

## Milestone 3 – Final Report

**Continuous Batch Washer (CBW) Grey Water Pre-rinse Project 72R-7025**

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**With the support of the Smart Water Fund**

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## Executive Summary

Warragul Linen Service (WLS) is a business unit of the West Gippsland Healthcare Group and is operated as a State Government Commercialised Organisation. The service was established in 1962 by what was then the Victorian Health Commission, to supply linen requirements to public health facilities located in the West and South Gippsland region.

As a linen supplier the core process activity of the organisation is that of a large commercial laundry, which of necessity consumes considerable quantities of fresh water to achieve the levels of cleanliness and sterility required to meet the needs of its customers. Through a number of innovative projects and smarter production regimes, WLS has managed to reduce potable water usage of 17.24 litres of water per kilogram of linen washed (L/Kg) in 2003/4 to 10.37 L/Kg in 2009/10 (Figure 1). At current throughput levels, this represents an annual saving of nearly 50 million litres. The potential water savings that can be achieved with relatively little cost throughout the laundry industry state wide are certainly significant.

This project sought to pump press water directly from the two Continuous Batch Washer (CBW) presses into the rinse zone of the same machines - a process that is integral in newer CBWs. Rinse water in the older CBWs was sourced totally from incoming potable water lines and replacing a proportion of this with "grey water" from the press tanks was expected to reduce water consumption by around 10 – 11 ML per year (representing approximately a 20% saving). As around 95% of incoming water is discharged to sewer, a reduction of around 9 ML in sewage discharge was also expected.

The base of the press water receiving tank on each of the 2 older CBW's was modified to accept a stainless steel suction outlet plate, to ensure that the attached high flow water pumps and valves pulled water from the base of the tank and always remained under water. The pumps were designed to deliver this grey water from the press tanks directly into the rinse zone of the CBW via stainless steel pipes and the whole process is controlled by the washer control computer following modification to programming to enable this to be achieved. Water usage is metered at each individual washing machine and recorded on a weekly basis, so changes in water consumption following commissioning were immediately quantified.

The reduction in water usage immediately following commissioning of the first machine was clear and dramatic. The commissioning of the second CBW was delayed for 7 days so to ensure that the initial findings in regard to reduced water usage were able to be maintained without impediment. Some minor adjustments in regard to fresh water/grey water mix have been made during the assessment period, however current settings have been in place now for 6 weeks and no further adjustments are expected to be made. Late in February and March, water usage through the 2 modified CBW's increased (refer Attachment 1), but this was unrelated to the modifications and current consumption is in line with the average reported.

As previously mentioned there are numerous older style CBWs in use throughout the industry in Victoria and Australia. The short pay-back time demonstrated in this project should make the adoption of this procedure an attractive proposition for other laundry operators, and given the likelihood of the increased cost of water in future, the appeal will only be strengthened.

The potential water savings throughout the industry are significant by the introduction of this relatively inexpensive modification.

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## **Background**

Warragul Linen Service (WLS) is a business unit of the West Gippsland Healthcare Group and is operated as a State Government Commercialised Organisation. The service was established in 1962 by what was then the Victorian Health Commission, to supply linen requirements to public health facilities located in the West and South Gippsland region.

In 1986 the service was expanded to a new facility which included 'state of the art' technology, designed to enhance the services ability to meet the increasing demands of a rapidly growing customer base. WLS is one of the largest suppliers of linen to the Victorian health care market and is the largest public institutional linen supplier in Victoria.

There are currently around 195 staff employed processing over 460,000 items, or approximately 138 tonne of linen per week which is supplied to many of Melbourne's major public hospitals, and 5 star hotels. Major customers include Southern Health (Monash Medical Centre, Clayton & Moorabbin, Dandenong Hospital, Kingston Centre etc.), The Alfred Hospital, Caulfield Hospital, Peninsula Health & Aged Care, Parkview Hotel on St Kilda Rd, Crowne Plaza and many more.

WLS supplies total linen requirements to its health customers including general ward linen, theatre linen, pre-packed theatre linen bundles, reusable barrier gowns and drapes for use in operating theatres and kitchen linen etc. and supplies all bed linen, bathroom, kitchen and table linen to its hospitality customers.

Warragul Linen Service's contribution to the Gippsland community has been acknowledged in being a finalist in the Service Industry category of the Gippsland Business Awards since 1999.

WLS is an ISO 9001 quality certified organisation, and is committed to a policy of Total Linen Management to its customers.

As a linen supplier the core process activity of the organisation is that of a large commercial laundry, which of necessity consumes considerable quantities of fresh water to achieve the levels of cleanliness and sterility required to meet the needs of its customers. Reducing water usage has been the focus of management for several years at WLS but this challenge has become more pressing in recent years not only because of the increasing shortage of this valuable resource, but also to meet WLS's policy of operating within an environmentally sustainable environment, and constantly striving to reduce our environmental footprint.

Through a number of innovative projects and smarter production regimes, WLS has managed to reduce potable water usage of 17.24 litres of water per kilogram of linen washed (L/Kg) in 2003/4 to 10.37 L/Kg in 2009/10. At current throughput levels, this represents an annual saving of nearly 50 million litres. The potential water savings that can be achieved with relatively little cost throughout the laundry industry state wide are certainly significant.

## **Introduction**

This project seeks to pump press water directly from the Continuous Batch Washer (CBW) presses into the rinse zone of the same machines - a process that is integral in newer CBWs. Rinse water in the 2 older CBWs (subject of this projects modifications) is sourced totally from incoming potable water lines and replacing a proportion of this with "grey water" from the press tanks has the potential to reduce water consumption by around 10 – 11 ML per year (approx 20% saving). As approximately 95% of incoming water is discharged to sewer, a reduction of around 9 ML in sewage discharge can also be expected.

This project involved the base of the press water receiving tank on each of the 2 older CBW's being modified to accept a stainless steel suction outlet plate, to ensure that the attached high flow water pumps and valves will pull water from the base of the tank and always remain under water. The pumps will deliver this grey water from the press tanks directly into the rinse zone of the CBW via stainless steel pipes and the whole process will be controlled by the washer control computer after modification to programming to enable this to be achieved. Water usage is metered at each individual washing machine and recorded on a weekly basis, to enable savings to be immediately quantified.

There are numerous older style CBWs currently in use across Victoria and Australia. If proven successful this retrofit process can be replicated elsewhere with the potential to achieve significant water savings throughout the industry.

Although the ratio of "grey water" to fresh water is adjustable, the quantity of grey water available dictates an upper limit to this ratio. This limit was established to be 35% grey water and 65% potable water in the rinse zone and this is the setting that was adopted. Linen rejected during finishing process due to the presence of visible staining (for example) is rejected and subject to a "rewash" program. Rewash is weighed and recorded weekly as a percentage of total linen washed and is one measure of wash effectiveness. A change in rewash levels resulting from this project's commissioning, was considered to be the most effective measure of the projects success. No increase was noted and therefore no change to the established grey to potable water ratio has been necessary.

This project is supported by the Textile Rental and Laundry Association of Victoria and the DSE's Laundry Efficiency Program.

## **Objectives/Goals**

"Environmental management is seen as an important responsibility by WLS and environmental regulations, laws and codes of practice are regarded as setting the minimum standards of our environmental performance. The organisation recognises that its operations inevitably have an effect on the local, regional and global environment and is committed to minimising potentially harmful effects of such activity wherever and whenever possible."

The foregoing is the introduction to the WLS environmental policy, which goes on to detail more specifically how these obligations will be met. As identified in the introduction, minimisation of water consumption meets the aims of this environmental policy whilst at the same time making good economical sense.

Intended goals of the project include:

- To modify software controlling CBW's to take grey water to use in the pre-rinse phase of the washing process.
- To reduce water usage by 10-11 ML per year.
- To reduce sewage discharge by 9 ML per year.
- To establish a demonstration site from which others can learn.

## Key Steps / Milestones

This project comprised of 3 Key Steps / Milestones as outlined below.

### Milestone 1 Planning

- **Milestone Description**

Project feasibility study and planning

- **Methodology**

Scott Systems Pty Ltd evaluated the possibility and practicality of modifying the CBW computer controls to enable saved press water to be introduced into the rinse zone prior to the introduction of fresh water, in a manner similar to the intrinsic system used in later model CBW's and together with the WLS maintenance team, design the plumbing modifications needed to facilitate this grey water pre-rinse application.

- **Resources**

Scott Systems and WLS maintenance team.

- **Timing**

Completed on 12/10/2010

- **Financial Summary**

Funding Summary for Milestone 1		
Source	Amount	
	\$	In kind
Smart Water Fund	5,000.00	
Grantee		
Other (please name)		

- **Key Performance Indicators**

Developed a practical plan which will enable the introduction of the proposed system.

Detailed Project Plan (including Communications Plan) is to be prepared by the Grantee and approved by the SWF

### Milestone 2 Installation and Commissioning

- **Milestone Description**

Installation and commissioning of all key infrastructure components

- **Methodology**

- The base of the press water receiving tank on each of the 2 older CBW's will be modified to accept a stainless steel suction outlet plate, to ensure that the attached high flow water pumps and valves will pull water from the base of the tank and always remain under water. The pumps will deliver this grey water from the press tanks directly into the rinse zone of the CBW via stainless steel pipes and the whole process will be controlled by the washer control computer after modification to programming to enable this to be achieved.

- **Resources**

Scott Systems Pty Ltd responsible for design, installation and commissioning of the water recycling system on the 2 x CBW's including pumps, valves, electrical & electronic controls, water meters, PLS software and PC software.

- **Timing**

Completed on 30/10/2010

- **Financial Summary**

Funding Summary for Milestone 2		
Source	Amount	
	\$	In kind
Smart Water Fund	11,500	
Grantee	21,500	
Other (please name)		

- **Key Performance Indicators**

Installation of all key components and necessary computer modifications tested and adjustments made as and if necessary.

**Milestone 3 – Final Report (this one)**

- **Milestone Description**

12 week monitoring and recording to determine success of project and to accurately quantify the benefits

- **Methodology**

Water consumption is measured and recorded through the 2 CBW's (subject of the project) on a weekly basis. This weekly recording has been conducted over the past few years which has enabled the linen service to quantify the value (positive or negative) of any changes made to wash programs, processing techniques or water saving initiatives. Water savings resulting from the introduction of this project will be clearly evident. Water consumption is measured against production (kilograms of linen washed) and is reported as litres per kilogram (l/Kg).

- **Resources**

As stated above, the monitoring and measuring of water consumption is a routine operational procedure.

- **Timing**

30/03/2011 completed 12 weeks monitoring of outcomes.

- **Financial Summary**

Funding Summary for Milestone 3		
Source	Amount	
	\$	In kind
Smart Water Fund	5,000.00	
Grantee		
Other (please name)		

**Key Performance Indicators**

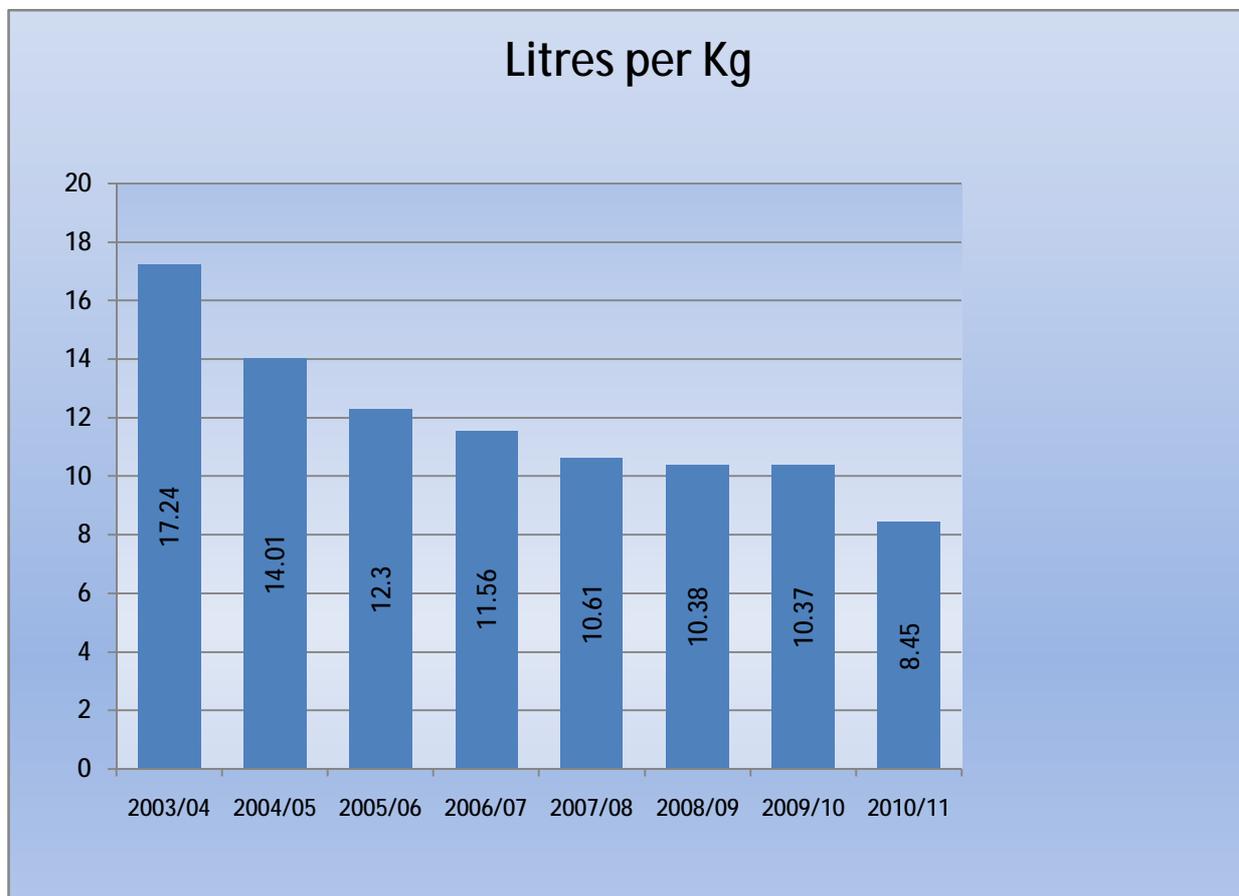
Reduction in water consumption in terms of Litres/Kg of linen washed. Water consumption is measured in terms of litres of water used to process 1 kilogram (dry weight) of linen processed (Lt / kg).

Completion of communication activities – refer Attachment 2 and 3.

**Outcomes**

Since 2003, Warragul Linen has been consistently finding new ways to reduce their overall water consumption (Figure 1).

**Figure 1: Total Water consumption at Warragul Linen Services from July 2003 to June 2010**



The above figure illustrates the overall total water usage of Warragul Linen. It is based on the monthly water accounts from Gippsland Water so usage here includes all water consumed, that is, washing machines plus domestic usage e.g. staff washrooms, toilets, tea room, air conditioning and so on. These records are financial year records from July to June each year, so the 2010/2011 consumption is YTD and next year will reflect the full benefit of the Smart Water Fund project.

The Smart Water Fund Project has contributed to reducing potable water consumption by approximately 17.8 megalitres per year (Figure 2).

**Figure 2: Water usage through CBW12 AND CBW13 for the period Feb 2010 to April 2011**

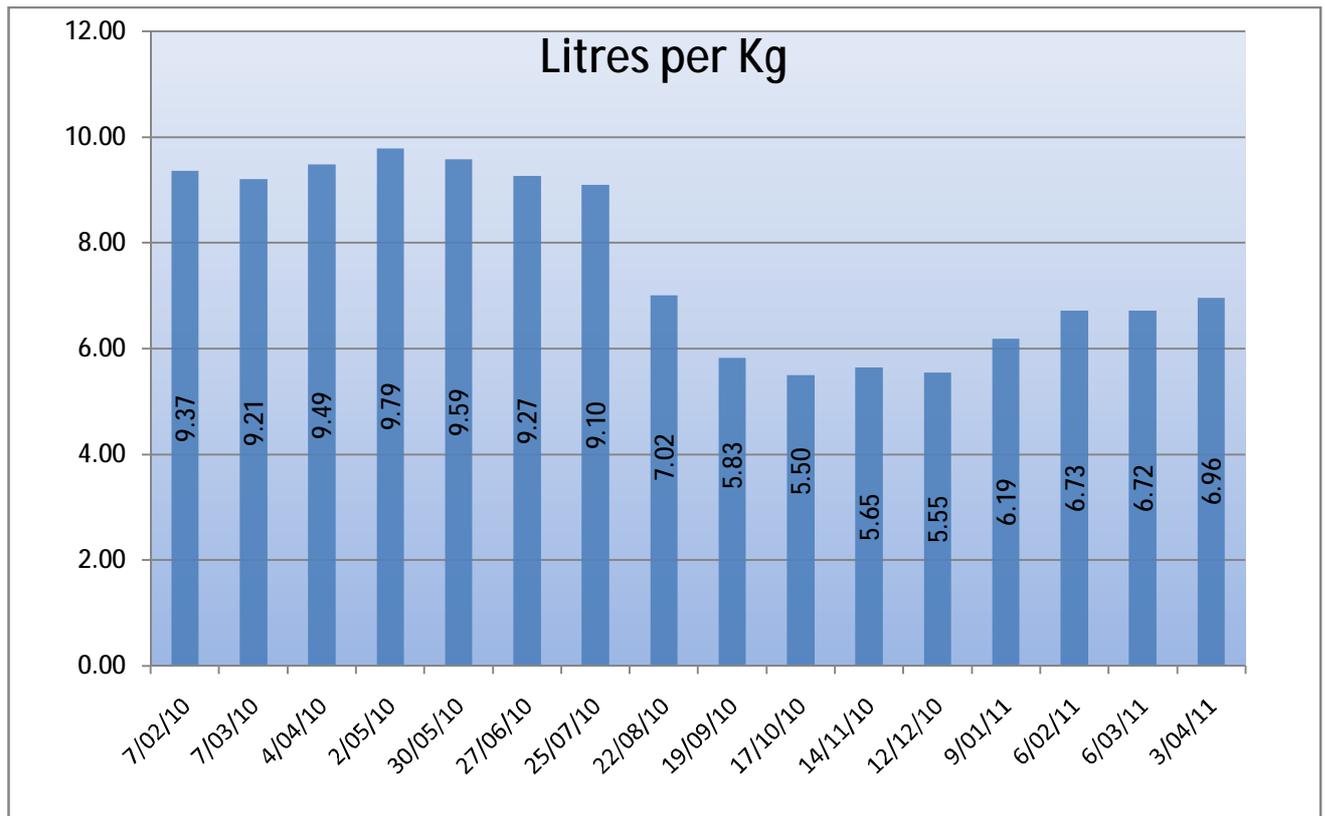


Figure two shows that for the 6 month period prior to this projects commissioning, on the 1<sup>st</sup> August 2010 and 8<sup>th</sup> August 2010 respectively, the collective average water consumption through CBW12 and CBW13 was 9.37 Lt/kg. For the 8 month period post commissioning (ending April 2011), the average water consumption was reduced to 6.12 Lt/kg. Based on these two machines processing around 5,500,000 kilograms of linen per annum, this 3.24 Lt/kg reduction represents an annual potable water savings of 17.8 megalitres – approximately a 35% reduction. Additionally, given that 95% of water consumed is also discharged to sewer, a saving of almost 17 megalitres to sewer has also been achieved. Refer to Attachment 1 for tabulated data.

## Risk Management

Description of Risk (and reference to applicable milestone)	Probability (H,M,L)	Impact (H,M,L)	Impact on Project (Description)	Mitigation Strategy
Reduction in quality of finished product to an unacceptable level.  <b>Refer Milestone 3</b> - Monitoring and measuring of project benefits.	L	L	Worst impact could be an extension of the payback time, if the anticipated ratio of grey water to fresh water cannot be sustained.  Rewash levels and other measures of quality remain within normal accepted parameters	As the flow of grey water replacement of treated incoming potable water will be metered and adjustable, grey water flow can be fine tuned to ensure maintenance of acceptable product quality together with acceptable water usage reduction.

## Evaluation

The reduction in water usage immediately following commissioning of the first machine was clear and dramatic. The commissioning of the second CBW was delayed for 7 days to ensure that the initial findings in regard to reduced water usage were able to be maintained without impediment. No unforeseen difficulties arose during the installation or commissioning of the project, and only minor adjustments in regard to fresh water/grey water mix have been made during the assessment period, which is set to call for 35% of the water per batch from the press water tank, which, as previously mentioned represents the maximum re-use water available. Late in February and during March, water usage through the 2 modified CBW's increased (refer Attachment 1) but this temporary increase related to a water leakage elsewhere and was unrelated to the project. Current consumption is consistent with that reported in Attachment 1 namely 6.12 Litres/Kg.

The total installation of all plumbing, including modifications to the press water tanks was accomplished in a few days and we believe is a suitable modification that could be applied to most older-style CBWs in operation.

For the 6 month period prior to this projects commissioning, the collective average water consumption through CBW12 and CBW13 was 9.37 Lt/kg. Following commissioning, the average consumption for the 8 months to 31/03/11 is 6.12 Lt/kg, a reduction in water usage of 3.24 Lt/kg. As these two machines process around 5,500 tonne of linen per annum, the reduction in usage equates to an annual saving in drinking water of 17.8 megalitres (approximately 35% reduction). As 95% of water consumed is discharged to sewer, a saving of almost 17 megalitres to sewer is being experienced. The original estimate of saving between 10 and 11 megalitres was intentionally conservative as it was unknown how much of the available re-use water could be used in this way without negatively affecting wash outcomes.

As previously mentioned there are dozens of older style CBWs in use throughout the industry in Victoria and Australia. The short pay-back time of 9 months demonstrated in this project should make the adoption of this procedure an attractive proposition for other laundry operators, and given the likelihood of the increased cost of water in future, the appeal will only be strengthened.

The potential water savings throughout the industry are significant by the introduction of this relatively inexpensive modification. The cost of a replacement CBW with this feature inbuilt will vary

considerably depending on the specified batch size and number of compartments etc., and other ancillary equipment that may be required, but may be expected to be upward of half a million dollars.

## Return on Investment

These two CBWs collectively process on average 5,500 tonne of linen per year so a continued reduction of 3.24 Lt/kg in consumption will impact as follows:

Note:

1. Trade waste is calculated at 95% of treated water consumption
2. Additional waste disposal charges e.g. Biochemical Oxygen Demand (BOD) and Suspended Solids (SS) are not included in the following as these items are quality issues which are measured by the water authority and charged accordingly.

A	B	C	D	E
Relevant production (kgs pa)	Recorded savings (litres/kg)	Total annual savings (litres)	volumetric charge (\$/kl)	Total annual cost savings \$
		(A x B)		((C/1000) x D)

WATER	5,500,000	3.24	17,820,000	1.6754	\$29,855
SEWAGE (water x 0.95)		3.08	16,940,000	1.6233	\$27,499
<b>Total saving</b>					<b>\$57,354</b>
<b>Project cost</b>					<b>\$43,000</b>

**Payback time equals total cost/ annual saving or 0.75 years (approximately 9 months)**

## Summary/ Conclusions

- Warragul Linen Service (WLS) is a State Government Commercialised linen service/laundry that supplies linen requirements to public health facilities and the hospitality industry throughout Melbourne and South and West Gippsland. WLS is the largest public institutional linen supplier in Victoria.
- The core process activity is that of a large commercial laundry which of necessity uses large amounts of water to achieve the levels of cleanliness and sterility demanded of the health sector.
- This project seeks to pump press water directly from the Continuous Batch Washer (CBW) presses into the rinse zone of the same machines - a process that is integral in newer CBWs.
- Modification to washer control computer programming to facilitate the re-use of press water, together with the introduction of the necessary pumps, valves and plumbing to transport press water to the pre-rinse zone was necessary to achieve the desired outcome.
- The goal of the project was to reduce water consumption by 10-11 ML per year and discharge to sewer by 9 ML.
- All milestones have been completed.
- The goals identified have been exceeded with a reduction of nearly 18 ML in water consumption being measured.
- Payback should be 9 months based on current water and sewage charges.

## **Recommendations**

It is our opinion that this project has achieved in every regard the goals identified and the project may be considered completed. WSL will continue to fulfil its obligations as detailed in the communications plan.

## **Appendix**

### **Attachment 1**

Data tables detailing throughput (Kgs) and water consumption (KI) and water usage (Lt/Kg) through each of the CBW's subject to this project pre and post commissioning.

### **Attachment 2**

VILA (Victorian Institutional Laundries Association) Traralgon Seminar program.

### **Attachment 3**

TRLAA June 2010 newsletter "The Clean Sheet"