2.1 Cost Effectiveness Analysis

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.

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

The payback method does not take into account the time value of money.

2) A simple present worth analysis, with the assumptions of a 6 percent rate over the estimated life of the controls of ten (10) years shows that it would be cost effective to implement the measure.

6%, 10 years		Amount	Years	P V
Capital Costs	$	7,500	0	($7,500)
O & M Contractor	$	250	per mo	($22,518)
Water Savings	$	480	per mo	$43,235
Net Present Value				$13,217

3) The second water savings recommendation is to increase the overall efficiency of the cooling system by such measures as coil cleaning, reducing heat load, making operations more efficient with variable speed fans and pumps, adjusting belts, replacing fill, repairing and replacing shielding, and generally keeping the system in good repair. Estimated water savings from these measures could be up to an additional 15 percent (Pacific Institute, 2003), which is about 1,800 gallons per day. If the company spends $5,000 in cleaning up the cooling tower operation initially, and then spends $1,000 every other year for a ten year period, the cost effective analysis shows that the measure would be effective, again assuming a ten (10) year life of the measure.

6%, 10 years		Amount	Years	P V
Capital Costs	$	5,000	0	($5,000)
Periodic cleaning, etc	$	1,000	every 2 yrs	($3,573)
Water Savings	$	108	per mo	$9,728
Net Present Value				$1,155

4) The next recommended water savings measure was to investigate opportunities for reuse of the blowdown water for other purposes within the facility. After savings from increasing the cycles of concentration, the quantity of water is relatively small, and quality of the water will not be suitable for every purpose. This facility requires relatively good quality of water for reuse in its manufacturing processes, so in order to use the approximately 2,000 gallons per day of blowdown, collection facilities, a tank, additional pumping, and a small membrane treatment unit will be needed for a cost of $10,000. Then operating costs are conservatively estimated to be approximately $100 per month. If the

facilities have a useful life of 10 years, then the analysis shows that the measure is not cost effective.

6%, 10 years		Amount	Years	P V
Capital Costs	$	10,000	0	($10,000)
Treatment costs	$	100	per mo	($9,007)
Water Savings	$	108	per mo	$9,728
Net Present Value				($9,279)

Additional Considerations

The analyses in these examples are fairly straightforward and some assumptions to simplify the example were made. In a detailed, case by case evaluation of the water users facilities, there are additional cost components associated with the water savings measures that may be taken into consideration, including:

1) Initial efficiency evaluation and engineering costs.
2) Administration and other increased labor costs if significant.
3) Estimated energy savings.

The cost of water is also a very significant component of the analysis. In this example it was assumed to be the same for the entire period, and the production facilities were already in place. If the industry would have to consider the additional expansion of its water facilities, or obtaining alternate water supplies at some point in the future, the costs of water saved would be even greater. These costs would include:

1) Costs of water or contract purchase of water.
2) Construction of treatment or production facilities.
3) Operating costs.
4) Increased or alternative costs of waste disposal.