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MARK THROWER MANAGING EDITOR

Water Management in Buildings & Industry

By Joe McClelland, senior energy consultant

There is a global increase in floods and droughts and the question is as to whether this is just normal weather fluctuations, or if it is the new norm in prevailing climate conditions, as some compelling data suggests. Globally, the spatial and temporal changes to rainfall patterns when combined with a growing population mean that by 2035 an estimated two-thirds of the world's population will live in an area of water stress, which has led to water shortage being seen as a primary threat to global stability.

Mostly to date we have delivered only supply-side solutions but Consumers need to understand that water is not unlimited and that a major part of the solution will depend on integrated supply and demand-side measures.

This is the challenge— centralised management of utilities gives efficiencies but makes the problem distant from the solution, local solutions at industry, commerce community and household levels are the most efficient ways to deliver demand management, but utilities don't have the capacity to manage millions of individual household water saving projects.

This message is delivered to consumers via third party routes augmenting utility programs and building a water saving culture. At the same time links are being made between the environmental programmes of water utilities, energy utilities, and corporates and this will add value to each of the programmes, this also gives the opportunity for cross-funding.

Water, waste, energy, and CO_2 savings at all levels can be aggregated into integrated managed savings programmes.

This article will focus on how water management can deliver resource, energy and cost efficiencies through integrated Water Management within the built environment.

Water management in the environment is the activity of managing the optimum and cost effective use of delivered water resources. It is a sub-set of resource management. Ideally, the water management process has regard to demand for water supply, subsequent wastewater levels, and how to reduce these without affecting the existing quality of service.

Successful management of any resource requires accurate knowledge of the resources available, the uses to which it may be put, the demands for the resource and processes to measure and evaluate these and to identify, implement and verify the outcome of applied conservation measures.

Managing water use in buildings covers many elements, from initial investigations and commitment from senior management, through to implementation and continuous improvement.

It is vital to have effective procedures in place to manage a water reduction programme, otherwise any improvement may become a one-off initiative with no follow-up; employees will not be motivated to continue good practices and the programme will lose momentum and fail.

Ensure your employees are aware of the total cost of water to your site – water is often an undervalued resource and some sites still believe it is free.

Potential cost savings associated with water efficiency improvements are often the driver that motivates management to support a water use reduction programme.

Successful management involves identifying and initiating water saving projects; continual monitoring of water use and company/staff practices; and a timely, appropriate response to the information gathered.

The initial water management process as shown in Figure 1 (see page 26) consists of:

- **assessment** – a high-level assessment of the existing services potential for the site;
- **data gathering** – check historical bill payments and meter readings and gather all data available for the last two to three years;

• **invoice validation** – check all appropriate invoices for possible discrepancies across the range of all water services supplied;

• **reporting** – present findings and where possible identify recoveries from billing data irregularities;

• **recovery** – approach the water supply company for reimbursement of identified and verified past over-charging episodes;

• **demand-side survey** – arrange for a survey to identify where water is being consumed and recommend measures to reduce consumption.

Potable mains water supply from your utility company is billed depending on the amount of consumption measured through the water meter. This source of water is potable as it is essentially supplied at food grade so demand-side reduction measures help to conserve this and also reduces supply costs.

Fig. 2 identifies various supply and demand measures that can be employed to manage water supply and reduce consumption and costs in buildings.

Examples of conservation measures for water supply sides are as follows:

• **harvested rainwater** - rainwater harvesting is the collection of water from surfaces on which rain falls, and storing this water for later use. The most common method of rainwater harvesting is the collection of rainwater from the roofs of buildings. Capturing rainwater cannot only significantly reduce water costs but also helps to reduce the stress on national reservoirs.

• **treated grey water** – grey water is all wastewater generated in buildings from waste streams except for the waste water from toilets. Sources of grey water include, sinks, showers, baths, clothes washing machines or dish washers. As grey water contains fewer pathogens than domestic wastewater, it is generally safer to handle and easier to treat and reuse onsite for toilet flushing, landscape or crop irrigation, and other non-potable uses; and

• **recycled water** - reclaimed or recycled water is the process of converting wastewater into water that can be reused for other purposes. Recycled water can be directed toward fulfilling certain needs in businesses and industry, and can even be treated to reach drinking water standards. Reclaiming water for reuse applications instead of using freshwater supplies can be a substantial water-saving measure. Reusing wastewater as part of sustainable water management allows it to remain as an alternative water source for human activities.

Fig 1. An initial water management process

Examples of conservation measures for potable water demand side are as follows:

• **WC cistern water displacement devices** - fitting a water saving device in toilet cisterns is a simple, low-cost way of saving water. Modern toilets, fitted since 2001, typically use 4-6 litres of water per flush and may have a two-button dual-flush operation. Water displacement devices are not suitable for this type of toilet but can save 2 to 3 litres per flush on 9 litre cisterns installed prior to 1991;

• **low water use spray heads and nozzles** - these are devices that can be used to greatly reduce water use from replacing showerheads and also from industrial process water spray nozzles.

• **water leakage management** – check meter readings and compare against expectant levels of water consumption for your use/industry. If the results are indicating excessive water consumption, this could be due to leakage from you incoming water supply pipework downstream of your meter point. This can be resolved by carrying out leak detection activities to identify where the leak is and repairing it.

Following the initial review, the steps below are recommended for further examination, appraisal and assessment.

1. Obtain management commitment to water saving activities

Your business is most likely to make savings if senior management is committed to saving water.

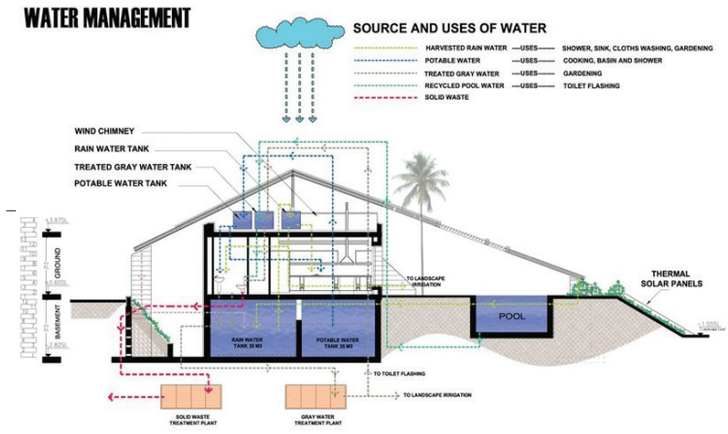
It is also useful to identify at least one person in the company who will be allocated the time and resources to champion water-saving initiatives. This person should take regular site tours during all shift patterns to establish where water is being used, whether procedures are being adhered to and where water is potentially being wasted.

It is important that key personnel such as your water champion, site engineer or site manager have access to water bills. Ensure that bills are not simply paid by the accounts department. Check that they reflect actual usage.

2. Measure water use on your site

Create a water balance by gathering existing site water use data and marking the major water uses on a simple pictorial representation of your site.

Fig 2. Supply and demand measures to manage water supply



To ensure robust data is obtained, consideration should be given to the development of an operational control procedure to monitor and measure water on site. The purpose of such a procedure is to provide methodologies to:

Monitor water consumption in a controlled manner. This would include instructions on:

• how to measure water consumption (e.g. electronically and/or manually);

• the frequency of measurement (e.g. daily, weekly);

• where to record the data; and

• how to communicate the data.

Demonstrate progress towards, and the achievement of, water efficiency objectives and targets.

3. Analyse results and identify areas of potential savings

Brainstorm and research ideas for reducing water use in certain areas. Involve all staff and consider including all appropriate contractors, such as cleaning staff, at this point as they may have good ideas. Identify water use reduction projects and assess the potential cost savings from them.

4. Set targets

Decide on your maximum budget. Set targets for the savings you want to achieve in each area. Set target payback times so that you have a timeframe in which to achieve the savings.

For companies that have/are implementing an EMS, these targets can be used in your management programme/action plan. For those that have not yet implemented an EMS, such targets could be used as a catalyst for a full EMS implementation programme.

5. Plan

Get detailed costs from suppliers for any new equipment you want to install and work out what resources you need for various activities.

Use all the information you have gathered to develop your action plan. An action plan will help you to assess your environmental performance, compare opportunities and prioritise actions.

6. Involve Site/Building Users

You may already have involved staff when looking for ideas for saving water. Keep them involved at all stages. It is vital for staff to feel that they are involved, consulted and informed; this improves motivation.

7. Implement improvements
This may include training staff, installing new equipment or fixing existing equipment and informing staff about best practice procedures.

8. Monitor, report and review
Once improvements have been implemented or adopted, it is important to measure and monitor regularly. That way, you not only check that you are hitting your targets, but you also identify any areas that need attention. Get feedback from staff and carry out regular inspections and surveys. Inform staff of progress and results, and be sure to report success stories.

Staff suggestions that directly result in water savings could be reported in company communications (e.g. a newsletter).

To achieve certification/registration to a formal EMS, you must provide documented evidence that you have worked towards achieving the objectives and targets in your management programme/action plan. Monitoring, measuring, and reviewing objectives and targets are therefore key elements of EMS implementation. These processes enable you to identify whether the objectives and targets are realistic and achievable. If the process concludes that the objectives and targets are not realistic, a review will need to be undertaken to modify them and make them achievable.

9. Continue
Use your reviews as the basis for further action. Set future targets and use your environmental action plan for ongoing improvements.

Benchmarking is the process of comparing the cost, cycle time, productivity or quality of a specific process or method against one that is widely considered to be an industry standard or best practice. Essentially, benchmarking provides a snapshot of your business performance and helps you understand where you are in relation to a particular standard.

Internal benchmarking is a comparison between similar operations in your own organisation. External benchmarking is a comparison with best practice achieved by others in the industry.

Benchmarking can be used by a business as an indication of how it is performing in terms of water consumption and effluent generation (i.e. product loss) compared with the rest of its sector.

Objectives are the overall aims that a business will set to reduce its water consumption on site. However, this alone will not bring about a reduction in water use. Short-term goals need to be set to achieve the overall objective of reducing water use. These short-term goals are referred to as targets, which are derived from internal/external benchmarking.

Benchmarking data also provides assurances that the target associated with the objective is realistic and achievable.

Benefits of benchmarking

- a useful tool for highlighting areas where there might be discrepancies;
- a simple way to express performance that can be used as a tool to communicate to staff the need to manage resources;
- it encourages improvement and makes it easier to identify opportunities to reduce wastewater; and
- it helps to manage variable costs and to develop key performance indicators.

There are a number of benchmarks that have been developed from surveys of a large number of sites with a similar activity by a range of organisations. These can be used to provide further robust benchmarks of water use for each site other than yearly water use divided by area. In many instances, this additional benchmarking data can be used to highlight good, average and excessive water practices on site.

For each site report, reference should be made to the most relevant water use benchmarks depending on the main use and the specific determinant that would influence water use.

By dividing the most recent aggregated cost for annual water use and sewerage charges by the annual mains water use, an average overall cost per cubic meter can be developed.

Key Performance Indicators (KPIs) are essential to any successful benchmarking campaign. KPIs are financial and non- financial measures that can be used to help a business define and evaluate how successful it is, typically in terms of making progress towards its long-term organisational goals.

KPIs can allow management to see the performance of a company or department in one place. A team can work together to a common set of measurable goals and they can be a very quick way of seeing the actual benefits and improvements from a strategic objective. As a result, decisions can be made much more quickly when there are accurate and visible.

KPIs are an essential element of water management implementation as they provide normalised numerical values to the environmental performance of a business. Normalising data is key to monitoring the success of any environmental programmes in a business, such as water efficiency projects.

Further reading

- Butler, D. and Fayyaz M., Eds (2006): Water Demand Management.
- Water Minimisation in the Food and Drink Industry. www.wrap.org.uk
- A Practical Approach to Water Conservation for Commercial and Industrial Facilities, Mohan Seneviratne.
- A Practical Water Efficiency Guide for Businesses in Northern Ireland, Invest Northern Ireland.
- 'Cutting Water and Effluent Costs' IChemE
- 'Water Use and Reuse" IChemE/ Envirowise
- R&D Technical Report W6-056/TR2 Part A: Industrial Component
- www.bbc.com/water

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CPD SERIES 15 | MODULE 04 | SEPTEMBER 2017

ENTRY FORM

WATER MANAGEMENT

Please mark your answers on the sheet below by placing a cross in the box next to the correct answer. Only mark one box for each question. You may find it helpful to mark the answers in pencil first before filling in the final answers in ink. Once you have completed the answer sheet in ink, return it to the address below. Photocopies are acceptable.

QUESTIONS

1. By 2035, what is the estimated percentage of the world's population that will live in an area of water stress is:
- ☐ One-third;
- ☐ Two-thirds;
- ☐ One-half;
- ☐ One-fifth.

2. Which of the following are steps in an initial water management process?
- ☐ Assessment;
- ☐ Recovery;
- ☐ Data gathering;
- ☐ Install water conservation measures

3. Which of the following are examples of a water demand side conservation measure?
- ☐ WC cistern water displacement devices;
- ☐ Treated grey water;
- ☐ Water leakage management;
- ☐ Recycled water

4. Which of the following are examples of a water supply-side conservation measure?
- ☐ WC cistern water displacement devices;
- ☐ Treated grey water;
- ☐ Low water use spray heads and nozzles;
- ☐ Harvested rain water

5. Which of the following are key issues and actions for successful water management?
- ☐ Obtaining management commitment to water saving activities;
- ☐ Setting targets;
- ☐ Planning;
- ☐ Water quality

6. Which of the following are true water use benchmarking benefits?
- ☐ It is a useful tool for highlighting areas where there might be discrepancies;
- ☐ It is a simple way to express performance that can be used as a tool to communicate to staff the need to manage resources;
- ☐ It does not encourage improvement and makes it easier to identify opportunities to reduce wastewater;
- ☐ It is a highly accurate water consumption assessment method and tool

7. Which of the following are true KPI benefits?
- ☐ They can allow management to see the performance of a company or department in one place;
- ☐ Decisions can be made much more quickly when there are accurate and visible measures to back them up;
- ☐ It does not particularly help a team to work together to a common set of measurable goals;
- ☐ It can be a very quick way of seeing the actual benefits and improvements from a strategic objective

8. When monitoring, reporting and reviewing water consumption, which of the following are false?
- ☐ Once improvements have been implemented or adopted, it is important to measure and monitor regularly;
- ☐ Inform staff of progress and results, and be sure to report success stories;
- ☐ These processes do not enable you to identify whether the objectives and targets are realistic and achievable;
- ☐ Sub-metering of separate water consumption areas has no value

9. When analysing results and identifying areas of potential savings, which of the following approaches are false?
- ☐ Do not include contractors;
- ☐ Brainstorm and research ideas for reducing water use;
- ☐ Involve all staff at this point as they may have good ideas;
- ☐ Identify water use reduction projects and assess the potential cost savings from them

10. When setting targets for reducing water consumption, which of the following statements and actions are true?
- ☐ Set targets for the savings in each separate area;
- ☐ For companies that have/are implementing an EMS, their targets should not be used in a water management programme/action plan;
- ☐ Due to inherent low costs there is no need to set a maximum budget for this;
- ☐ For those that have not yet implemented an EMS, such targets could be used as a catalyst for a full EMS implementation programme

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