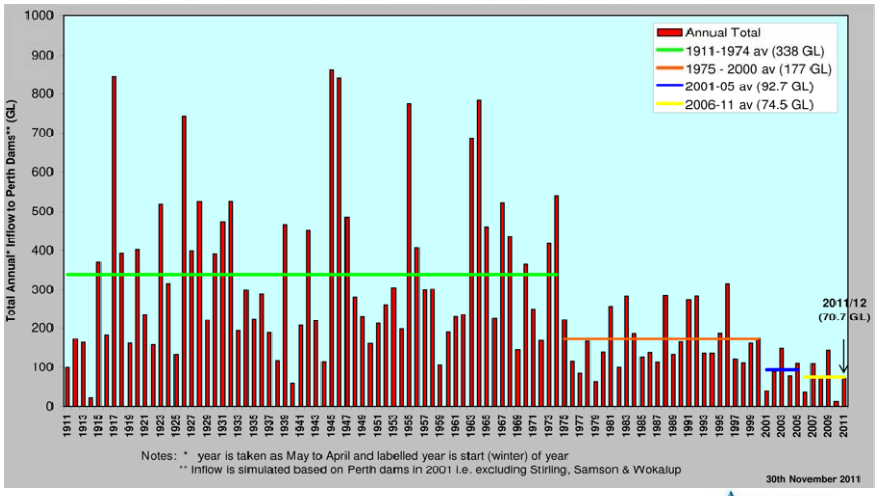
Water Efficiency in WA Cooling Towers

Pamela McGarry
Water Corporation

Ryan Milne
Ecosafe International

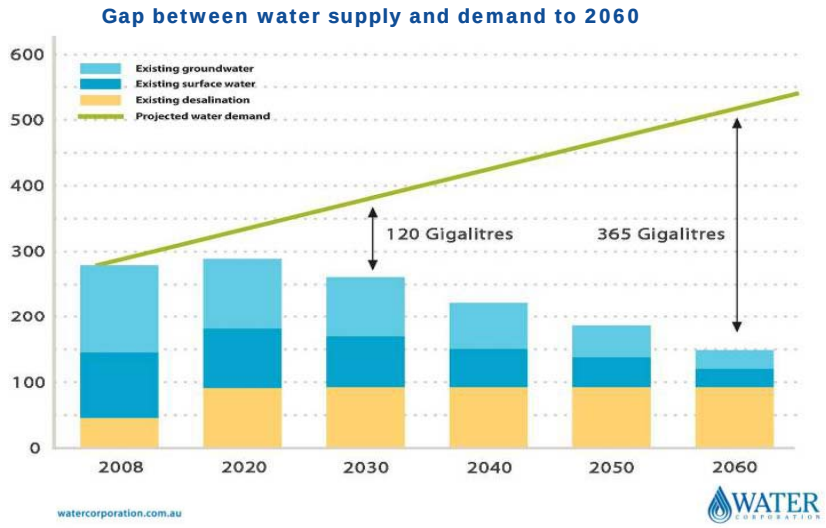
watercorporation.com.au

Streamflow into dams

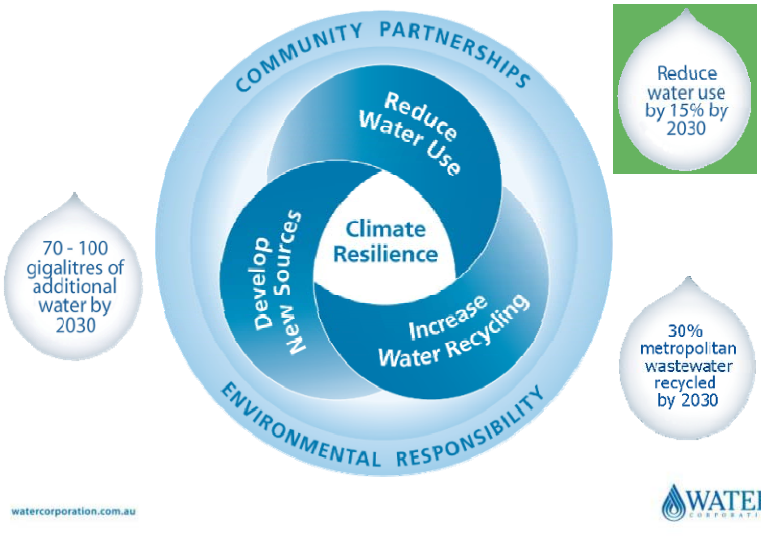


watercorporation.com.au

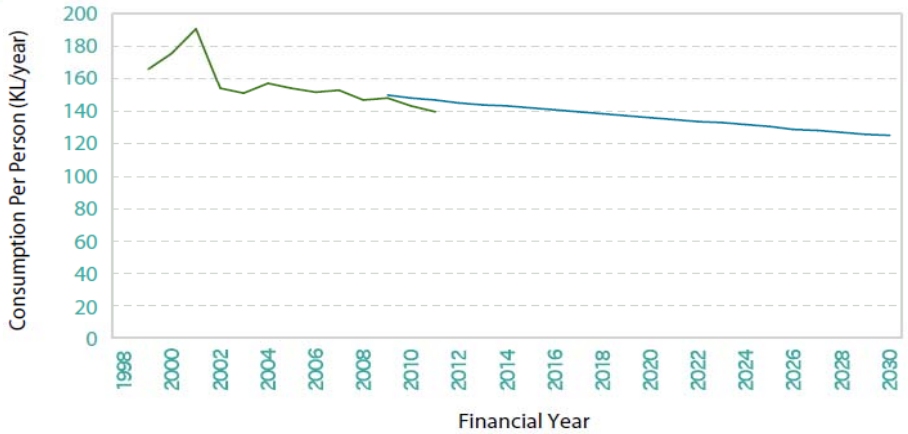
The 50 year challenge



Water Forever vision



The good news



watercorporation.com.au

WATER CORPORATION

Why reduce your water use?

- Cost effective
- Community support
- Minimise impact on our environment
- Reduce your water bills

watercorporation.com.au

WATER CORPORATION

What are the benefits

- Reduction in water bills
  - Large businesses saved 4.6 billion litres in 2010/11, saving them $8.5 million in avoided charges
  - From 2012/13, the lowest price for water for non residential customers will be $2.11 per kL
  - Discharge factor costs will be $2.67 per kL
- Positive message about your commitment to water efficiency

WA Cooling Towers

Cooling Tower Water Efficiency

by Ryan Milne

Water Conservation in Cooling Towers

To optimise water conservation of any cooling system requires a holistic view of all water outflows / losses, these include:

- Evaporation – controlled loss need to optimise
- Bleed – controlled loss need to optimise
- Overflows – uncontrolled need to minimise
- Drift - uncontrolled need to minimise
- Splash outs - uncontrolled need to minimise
- Windage - uncontrolled need to minimise
- System leaks - uncontrolled need to minimise

Need to assess and manage outflows as volume made up via makeup supply

Cycles of Concentration (CoC)

- CoC significant factor in determining water efficiency in cooling systems. CoC impacted by:
  - Makeup water quality
  - Limiting factor in CoC
  - Chemical conditioning of water (water treatment)
- CoC can impact on:
  - Water efficiency
  - System longevity (pH, corrosion etc.)

Cooling Towers Water Efficiency Evaluations in WA

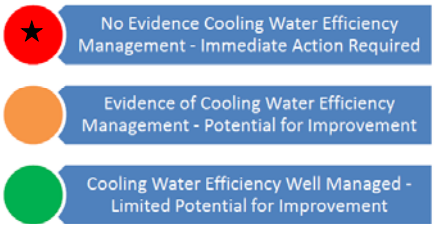
- Ecosafe International was engaged by the Water Corporation to undertaken 10 independent Cooling Tower water efficiency evaluations of cooling tower systems within the Perth Metro area
- Sites included hospitals, office buildings, shopping centres, hotels and universities
- Evaluations undertaken from Oct'11 – May'12

Approach Adopted

- Sites identified by Water Corporation and offered free cooling tower water efficiency assessment
- Ecosafe Int. undertook independent evaluation of a selected cooling tower system at each site
- Utilised the AIRAH evaluation tool and rating system as utilised within Victoria
  - Excellent < 5%
  - Good 5-10%
  - Moderate 10 -15%
  - Poor > 15%
- Included evaluation of 12 months of water treatment reports and/or water meter readings and general observations relating to cooling tower management and water efficiency

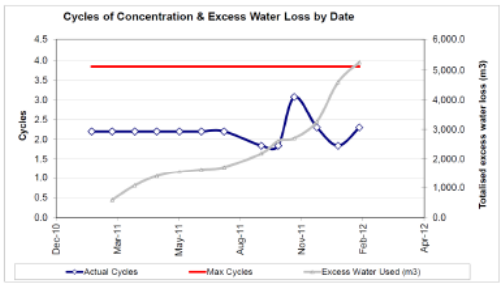
Evaluation Reporting

- Reporting included the following:
  - AIRAH Rating %
  - Potential Water Saving over 12 months
  - Water Efficiency 'Traffic Light System'



Evaluation Reporting

- Assessment of maximum / optimum vs actual cycles of concentration (CoC)



What Did We Find?

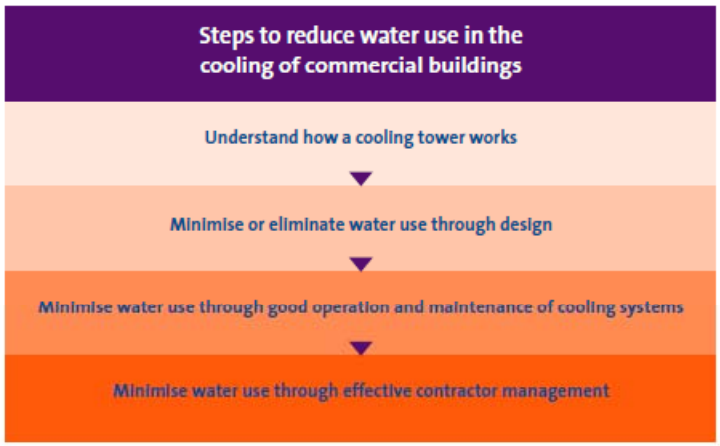
What Did We Find ?

- Average AIRAH rating based on 9 completed assessments = **12.9 %** (Moderate)
- Worst AIRAH Rating = 30.3 % (Poor)
- Best AIRAH Rating = 1.4 % (Excellent)
- Potential Water Savings per annum ranged from 5269 kL to 140 kL

Management Challenges

- Cooling towers often out of sight and out of mind
- False sense of security due to engagement of water treatment suppliers (only portion of water efficiency management and only typically visit site 1 / month)
- Need to understand and interpret water treatment reports as direct impact to system water efficiency
- Typical focus on electrical efficiency and water efficiency often ignored
- A holistic view of system required as cooling tower a single component of larger cooling system
- Physical spec of system often unknown / not recorded
- Changes can impact e.g. risks associated with Legionella.

Improvement Steps



*Extracted from Sydney Water – Water Conservation in Cooling Towers

Opportunities for improvement

- Basic increased awareness of cooling tower water efficiency required
- Improved ownership of management associated with cooling tower systems (not just water treatment supplier responsibility)
- Improved service demand from water treatment suppliers (e.g. Equipment reliability, reporting etc.)
- Importance of water treatment reports and associated interpretation
  - Increased focus on CoC
- Address uncontrolled losses (e.g. Leaks and balancing)

Opportunities for improvement

- Reduce controlled losses e.g. cooling load & improving system control and maintenance (e.g. solenoid valves on bleed systems)
- Manage cleaning / filter usage
- Audits of system (need to understand the system) – develop benchmarks / targets.

Improved Control

Practical Examples

- A total of 3 of the 10 sites (30%) did not have water treatment reports for the full 12 month period (near impossible to understand water efficiency if critical info missing)
- A total of 8 of the 10 sites (80%) did not track actual vs optimum CoC – this is central to water efficiency in cooling towers
- Lack of adequate tower inspections or use of telemetry for tracking / alarms associated with TDS
- Presence of makeup water meters, but limited evidence of recording or trending (usage not efficiency)

Practical Examples

- Excessive tower cleaning and disinfection – suggest adopt risk based approach as per AS/NZS 3666.3 (2011) – Annual vs quarterly / biannual cleans
- Faulty TDS bleed solenoid
- Timed backwashing of filters
- Unknown management / maintenance of TDS bleed control equipment

Water Treatment Reports

- Information central to effective system management
- Should include makeup and system TDS
- Should include details of actual vs optimum CoC and associated trending
- Details of general system concerns e.g. System leaks, excessive aerosol, when control equipment calibrated and next due for calibration
- Tracking of actual vs expected water and chemical usage
- Details of any suggested improvements

Top Three Improvement Opportunities

1. Ensure responsibility for operation of cooling tower clearly defined and ensure as a minimum water treatment supplier reports actual vs maximum / optimum CoC (trend actual vs optimum)
2. Implement regular (at least daily) inspections of cooling tower systems and use of telemetry for key factor such as TDS (interface with BMS)
3. Implement regular makeup water quality analysis and adapt CoC accordingly

Thank You For Your Time – Any Questions

Uncontrolled Losses

- Drift controlled by system design and efficiency of drift eliminators
  - AS/NZS 3666.1 stipulates drift <0.002% of total volume of reticulating water
  - Drift inspections should be undertaken regularly
  - Air flow rates important to reduce drift

- Overflow occurs when sump overflows due to return of excess water to systems sump or excess system makeup (e.g. faulty ball valve or incorrectly balanced).