3.15 Cost Effectiveness for Industrial Water Users

A. Introduction

The industrial water user should determine if implementation of each identified BMP measure to achieve water savings would be cost effective. The analysis should determine the cost effectiveness to the industrial water user of the lower direct costs of the saved water and other cost savings that may also accrue. Many operating procedures and controls that improve water use efficiency should be implemented simply as a matter of good practice. In other cases the industrial user may decide to implement BMPs based on non-cost factors such as public good will or political reasons. In evaluating equipment and process additions or changes, each industry should utilize its own criteria for making capital improvement decisions.

B. Cost Effectiveness Example

The following gives a simplified example of the process that an industrial water user can use to evaluate the cost effectiveness of making water savings investments and decisions under any applicable BMP. Each industry should utilize its own financial criteria for making capital improvement decisions.

A cooling tower efficiency audit of a small industrial facility resulted in three recommendations for water savings: increase the cycles of concentration in the cooling tower, improve the overall cooling system efficiency with regard to repairing facilities and overall system operations, and look for opportunities to reuse the cooling tower blowdown.

The system currently uses approximately 20,000 gallon per day (14 gpm). Increasing the cycles of concentration from two (2) to six (6) will reduce the amount of blowdown water by about 8,000 gallons per day. To effectively do that the system will require new monitoring and controls for pH and conductivity, automatic blowdown controls, chemical feed systems, and related piping and equipment modifications. Also, to maintain that level of operation, the industry will utilize the service of a professional water treatment firm to monitor the operation and supply appropriate chemicals to keep the facilities in good repair.

Estimated capital costs of retrofitting and installing conductivity controller, probes, valves, chemical injectors, relays, etc., will be about $7,500. For a medium size facility the cost of using a monthly water management consulting and chemicals firm would increase by approximately $250 per month ($3,000 per year). In this example, the water source is the company's own wells, and the overall average cost of supplying water and disposing of wastewater is $2 per 1000 gallons.

Estimated water savings = 8,000 x 360 days = 2,880,000 gal (8.84 ac ft)
Or $5,760 a year ($480 per month) or $652 per acre foot per year

1) The simple payback analysis for capital expenditures =

   $7,500 / ($5,760 - $3,000) = 2.7 years

3) Millwater Pumping System Optimization Improves Efficiency and Saves Energy at an Automotive Glass Plant, Office of Industrial Technology, Department of Energy, March 2003. http://www.oit.doe.gov/bestpractices/factsheets/gl_cs_visteon_nashville.pdf
4) *Water Efficiency Guide for Business Managers and Facility Engineers*, Sate of California Department of Water Resources, October 1994.
5) *Commercial and Institutional End Uses of Water*, AWWA Research Foundation, Summer 2000.
6) *Waste Not, Want Not: The Potential for Urban Water Conservation in California,* Pacific Institute, November 2003. http://www.pacinst.org/reports/urban_usage/waste_not_want_not_full_report.pdf
7) *Water Efficiency Manual for Commercial, Industrial and Institutional Facilities*, State of North Carolina, August 1998. http://www.p2pays.org/ref/01/00692.pdf

F. Documentation

To track the progress of this BMP, the industrial water user gathers and maintains the following documentation and can utilize industry accepted practices:

1) Water-use survey results and potential conservation measures identified through the survey;
2) A description of each BMP implemented;
3) A description of the measures implemented and estimated water use reductions achieved through these measures. The water user should document how savings were realized and the method and calculations for estimating savings; and
4) A copy of the site specific conservation practice and the conservation program, which includes all BMPs planned, estimated potential water savings and schedule for completion.

G. Determination of Water Savings

The industrial water user should calculate water savings based on the calculation methodology appropriate to the identified water efficiency measures adopted. Each industrial process will have its own potential for water savings. Studies have shown estimated overall water savings for implementing water audits have been in the range of 10 percent to 35 percent on average. Efficiency measures which included changing from high quality or potable water to recycling water have shown savings in the range of 50 percent to as high as 95 percent.[1]

H. Cost-effectiveness Considerations

The industrial water user should determine the cost effectiveness to implement each identified water savings opportunity, utilizing its own criteria for making capital improvement decisions. A cost effectiveness analysis under this BMP should consider, as appropriate, capital equipment costs, staff and labor costs, administrative materials and overhead, chemical and treatment costs, additional costs or savings in energy use, costs for waste disposal, and potential savings in wastewater treatment costs. The one-time-only costs of developing and implementing the facility evaluation survey and recommendations should also be included.

I. References for Additional Information

There are significant resources that have already been developed that should assist an industrial water user in implementing this BMP.

1) *Handbook of Water Use and Conservation*, Amy Vickers, Waterplow Press, May 2001.
2) *A Water Conservation Guide for Commercial, Institutional and Industrial Water Users*. New Mexico Office of the State Engineer, July 1999. http://www.seo.state.nm.us/water-info/conservation/pdf-manuals/cii-users-guide.pdf

reviewing information should be defined. Direct management involvement in the goal setting process should facilitate acceptance and improve the likelihood of success. The specifics of the conservation practice will dictate how quickly it can be implemented and how quickly water savings can be achieved. Generally, a conservation practice should not take more than one year to develop and implement. Water conservation should become a regular parameter that the management team reviews just as they regularly review revenue, costs, financial performance, safety, and environmental compliance. Toward that end, just setting expectations of water conservation without regular review or monitoring of the results will not result in a more water-use efficient facility.

In addition to saving water, energy and money, positive public opinion is an extremely important benefit. Because Texas is a very diverse state with a variety of climatic conditions, water conservation is of ongoing public interest. News media throughout the state routinely cover "good news" stories about companies, institutions, and industrial facilities that take a proactive stand on water conservation. Incorporating conservation efforts into qualifying for TCEQ's Environmental Excellence Program or Clean Texas Program are excellent methods of achieving this objective.

D. Schedule

If the water user chooses this BMP, the following is a recommended schedule:

1) The water-use survey should be conducted in a timely manner. Audits of very large or complex systems should be completed in the first three (3) months after initiating this BMP.
2) The selection and development of BMPs, cost-effectiveness analysis of water efficient alternatives, and the development of the conservation practice should be completed by the end of the first year. If determined to be necessary for very large or complex facilities, the schedule can be extended. BMPs should be initiated within the normal business cycle and continued until the targeted efficiency is reached.
3) Regular monitoring of water use and annual evaluation of water-use efficiency should be maintained.

E. Scope

To accomplish this BMP, the industrial applicant should:

1) Conduct an industrial water-use survey consistent with the guidelines and schedule above, and
2) Implement the site specific conservation practice.

For new facilities, design and construction should be accomplished with conservation in mind, and measures implemented should be documented to demonstrate efficiencies achieved, and water savings potential of such measures.

C. Implementation

Any industrial site specific water conservation program must have a fundamental starting point: to understand the water use at the facilities. The initial step is to perform an industrial water-use survey as described in BMP 3.1 (Industrial Water Audit). The water-use survey should include an evaluation of all water-using equipment and processes and identification of potential conservation measures along with their expected payback based on a cost/benefit analysis.

1) Access Information and Resources
There are many sources of information available on all aspects of water conservation. Water conservation districts, water planning groups, industry trade associations, and the Texas Water Development Board ("TWDB") are all good sources for specific conservation guidance materials. A water user should first attempt to find available resources that will greatly reduce the time and cost of developing a site specific BMP. The easier and quicker the practice can be prepared the sooner implementation can commence and results can be obtained.

2) Define Performance Measures
In order to set goals and monitor conservation success it is necessary to derive performance measures. Each facility audit should identify the appropriate performance measure of water usage. Examples of performance measures are gallons per unit of product, per employee, per process, per cycle, per unit of energy consumption, per unit of manufacturing area, or per time period. Those performance measures should be used in tracking the success of this Industrial Site-Specific Conservation Program BMP. Two examples are gallons per pound or ton produced and gallons per kWh of power produced.

3) Employee Education & Participation
Employees can have a major effect on the success of a water conservation practice and the overall conservation program. Employees will be responsible for implementing efficient practices and are usually the first to notice a problem and/ or identify changes that can make the process more efficient. Therefore, it is imperative that they be kept informed about the program and made an integral part of all water reduction efforts. The steps outlined in BMP 3.12 (Management and Employee Programs BMP) can serve as a guideline for effectively informing employees of the BMPs in your program and enlisting their full support and participation on an ongoing basis.

4) Measure Results & Publicize Success
The site-specific water conservation practice should include specific metrics on water use and water conservation strategies. Goals should be approved by management and be specific and measurable, and a timetable for compiling and

3.14 Industrial Site Specific Conservation

A. Applicability

This BMP applies to any industrial water user with facility or product-specific water-using processes. While other BMPs address most water uses in industrial facilities, this BMP is offered to assist the industrial water user in designing a BMP for process which is not covered by other industrial BMPs. The industrial water user can use the guidelines of this BMP to develop a site-specific BMP using appropriate elements from other BMPs. This BMP would also be useful for an industrial user that may be required to submit a conservation plan to a wholesale provider or other entity.

B. Description

Industrial conservation practices are essential for reducing water usage in the industrial sector. Under this BMP, the water user should conduct an industrial water-use survey as defined in BMP 3.1 (Industrial Water Audit). The water-use survey includes an evaluation of all water-using equipment and processes and will result in a report identifying potential conservation measures and their expected payback based on a cost-effective analysis. From the results of the survey a water conservation program should be developed that identifies performance goals, actions to meet the goals, and methods of measuring success and estimating water savings.

Those facilities which operate an Environmental Management System ("EMS") may already have water conservation as an environmental aspect and may have already adopted a conservation program. Facilities that have adopted ISO 14000 or other systems with a "Plan-Do-Check-Act" framework may already meet several of the elements of this BMP.

Because each facility is unique, the scope and formality of its conservation program will vary according to its size, sector, and complexity. Once all water uses are identified through a survey and potential conservation goals are identified, other industrial BMPs should be reviewed for applicability and those BMPs that would be beneficial to the water user should be selected.

If there are specific measures that should be implemented that fall outside already existing BMPs, a BMP can be developed following the Best Management Practice outline. All selected and developed BMPs should then be incorporated into the conservation program. A qualifying conservation program and site specific BMP should include the following essential elements:

1) Clear description of goals and implementation steps
2) Implementation schedule
3) Scope
4) Documentation
5) Information used to determine water savings
6) Cost-effectiveness analysis

4) *Turf and Landscape Irrigation Best Management Practices*, Water Management Committee of the Irrigation Association, September 2003. http://www.irrigation.org/PDF/IA_LIS_AND_WM_SEPT_2003_DRAFT.pdf
5) *Waste Not, Want Not: The Potential for Urban Water Conservation in California,* Pacific Institute, November 2003. http://www.pacinst.org/reports/urban_usage/waste_not_want_not_full_report.pdf
6) *WaterWise Council of Texas.* http://www.waterwisetexas.org/
7) *San Antonio Water System Conservation Program.* http://www.saws.org/conservation/
8) *ET and Weather Based Controllers CUWCC Web Page.* http://www.cuwcc.org/Irrigation_Controllers.lasso
9) *Smart Water Technology Initiative Web Page.* http://www.irrigation.org/swat1.asp
10) *Austin Green Gardening Program.* http://www.ci.austin.tx.us/greengarden/
11) *City of Corpus Christi Xeriscape Landscaping.* http://www.cctexas.com/
12) *Texas Cooperative Extension for El Paso County.* http://elpasotaex.tamu.edu/horticulture/xeriscape.html