An Integrated Approach to Water Conservation for Large Users

3rd Regional African Water Summit 2013

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- August 2013 -

Global Outlook
No need for fancy graphics
Increasing population
Growing standards of living
Changing climate =

BIG PROBLEM =
We have to look for new ways and EVERYBODY has to do their bit
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An Integrated approach to water conservation for large users

Deserved to be there
No new infrastructure
Some of highest water use in the world
No awareness
Wasteful water cycle

Why are we doing it?

Modern Water Cycle

Saving Water – How?

KISS!
Start with basics
• What data is there?
• Does it make sense?
• Why?
• How?
• Who?
• When?

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Sanity check – KPI’s
- Offices 0.8m³/m².yr
- Shop Centres 1.5m³/m².yr
- Hospitals 0.5m³/patient.yr
- Universities 2.5m³/student.yr
- Cooling towers 600-800L/m².yr
- Defence too hard
- Industry, e.g.:
  - Brewery 1.5L

Sub and Smart Metering Options
- Permanent smart meter
- Temporary smart meter: ‘Minilogger’
- Shower monitor

Permanent Smart Metering
- Water meter
- Data log and transfer unit
- With Internet connection via GPRS or cable
- PC displaying water consumption

How to get value for money

How to go about it
- what will happen to the report?
- prepare water management plan
- check past water use, cost, discharge factors
- single line diagram
- KPI’s
- water balance
- savings options and cost
- implementation plan
- buy in

Site Water Use Balance Model
Understanding Site Water Use

- High Level Water Consumption at Sample Site (without restrictions):
  - Irrigation: 135,005 litres, 22%
  - Domestic: 115,682 litres, 20%
  - Swimming pools: 10,125 litres, 2%
  - Leaks and repairs: 1,012 litres, 0.2%
  - Hot and cold water: 227,016 litres, 30%

Apply Hierarchical Approach

1. Reduce water consumption
   - Efficiency measures – taps, toilets, urinals
   - Leak detection & rectification
   - Optimise operations
   - Process redesign

2. Internal water re-use
   - Machinery cooling water
   - Cooling tower water

3. Alternative sources
   - Rainwater
   - Stormwater
   - Treated effluent

Savings Opportunities

- Leak reduction through smart meters & water management
- Efficiency gains through:
  - Flow and flush reduction
  - Process optimisation for e.g. pool backwash, cooling tower
  - Different technology and energy savings
  - Better irrigation application and control
- Potable water replacement through:
  - Rainwater harvesting
  - Stormwater capture
  - Grey water or black water recycling and sewer mining

Think beyond simple measures …

- Technology can only go so far
- Users have a big role to play but must be informed
- Site-wide approach to water management is critical

Fit for Purpose Reuse Matrix

- Potable water supply
- On-site water supply
- Reclaimed water (treated)
- Reclaimed water (untreated)
- Stormwater (outfall)
- Grey water
- Black water
- Sewer mining

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Recycling

Rain- and stormwater harvesting

... but you will run out of water

Summarising it all

<table>
<thead>
<tr>
<th>Item</th>
<th>Measure</th>
<th>Water Savings M/L</th>
<th>Water Savings Sqr</th>
<th>Budget Credit</th>
<th>Payback (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amenity Taps</td>
<td>Reduce flow for taps</td>
<td>271</td>
<td>$1,015</td>
<td>$6,975</td>
<td>7.7</td>
</tr>
<tr>
<td>Tuboile</td>
<td>Mildly soften, no flush</td>
<td>68</td>
<td>$1,450</td>
<td>$3,507</td>
<td>2.1</td>
</tr>
<tr>
<td>Urinals</td>
<td>Mildly soften, rainwater flush</td>
<td>561</td>
<td>$3,472</td>
<td>$11,880</td>
<td>7.9</td>
</tr>
<tr>
<td>Showers</td>
<td>Mildly softened flow showers</td>
<td>2,160</td>
<td>$8,481</td>
<td>$7,926</td>
<td>0.8</td>
</tr>
<tr>
<td>Fixed Preperation</td>
<td>Low flow showers</td>
<td>15</td>
<td>$307</td>
<td>$1,890</td>
<td>1.4</td>
</tr>
<tr>
<td>Leaks</td>
<td>Find and address leaks</td>
<td>94</td>
<td>$2,204</td>
<td>$2,246</td>
<td>3.2</td>
</tr>
<tr>
<td>Smart metering</td>
<td>Main meter; 3 sub meters</td>
<td>45</td>
<td>$5,165</td>
<td>$3,450</td>
<td>4.9</td>
</tr>
<tr>
<td>Water management</td>
<td>Water management and saving</td>
<td>30</td>
<td>$500</td>
<td>$5,800</td>
<td>5.5</td>
</tr>
<tr>
<td>User Awareness/Training</td>
<td>PIR campaigns, smart materials</td>
<td>20</td>
<td>$537</td>
<td>$5,250</td>
<td>9.7</td>
</tr>
<tr>
<td>Rainwater harvesting</td>
<td>From strategy for use in amenity &amp; hot water</td>
<td>4,263</td>
<td>$16,353</td>
<td>$18,039</td>
<td>17.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>16,266</td>
<td>$52,396</td>
<td>$49,228</td>
<td>6.3</td>
</tr>
</tbody>
</table>

% Water Saved: 56%

- Implementation, cross-subsidisation, funding

Account for all costs + & -

- Water
- Wastewater
- Trade waste
- Safety
- Quality
- Productivity
- Energy
- Chemicals
- O&M

Delivery Mechanisms

- But how to get it done?
  - Traditional: Audit-Specify-Contract-Implement
  - Larger users: EPC
  - Beware the extra contractual costs!
  - Why audit if you can't go forward from there?
  - So why not some alternatives?
    - Easy wins
    - Leak insurance
    - Identify feasible options, attack them first

Water Management

- Get the basics right first
  - Billing information available and monitored
- Gather the data you need
  - Smart metering of all main & key sub-meters
- Make the right people accountable
  - For consumption in high use areas
  - Senior management commitment
  - Contractors and sub-contractors as well as internal staff
- Measure and report on performance
  - KPIs relevant to site developed, measured and publicised
### Examples

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Leak (L/min)</th>
<th>Prevented Water Usage (L)</th>
<th>Physical Cost Saving ($)</th>
<th>Prevented Cost Saving ($)</th>
<th>Prevented Revenue ($)</th>
<th>Revenue Savings (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building Boral Water Tower</td>
<td>Repair leak on 1 L/min</td>
<td>1</td>
<td>520</td>
<td>$4,399</td>
<td>$4,399</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>High-speed Larkin Stationary</td>
<td>Repair leak of 5 L/min, from kitchen and Amexive - cold output</td>
<td>9</td>
<td>4,790</td>
<td>$11,772</td>
<td>$11,772</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>High-speed Sagi Stationary</td>
<td>Repair leak of 5 L/min</td>
<td>5.5</td>
<td>4,995</td>
<td>$13,402</td>
<td>$13,402</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Heating Cooling Tower</td>
<td>Caused by blockage of 6 L/min</td>
<td>6</td>
<td>8,896</td>
<td>$40,819</td>
<td>$40,819</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Ski Cooling Tower</td>
<td>Water does not pass for proper heating</td>
<td>300</td>
<td>$810</td>
<td>$1,360</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>SRS Breed Stationary Tower</td>
<td>Bread Water Tower is not blocked</td>
<td>900</td>
<td>$610</td>
<td>$1,399</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>VPPF compliance Actions</td>
<td>Jamaica Blue Eight, Water</td>
<td>600</td>
<td>$610</td>
<td>$2,000</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
</tbody>
</table>

### Comparison of Races by Water Use Category

<table>
<thead>
<tr>
<th>Race</th>
<th>Total Use (L)</th>
<th>% of Total Use</th>
<th>Potential % of Total Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race 1</td>
<td>12,345</td>
<td>30%</td>
<td>35%</td>
</tr>
<tr>
<td>Race 2</td>
<td>12,345</td>
<td>25%</td>
<td>30%</td>
</tr>
</tbody>
</table>

### Waste Water Treatment Costs & Payback Analysis

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost ($)</th>
<th>Payback (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Upgrade</td>
<td>5,000</td>
<td>3.5</td>
</tr>
<tr>
<td>Leak Detection</td>
<td>1,000</td>
<td>1.5</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>2,000</td>
<td>2.0</td>
</tr>
<tr>
<td>Water Conservation</td>
<td>5,000</td>
<td>4.0</td>
</tr>
<tr>
<td>Environmental Benefits</td>
<td>3,000</td>
<td>3.0</td>
</tr>
<tr>
<td>Total</td>
<td>18,000</td>
<td>3.5</td>
</tr>
</tbody>
</table>

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<table>
<thead>
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<th>Obstacles</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Too busy – energy is key focus</td>
</tr>
<tr>
<td>• We’re doing all we can</td>
</tr>
<tr>
<td>• No money (maintenance budget vs. capital)</td>
</tr>
<tr>
<td>• Does not pay</td>
</tr>
<tr>
<td>• The “system”</td>
</tr>
<tr>
<td>• Past sins</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lessons</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Don’t wait for the crisis – act now! It takes time!</td>
</tr>
<tr>
<td>• Standards, rules, regulations can work well</td>
</tr>
<tr>
<td>• Provide assistance but be clear why you are doing it and demand</td>
</tr>
<tr>
<td>monitoring and access to data</td>
</tr>
<tr>
<td>• Trial different options – but monitor them carefully</td>
</tr>
<tr>
<td>• Think more holistically, think in systems</td>
</tr>
<tr>
<td>• Trading off water efficiency vs. energy efficiency/savings</td>
</tr>
<tr>
<td>• Using stormwater or recycled water is not necessarily “better”</td>
</tr>
<tr>
<td>• Find a solution that fits rather than what is</td>
</tr>
</tbody>
</table>

Sample Cumulative Savings

<table>
<thead>
<tr>
<th>Contractually guaranteed</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>$47,937</td>
<td></td>
</tr>
<tr>
<td>$1,094,907</td>
<td></td>
</tr>
</tbody>
</table>

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Some good web sites

- google Sydney Water “Every Drop Counts” program
- google .au KPI’s for Commercial and Industrial Water Users
- www.watergroup.com.au

Freebies

- sample specifications and work methodologies
Summary

- Cost effective savings everywhere!
- Large potential inside industrial/commercial users
- Industry has money – and it pays (1-2yr payback)
- Start with end in mind! Taylor your approach

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