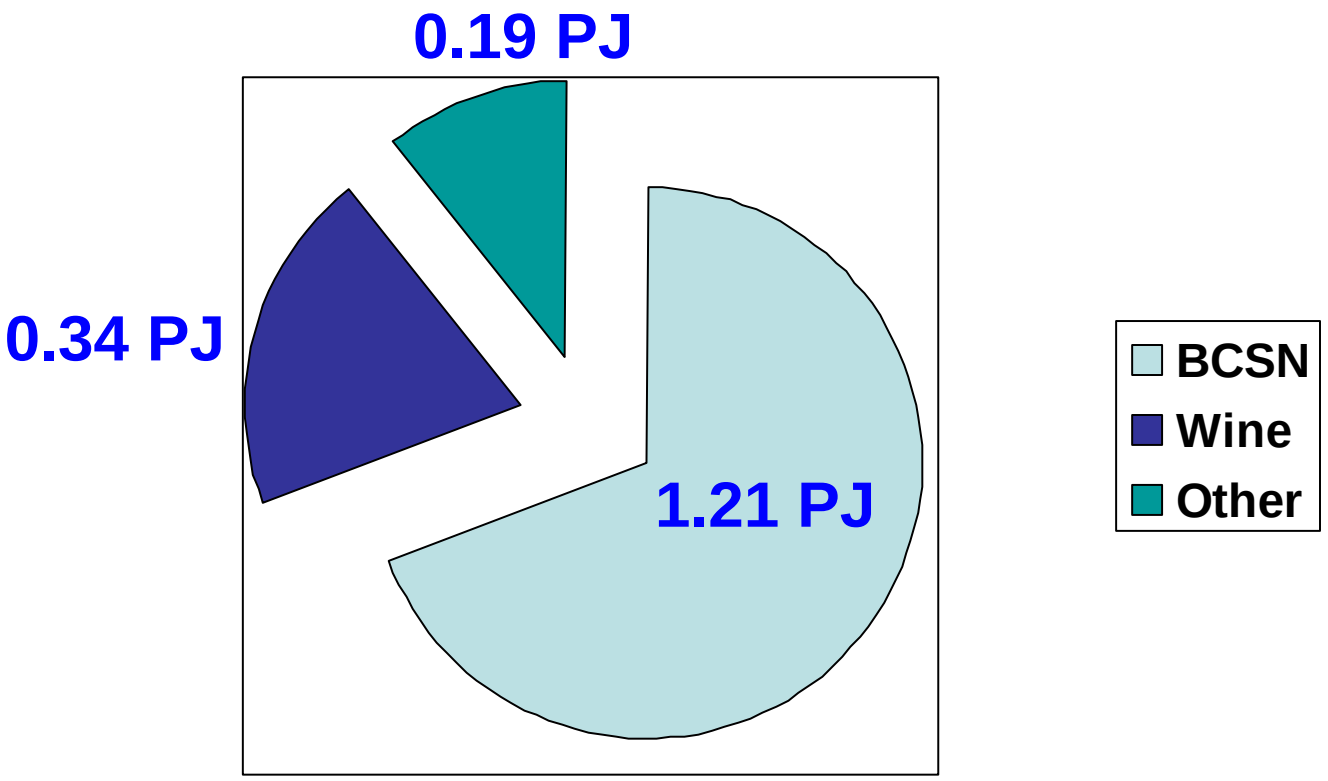
Split of Energy Usage



Total Group Energy Usage – 1.74 PJ

80% Rule – Total Group Assessment Req'd– 1.40 PJ

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Split of Water Usage

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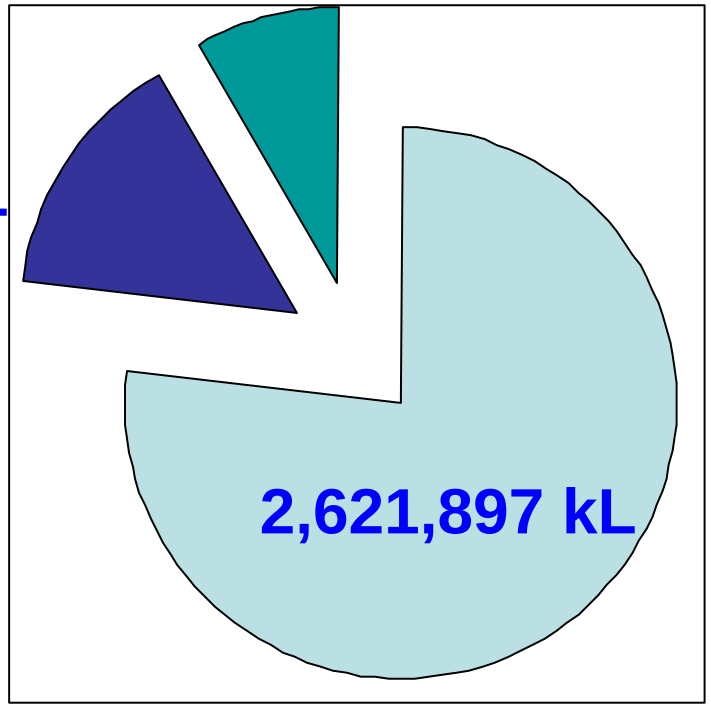
285,171 kL

497,960 kL



Total Group Manufacturing Water Usage – 3,405,028 kL

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Corporate and Government Initiatives

This program will help align existing and new corporate and government programs such as:

- Federal Government:
  - Energy Efficiency Opportunities
  - National Greenhouse & Energy Reporting
  - National Pollutant Inventory
  - National Packaging Covenant
- Carbon Taskforce – strategy, trading, disclosure
- Carbon Disclosure Project
- Sustainability Reporting – our annual profile

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EEO Program Objectives

1. To identify projects to deliver Fosters Group Energy and Water Targets
   - 10% energy and water reduction by F11
2. To meet regulatory requirements
   - in identifying energy and water savings opportunities across our nominated key operations
3. To provide an information exchange forum
   - across the BCSN and wine operations
   - up skilling resources in both areas
   - a view to roll out across international operations where appropriate
   - Re-invigorate the Foster's energy management program

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EEO Project Roles

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Steering Committee

Working Group

Project Manager

Assessment Teams

Site Champions

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EEO Steering Committee

- David Grant (Director Global Beer,Cider, Spirits & Non Alcohol Production)
- Stuart McNab (Director Wine Production Australia & New Zealand)
- Angela Tatlis (Director, Best Practice and Performance)
- Olivia Tyler (Global Manager - Environment)
- Michael Kluczko – US (VP, Wine Production - CA)

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EEO Project Working Group

- Project Manager - Michael Pecar
- Technical Advisor – Lachlan MacKenzie
- Technical Advisor – Tony Oliver
- Technical Analyst – David Sudarmana
- Technical Analyst - TBA

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Assessment Teams and Site Champions

- Assessments to be process based
  - Steam and hot water
  - Refrigeration
  - Air systems
  - Large electrical loads and Lighting
- Each site to be assessed by a team of technical specialist
- Each site to have champions and EM teams

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Yatala Brewery

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- Total annual capacity = 540 million litres of beer
- One of the two largest breweries in Australia (produces a quarter of Australia's domestic beer)
- Major services used includes: electricity, gas, biogas, steam, CO_2, air, refrigeration (brine and ammonia)
- World's best practice for a number of utilities including water (KPI now below 2.3litres per litre of beer) (Global best practice is around 4 to 5)
- A few years ago the plant capacity was doubled with only a 15% increase in water consumption

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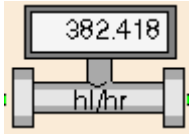
Metering Infrastructure

PCs (Plant control & Servers): 138

Networks (Ethernet): 25

PLCs (Rockwell): > 180

Networks (CNet, DNet, DH+): 200



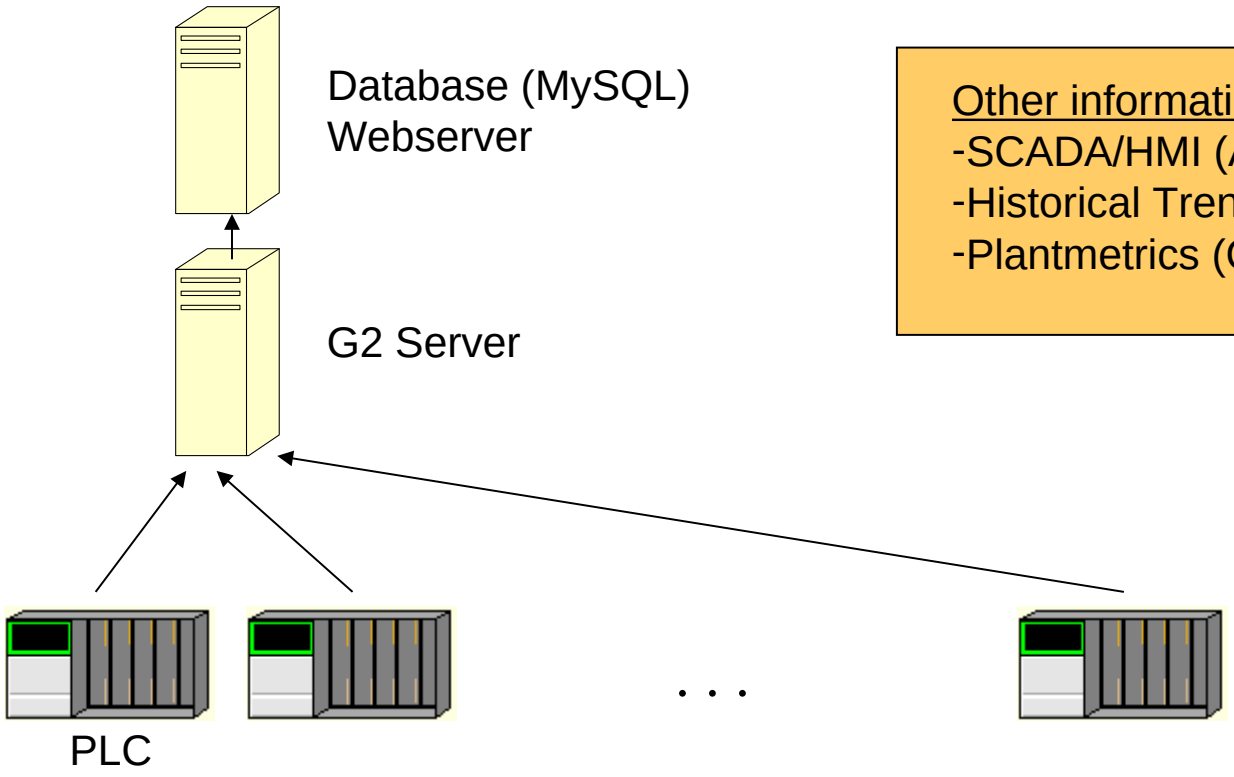
Totaliser meters: 200
Sensors: 1500

Standard PLC code for metering

	Name	Data Type	Style	Description
⊞	Units	Engineering_Units		Engineering Units
	This_Hour	REAL	Float	Real Time Totaliser
	Last_Hour	REAL	Float	Historical Totaliser
	This_Day	REAL	Float	Real Time Totaliser
	Last_Day	REAL	Float	Historical Totaliser
	This_Shift	REAL	Float	Real Time Totaliser
	Last_Shift	REAL	Float	Historical Totaliser
	This_Week	REAL	Float	Real Time Totaliser
	Last_Week	REAL	Float	Historical Totaliser
	This_Month	REAL	Float	Real Time Totaliser
	Last_Month	REAL	Float	Historical Totaliser
	Global_Sim_Statu	BOOL	Decimal	

Information Systems

-Historical trending
-Summary information
-Run logging
-Automated analysis
-Alarm/fault logging
-Presentation of energy data with production information



Other information systems include:
-SCADA/HMI (Among largest RA installs)
-Historical Trending
-Plantmetrics (OEE)

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Basic Metering & Energy Management

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(Basic metering data on its own is useful for identifying 'Low hanging fruit')

- Optimise supply of services
  - Engine room
  - Refrigeration compressors and condenser operation
  - Boilers
- Identify losses and leaks
  - piping
  - insulation
- Upgrade old equipment to more efficient models etc

Basic metering enables a comparison of consumption by unit time and can identify relative variations in consumption patterns

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Advanced Energy Management

('High hanging fruit')

When the efficiency of the plant equipment has been optimised the following issues have a more prominent impact on energy consumption

- How efficiently is the plant being used
- Minimise product waste
- Minimise product re-work
- Production scheduling (sequence)
- Equipment/tank scheduling (Sequence)

To tackle these types of issues requires an advanced system that has process awareness. At Yatala we have chosen to use the G2 real-time intelligent system platform for this function

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Real-Time Energy KPI's

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Month: September 2007 Product (hl): 325,900

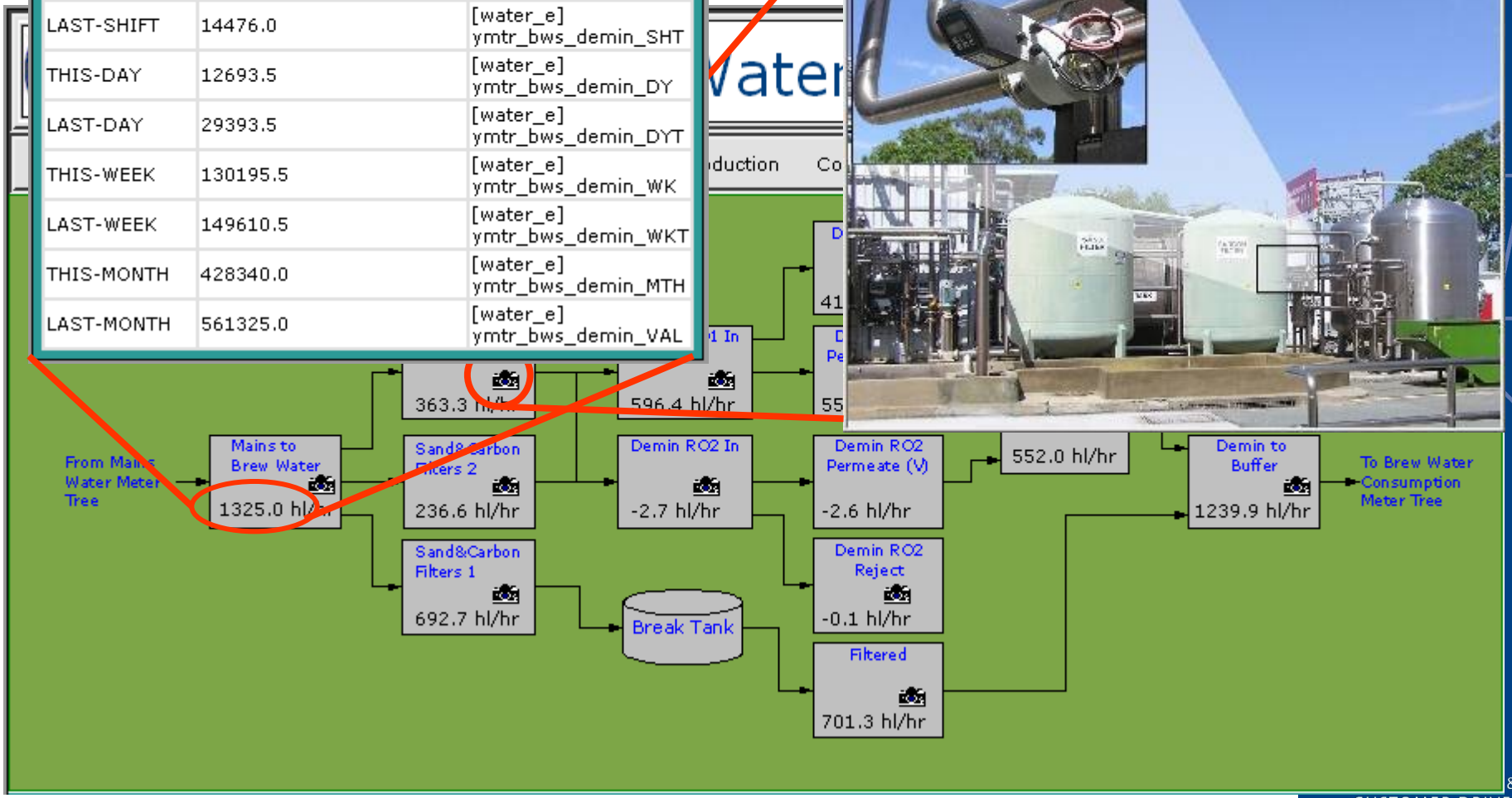
Utility	Total	KPI	Units
Water	703,700	2.16	hl/hl
Effluent	4,320	0.01	hl/hl
Elec	2,344,000	7.19	kWh/hl
CO2 (Collect)	761,300	2.34	kg/hl
CO2 (Cons)	1,082,000	3.32	kg/hl
Natural Gas	336,200	1.03	MJ/hl
Biogas	98,484	0.3	MJ/hl
Steam (Prod)	9,440	0.03	Tn/hl
Steam (Cons)	6,469	0.02	Tn/hl
Refrig (Elec)	912,700	2.8	kWh/hl
Refrig (Heat Flow)	7,463,000	22.9	MJ/hl
Air (Lube)	47	0	kg/hl
Air (Non-Lube)	284,000	0.87	kg/hl

- Don't need to wait until the end of the month to monitor KPI performance
- KPI figures are automatically updated as utilities are consumed and product is produced

Meter Tree

tion across the plant in real-time

Detail	Value	Item ID
THIS-HOUR	796.0	[water_e] ymtr_bws_demin_HR
LAST-HOUR	1308.5	[water_e] ymtr_bws_demin_HRT
THIS-SHIFT	6130.5	[water_e] ymtr_bws_demin_SH
LAST-SHIFT	14476.0	[water_e] ymtr_bws_demin_SHT
THIS-DAY	12693.5	[water_e] ymtr_bws_demin_DY
LAST-DAY	29393.5	[water_e] ymtr_bws_demin_DYT
THIS-WEEK	130195.5	[water_e] ymtr_bws_demin_WK
LAST-WEEK	149610.5	[water_e] ymtr_bws_demin_WKT
THIS-MONTH	428340.0	[water_e] ymtr_bws_demin_MTH
LAST-MONTH	561325.0	[water_e] ymtr_bws_demin_VAL



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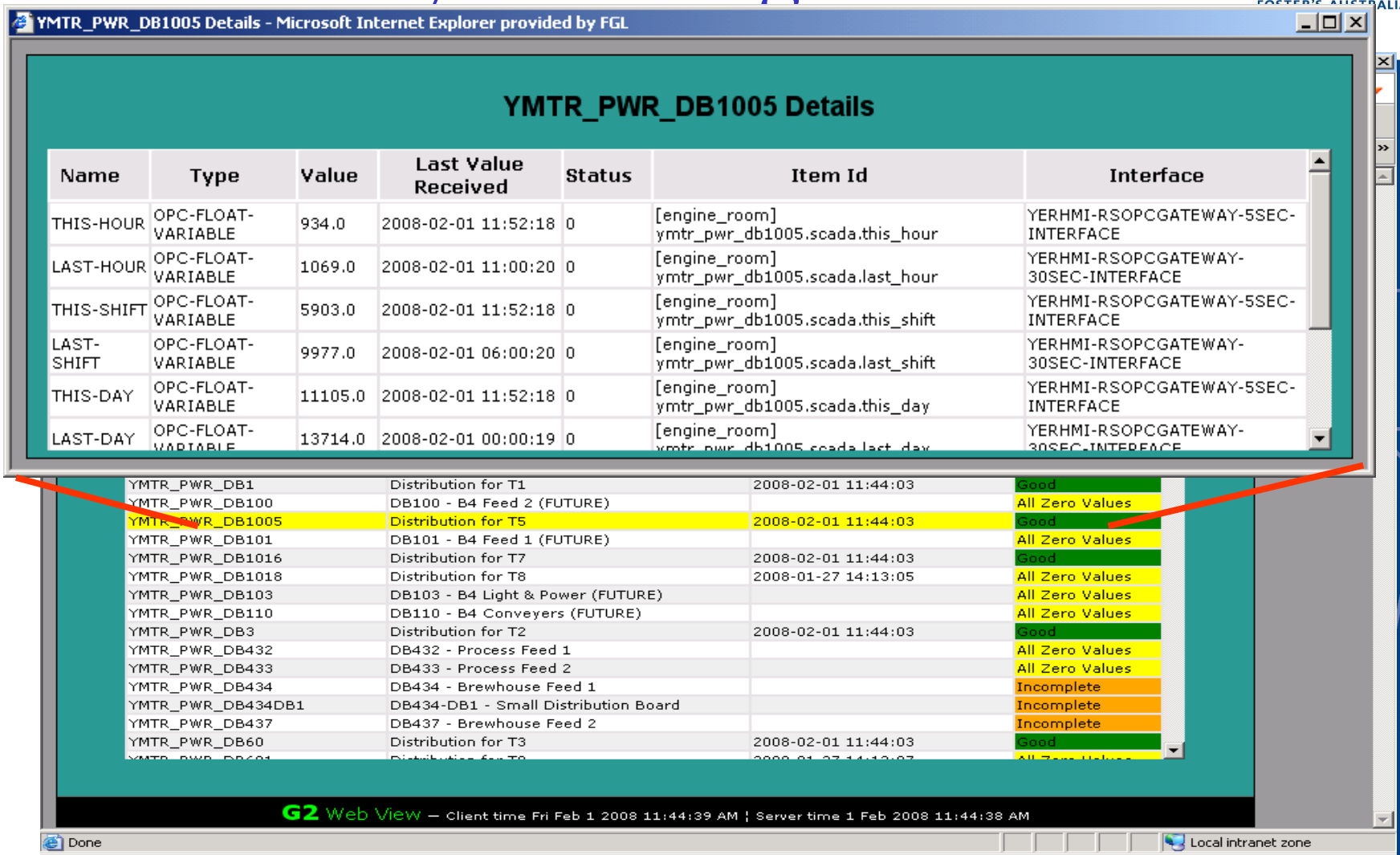
Electricity Metering Validation



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Automated Summary Information

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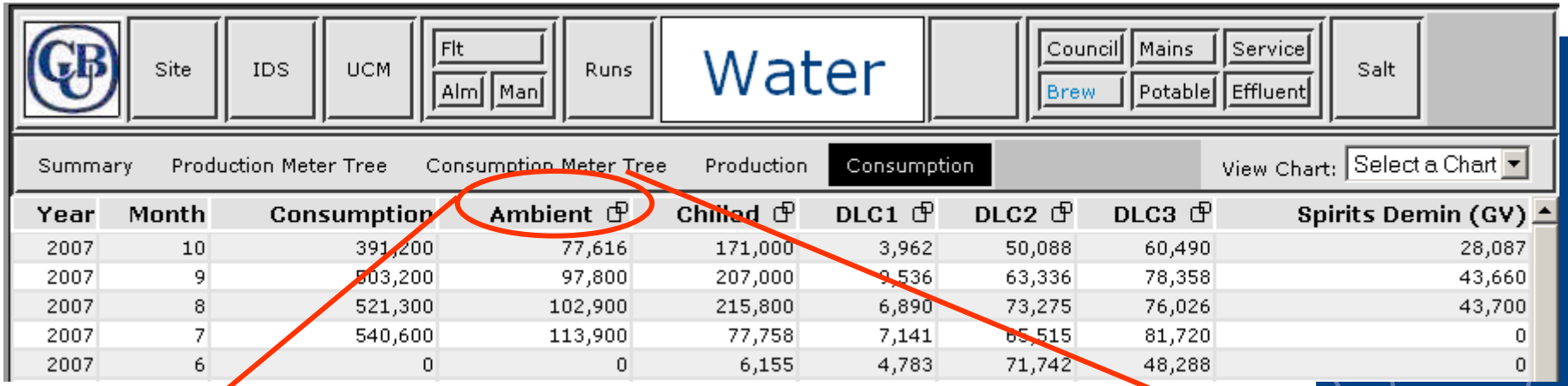

Year	Month	Consumption	Ambient	Chilled	DLC1	DLC2	DLC3	Spirits Demin (GV)
2007	10	391,200	77,616	171,000	3,962	50,088	60,490	28,087
2007	9	503,200	97,800	207,000	9,536	63,336	78,358	43,660
2007	8	521,300	102,900	215,800	6,890	73,275	76,026	43,700
2007	7	540,600	113,900	77,758	7,141	65,515	81,720	0
2007	6	0	0	6,155	4,783	71,742	48,288	0

Year	Month	Total BH	MAT 1	MAT 2	LAT 1 Sparge	LAT 2 Sparge	KET 1 Chase/Makeup	KET 2 Chase/Makeup	Other
2007	10	248,616	40,106	47,453	52,322	58,172	2,957	0	47,606
2007	9	304,800	9,670	6,881	8,432	8,455	15,433	0	255,929
2007	8	318,700	0	0	0	0	0	0	318,700
2007	7	191,658	0	0	0	0	0	0	191,658
2007	6	6,155	0	0	0	0	0	0	6,155

Columns relate to meters in meter tree

Column values are additive by row

Enables relative comparison by month including drill down functionality

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Automated Pie Charting

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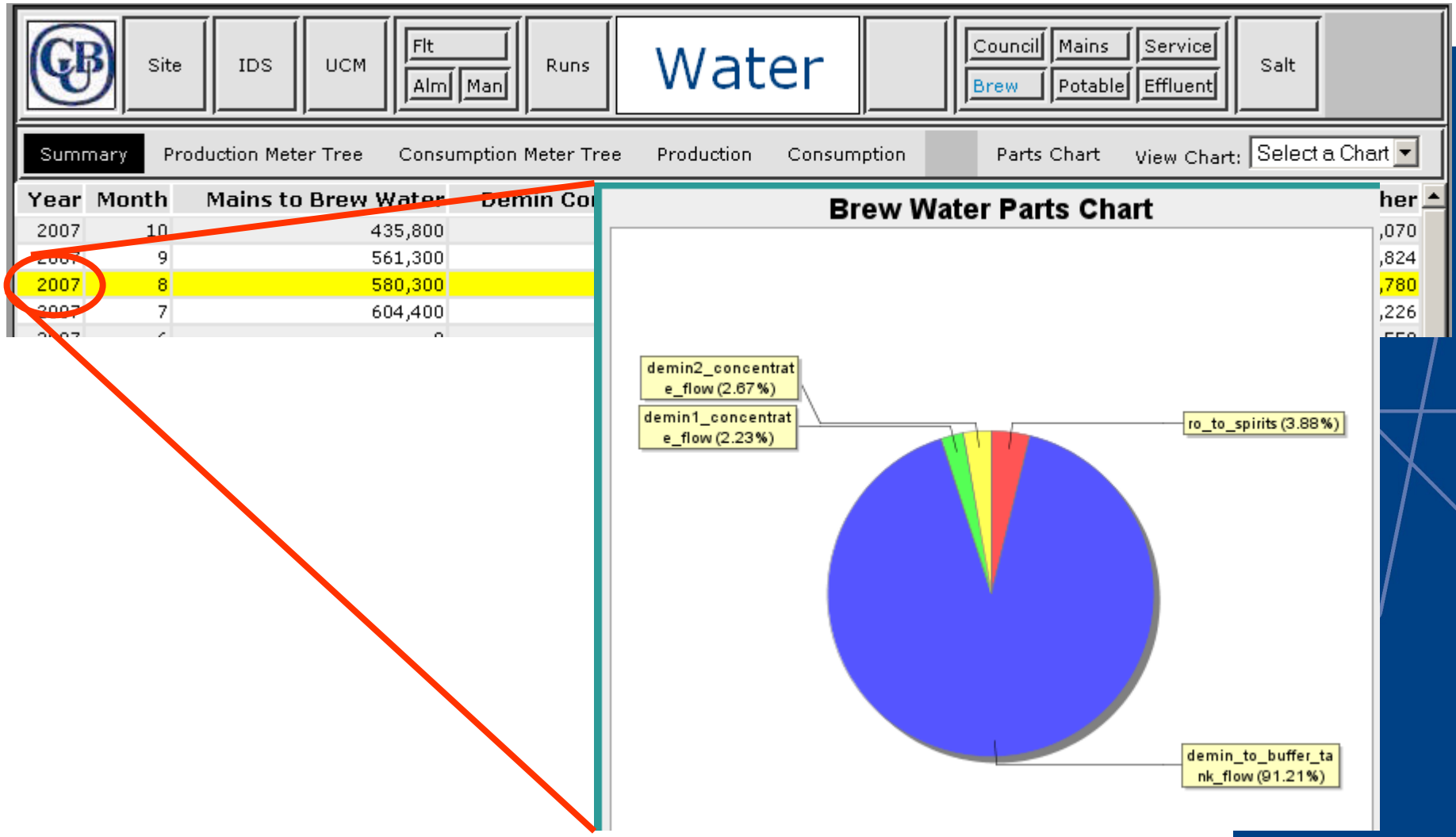

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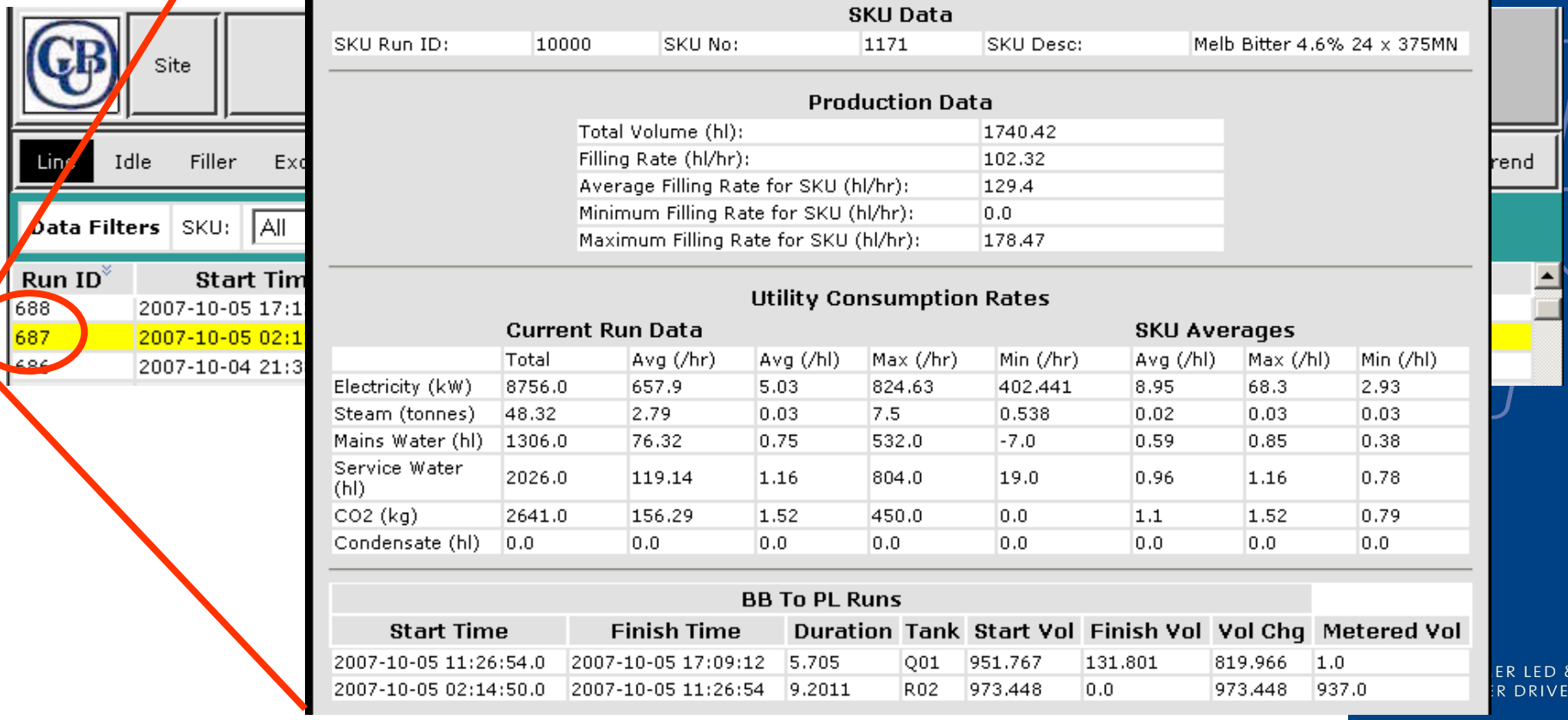
Production Data & Energy Data

Bottling line: Combining energy and production data



Run Times

	Filler	Excise Counter	Line
Run ID	683	767	687
Start Time	2007-10-05 02:11:20.0	2007-10-05 04:53:26.0	2007-10-05 02:11:20.0
Finish Time	2007-10-05 17:12:17.0	2007-10-05 19:11:54.0	2007-10-05 19:11:54.0
Duration (hrs)	15.0158	14.3078	17.0094

SKU Data

SKU Run ID:	10000	SKU No:	1171	SKU Desc:	Melb Bitter 4.6% 24 x 375MN

Production Data

Total Volume (hl):	1740.42
Filling Rate (hl/hr):	102.32
Average Filling Rate for SKU (hl/hr):	129.4
Minimum Filling Rate for SKU (hl/hr):	0.0
Maximum Filling Rate for SKU (hl/hr):	178.47

Utility Consumption Rates

	Current Run Data					SKU Averages		
	Total	Avg (/hr)	Avg (/hl)	Max (/hr)	Min (/hr)	Avg (/hl)	Max (/hl)	Min (/hl)
Electricity (kW)	8756.0	657.9	5.03	824.63	402.441	8.95	68.3	2.93
Steam (tonnes)	48.32	2.79	0.03	7.5	0.538	0.02	0.03	0.03
Mains Water (hl)	1306.0	76.32	0.75	532.0	-7.0	0.59	0.85	0.38
Service Water (hl)	2026.0	119.14	1.16	804.0	19.0	0.96	1.16	0.78
CO2 (kg)	2641.0	156.29	1.52	450.0	0.0	1.1	1.52	0.79
Condensate (hl)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

BB To PL Runs

Start Time	Finish Time	Duration	Tank	Start Vol	Finish Vol	Vol Chg	Metered Vol
2007-10-05 11:26:54.0	2007-10-05 17:09:12	5.705	Q01	951.767	131.801	819.966	1.0
2007-10-05 02:14:50.0	2007-10-05 11:26:54	9.2011	R02	973.448	0.0	973.448	937.0

Visual Representation

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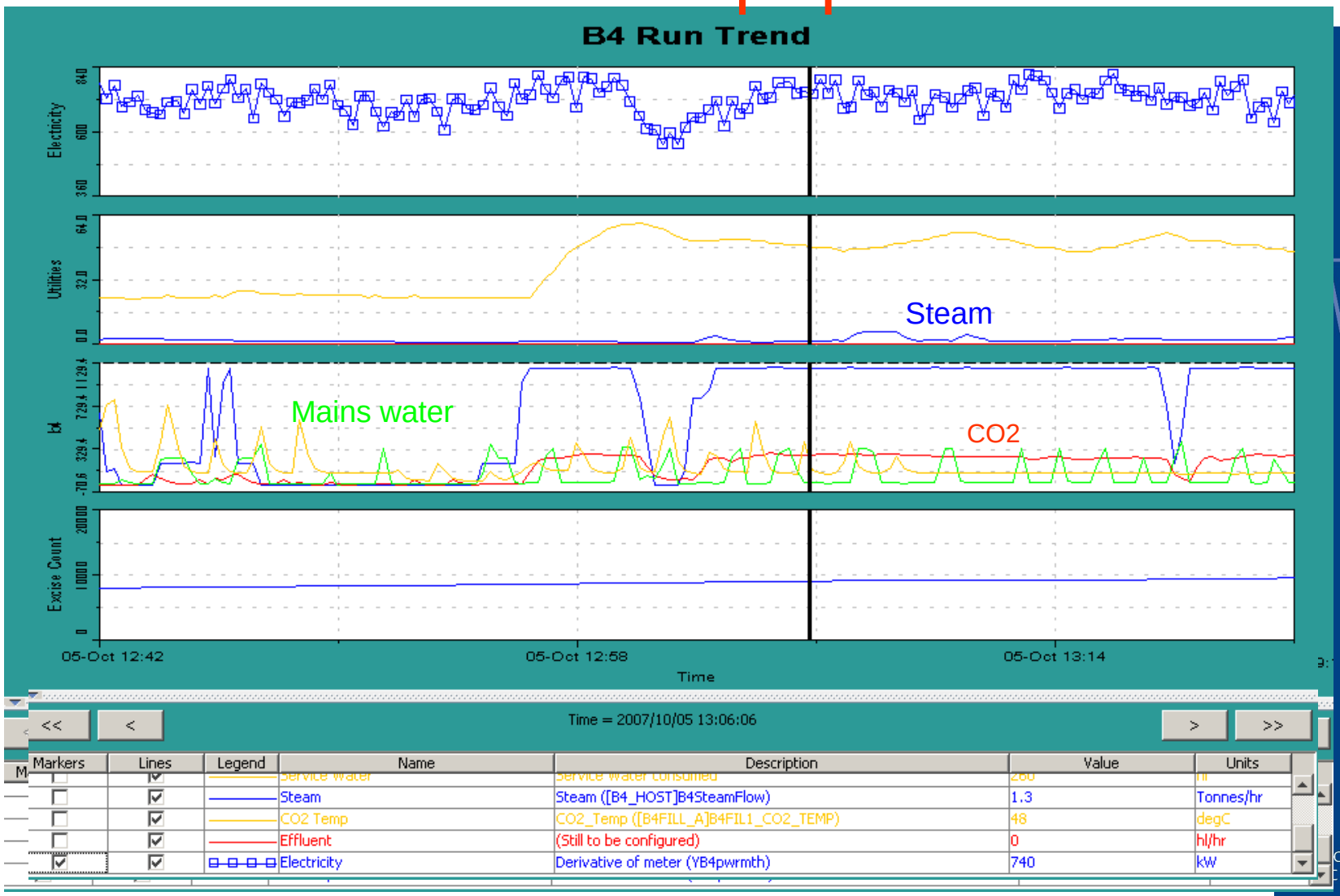

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Monitoring Energy use During Plant Idle Time

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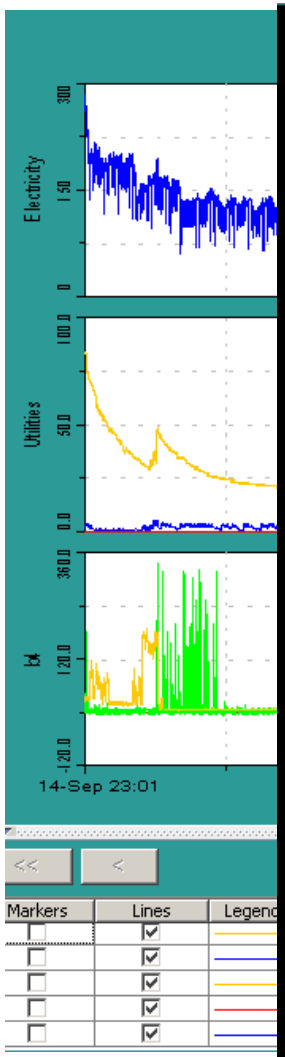

Run Times

	Filler	Excise Counter	Idle
Run ID	667		484
Start Time	2007-09-14 23:00:55.0		2007-09-14 23:00:20.0
Finish Time	2007-09-17 06:03:29.0		2007-09-17 06:04:34.0
Duration (hrs)	55.0428	Not Finished	55.0706

SKU Data

SKU Run ID:		SKU No:		SKU Desc:	

Production Data

Total Volume (hl):	
Filling Rate (hl/hr):	
Average Filling Rate for SKU (hl/hr):	
Minimum Filling Rate for SKU (hl/hr):	
Maximum Filling Rate for SKU (hl/hr):	

Utility Consumption Rates

	Total	Avg (/hr)	Max (/hr)	Min (/hr)	Avg (/hl)	Max (/hl)	Min (/hl)
Electricity (kW)	5185.0	115.63	284.32	0.0			
Steam (tonnes)	43.944	0.8	5.197	0.0			
Mains Water (hl)	396.5	5.27		336.0	-6.0		
Service Water (hl)	1083.0	20.03		228.0	4.0		
CO2 (kg)	3.0	0.08	6.484	0.0			
Condensate (hl)	0.0	0.0	0.0	0.0			

Fault Data

Fault Count:	0
Fault Sources:	0

Identifying inefficient use of plant

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Question: Are the vessels only being cleaned as often as required

Objective: Identify and minimise redundant cleaning cycles (automatically)

Number of runs with adjacent cleaning cycles

Year	Month	A Cellar	C Cellar	D Cellar	E Cellar	F Cellar	G Cellar	Total
2007	10	11	0	0	0	0	1	12
2007	9	9	1	0	0	3	0	13
2007	8	20	1	0	0	0	0	21
2007	7	10	0	0	0	0	1	11

Automatically identifying operator behaviour that causes unnecessary consumption of utilities

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Vessel Selection

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Empowering operators to make optimal decisions

Prioritised Fermenter Queues

A Cellar		C,D,E,F Cellars		G Cellar	
Fermenter	Hours Till Next Clean	Fermenter	Hours Till Next Clean	Fermenter	Hours Till Next Clean
FTA01	Clean Required Now	YFTF08	6.78	FTG02	21.18
FTA02	Clean Required Now	YFTF02	15.18		
FTA03	Clean Required Now	YFTD03	16.67		
FTA04	Clean Required Now	YFTF06	20.89		
FTA05	Clean Required Now				
FTA06	Clean Required Now				
FTA07	Clean Required Now				
FTA11	Clean Required Now				
FTA13	Clean Required Now				
FTA14	Clean Required Now				
FTA15	Clean Required Now				
FTA16	Clean Required Now				

The system presents the operators with the choice that results in minimum consumption of utilities

The operators use of this system has reduced the consumption of cleaning chemical by 10-15% (as well as a significant reduction in water consumption)

- I would like to thank The Winery Engineering Association for the opportunity to present

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Questions?

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