



**water&
energysavers**

Water Audits and Sterilisers

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Content of Presentation

- Introduction
- Water auditing
- Water efficiency and water re-use
- Water re-use: keys to success
- Sterilisers
 - Water use
 - Water efficiency and water re-use
 - Case study
- Summary

Introduction

Our involvement

- Water auditing and project management
- 60 hospital water audits across Australia

Myself

- Managing Consultant at Water & Energy Savers
- Water audits for program since June 2007

Water Auditing

- ***Stock take*** of site water use
- Point of use audit *versus* volumetric audit
- *Quantify* end use consumption
- *Qualify* projects & ideas

Why save water?

- Additional benefits:
 - Reduce costs and energy use (hot water)
 - Improve user amenity
 - Reduce cleaning / process times

Interesting Facts

Fact 1: Co-generation plants use water

Significant water use 2.5 kL/MWh

Coal-fired generators 2.0 kL/MWh

Fact 2: Absorption chillers use water

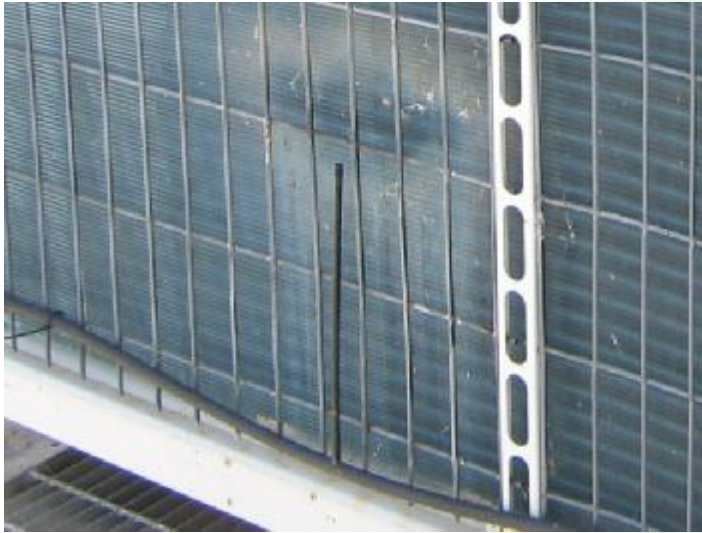
Water use in cooling towers *and* boilers

Comparing water use per MJ heat rejection:

- Refrigerant chiller - cooling tower: 0.47 L
- Old absorption chiller: 0.59 L
- New absorption chiller: 0.37 L

Fact 3: Air cooled chillers use water!

Condenser cooling with garden sprayers



Impact of Victorian water prices

Variable cost of water and waste water

Gippsland: **\$4.75** per kilolitre

Lower Murray: **\$0.64** per kilolitre

Project financial payback: Rainwater Harvesting

Warragul (Gippsland) mean rainfall: 1019.6 mm/year

Mildura (Lower Murray) mean rainfall: 288.5 mm/year

Financial payback **26** better in Warragul

Water efficiency

Definition: Consume less water to perform same function

Eliminate water use

- Identify and repair leaks
- Alternative technology, dry processes
 - Digital imaging (X Ray)
 - Air cooled equipment - Ice makers
 - Chilled water over once thru cooling
 - Bins over food waste disposers



Water Efficiency cont'd

Reduce water use without compromise of function

- Low flow appliances
- Retrofitting existing appliances
- Water Efficiency Labelling Scheme



Hospital examples:

- Laundries vary from 5L to 25 L/ kg linen
- Hydrotherapy pool filter back washing frequency
- Automatic pot washers versus manual wash troughs

Water re-use and recycling

Water re-use

- No treatment required
- Fit for purpose
- Sterilisers or dialysis RO reject for toilet flushing

Water recycling

Treatment required because:

- Higher level of contaminants
- More critical application



Water re-use approach

Key to success of water re-use:

Quantity : Match supply and demand

Quality : Fit for purpose, RMP

Timing : Timing of water in and water out determines storage volume – consider daily, weekly, seasonal

Location : Space for storage, space for transport route

Sterilisers

Purpose

- Steam sterilise equipment
- Re-usable in operating theatres
- Availability and performance critical

Steps to cycle

- Close door, pressurise gasket, conditioning
- Air removal, steam charge
- Sterilisation
- Evacuate, drying, air intake

Steriliser water use

Vacuum pump

Water sealed liquid ring vacuum pump “pulls” a vacuum in the chamber

Runs ~75% of a cycle

~50% of water consumption

Pre sterilisation: conditioning and air removal

Post sterilisation: evacuation, drying and air intake



Steriliser water use

Condenser or heat exchanger

Removes steam & condensate from the steriliser

Cools condensate prior to sewer

Protect vacuum pump

Pre sterilisation: Steam charge

Post sterilisation: Evacuate, drying, air intake

50% of water consumption



Steriliser water use

Water use: 500 to 1000 litres per cycle

Large hospital: 13 million litres of water per year

Steriliser water efficiency

Chilled water to condenser only

- When there is no feasible water re-use options
- Requires chiller:
 - Capacity all year round or
 - Stand alone chiller unit
- Additional energy usage is site dependant

Steriliser water re-use

- Common solution in program
- Feds toilet header tanks, boiler make up, irrigation
- Harvest condenser water and / or vacuum pump water
- Pumping requirements
- Cost effective for high use sterilisers

Steriliser case studies

Harvest from two sterilisers:

- Water available: 3,700 kL/year

Feed two header tank systems on level 6 and level 10:

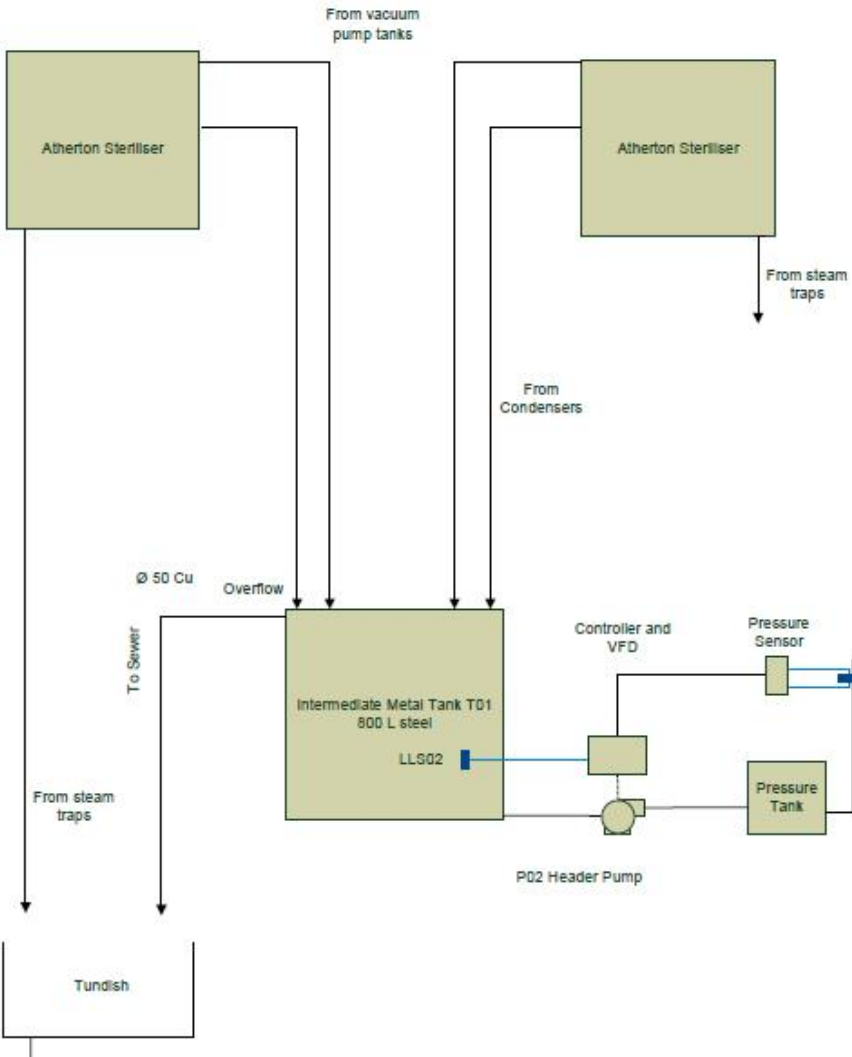
- Water demand: 3,200 kL/year

Challenges:

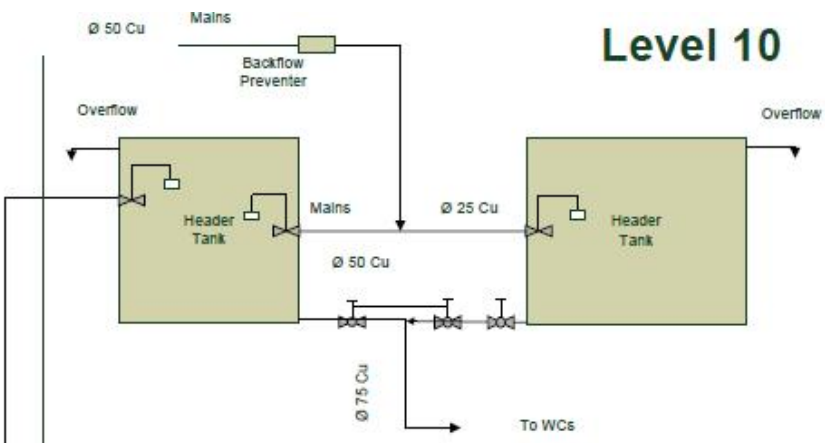
- Limited space in steriliser plant room
- Confined route to header tanks
- Two main flusher tank systems
- Copper corrosion
- Access windows

Solution:

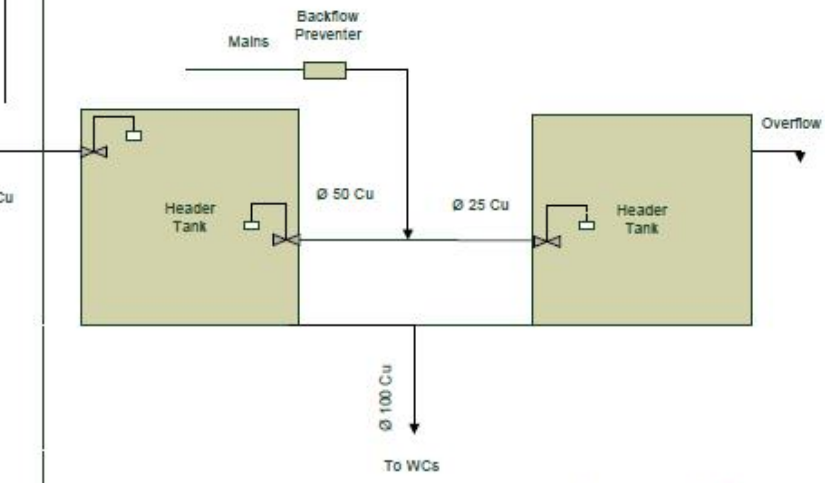
Basement



Level 10



Level 6



Summary

Benefits of starting with a water audit

- Quantify and Qualify
- “Master plan”

Saving water in sterilisers

- Significant savings
- Water efficiency versus water re-use