Optimising Cooling Water Use

The Water Consumption of 50 Cooling Towers in Victoria

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What is a Cooling Tower – How much water?

Rated: 100kW 	**Rated: 500kW** 
Rated: 600kW 	**Rated: 1400kW** 

What is a Cooling Tower – How much water?

Rated: 100kW **360,000litres** 	**Rated: 500kW** 
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Water Consumption

How much water is used in associated with Cooling Towers?

	Number of Towers	litres/day consumption
Victoria	4,100	80 million

Cooling Tower Water Efficiency

Simply:

How much water a tower actually used

vs

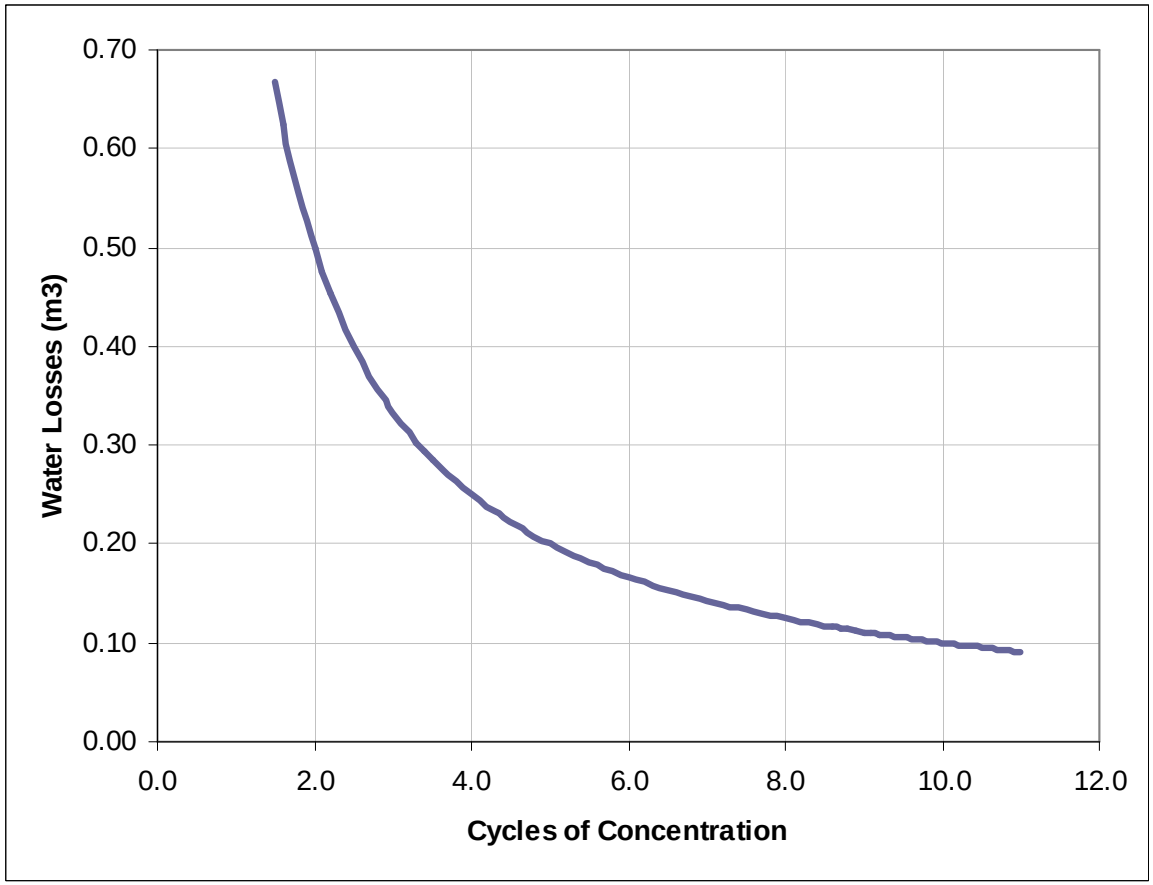
How much water the cooling system would have used when run as specified

Cooling Towers Need to Lose Water

- Cooling Tower cool primarily by evaporation.
- Remaining water - minerals concentrate.
- Concentrated water needs to be bled, to allow dilution by fresh water.
- **Cycles of Concentration = Make Up/Bleed**

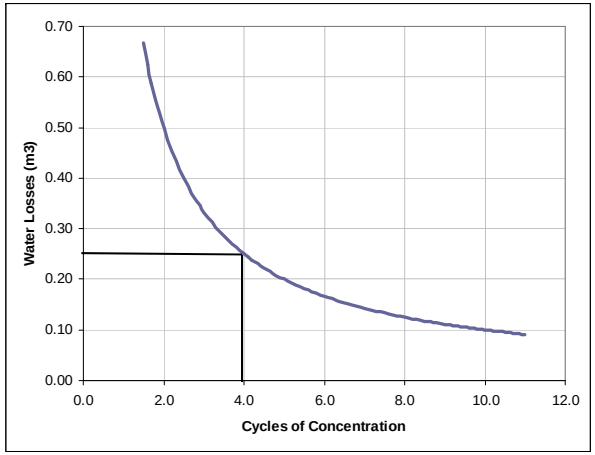
Cycles of Concentration

For every 1m^3 of makeup water

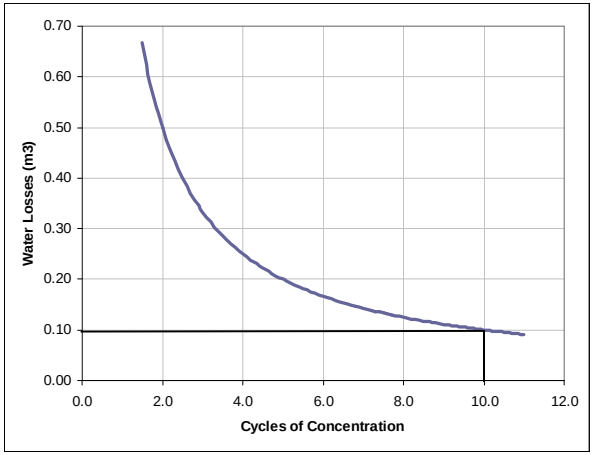


Calculations

Assume 4 Cycles Currently: (250litres)



Assume 10 Cycles possible: (100litres)



Saving: 150litres for 1m^3 of makeup

How Do We Calculate Cycles of Concentration

Approximately:

Conductivity in Cooling Water divided by Conductivity in Make Up

Accurately:

By mineral analysis

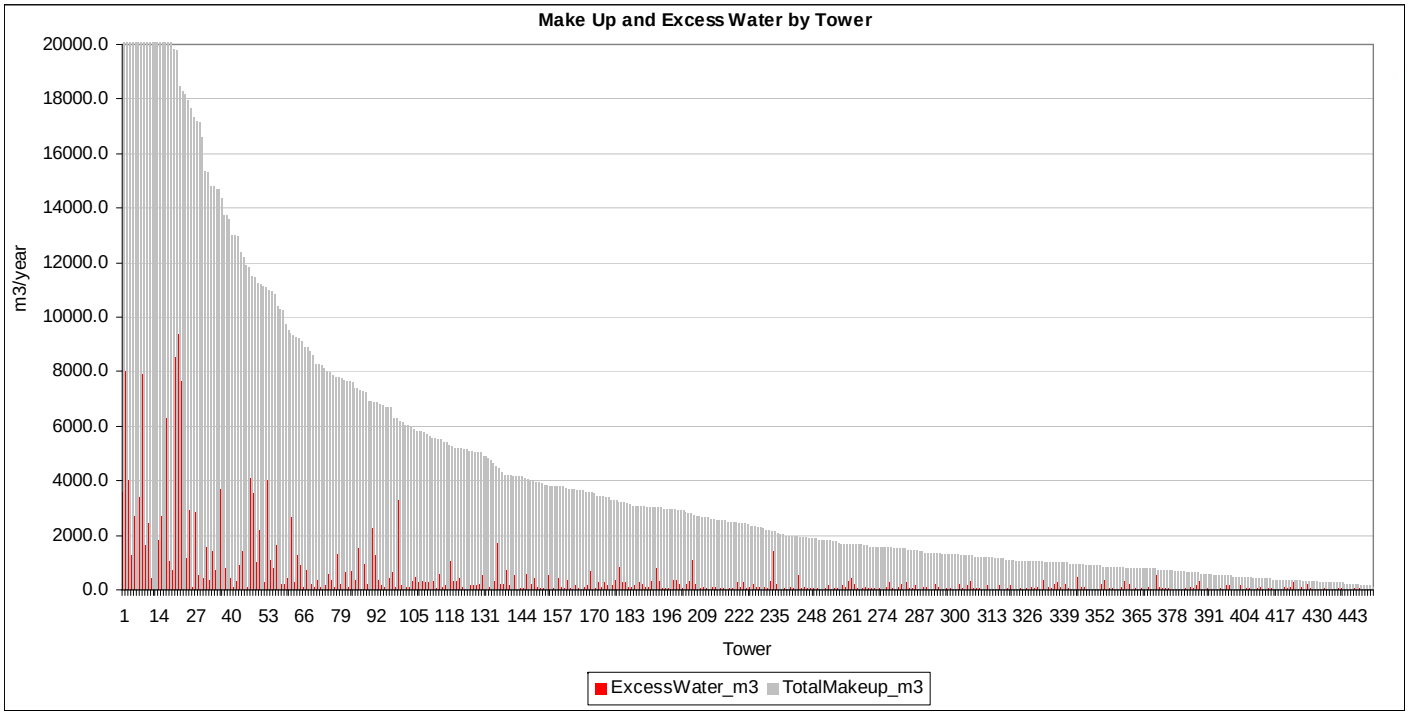
Scope of Project

- 469 Cooling Systems - between January and August
- 3 GL/yr water use by these towers
- 220kL Excess water (against best practice)
- 8% Excess water
- Extrapolated to State of Victoria – 1.9 GL Excess water

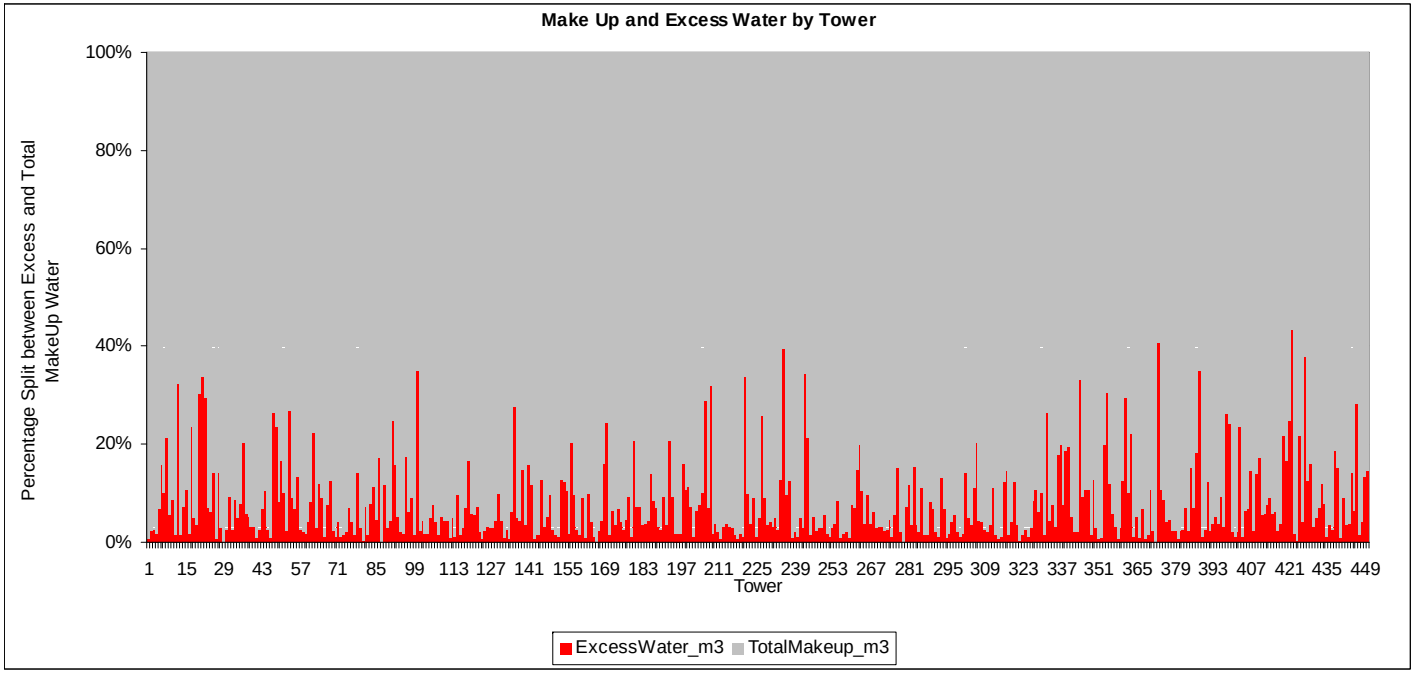
Outcomes

Relationship	No Relationship
• Presence of control equipment • Metro vs Non Metro • Overflowing systems (not many – but high water users)	• Size • Age •Manufacturer • Type • Water treatment service provider •Side stream filtration

Size



% In.Effncy



Further Investigation – 50 Worst Systems

- ***Basic Cooling System Information***
- Site Name
- Site Address & Contact
- System Common name:
- System CTS:
- Tower Manufacturer
- Tower Model
- Serial No
- Type of Cooling Tower
- Location of Tower
- No of Towers in System
- Width x Length x Height (m)
- Tower Volume (litres)
- System volume (litres)
- Recirculation Rate (l/s)
- Temperature differential (oC)
- Est Max evaporation rate (l/s)
- Calculated Ht Rej based on Evap (kW)
- Est Max Heat rejection (kW)
- Observed leaks/overflows
- Observed drift/splashout
- Services/Plant being cooled
- Water Treatment service provider
- Water treatment being employed
- Water treatment control equipment.
- Water source
- Visual condition of system
- Side stream filtration?
- Materials of construction
- Year tower built
- Life expectancy of Tower
- Future plans for expansion/removal
- Where does the bleed go

- ***Operational Data***
- Raw water quality
- Cooling tower quality (monthly)
- Recommended water quality provided by the water treatment service provider.
- Estimated cooling loads
- Water meter or bill readings

50 Worst Towers

- 11% of original sample
- 30% of original sample excess water
- Water conservation measures communicated
- Many sites implements conservation measures

50 Worst Towers – Outcomes

- **Initially**

  Total water : 454 ML/year
  Excess water : 93 ML/year

- **1st Visit (4 months)**

  Total water : 317 ML/year
  Excess water : 38 ML/year

- **2nd Visit (8 months)**

  Total water : 332 ML/year
  Excess water : 32 ML/year

- 51% reduction in total excess water

50 Worst – Main Reasons for Excess Water

Issue	Number of cases
Overflow (confirmed)	17
Overflow (suspected)	5
Control issues	8
Leaks	4
Tower balancing issues	3

Recommendations

- **Identify the worst performing towers**
  - Non metro focus
  - Automated bleed on all systems
  - Encourage service providers to report cycles of concentration and water efficiency
  - Encourage alarms on control equipment
- **Provide analysis tools**
  - Upgrade to efficiency calculator
- **3rd Party Audits**
  - Provided by water retailer
- **Communication**
  - AIRAH best practice guidelines
  - DA17 - updated
  - Regular training courses are presented.

Thank you

Any Questions ?

THE END