

## 2.3 Industrial Water Audit

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### *Applicability*

This BMP is intended for industrial water users and should be thought of as the initial BMP for industrial water users to increase water efficiency at their facility. Under this BMP, the water user collects information about all water that enters a facility and an understanding of how that water is used within a facility. Once an industrial water user decides to adopt this BMP, the water user should follow the BMP process closely in order to achieve the maximum water efficiency benefit from this BMP.

### *Description*

Water audits are effective methods to account for all water usage within a facility in order to identify opportunities to improve water use efficiency. Benefits from implementation of this BMP may include lower utility costs, energy savings, and reduced process costs. It will also provide information helpful in the implementation of related Industrial BMPs such as Water Waste Reduction BMP, the Industrial Submetering BMP, the Industrial Landscaping BMP, the Cooling Towers BMP, Cooling Systems (other than Cooling Towers) BMP, and the Industrial Alternative Sources and Reuse of Process Water BMP.

Facility water audits include accurate measurement of all water entering the facility, the inventory and calculation of all on-site water uses, any unused water sources or waste streams that may be available, calculation of water related costs, and identification of potential water efficiency measures. The information from the water audit should then form the basis for a comprehensive conservation program to implement specific water saving measures throughout the facility. The conservation program may consist of one or more projects in different areas of the facility.

The steps to conduct a water audit are listed sequentially in Section C. The order can be altered if it would be more effective at a particular facility. This BMP is the first step in implementing industrial water conservation. As the water user identifies opportunities for conservation, other BMPs will be indicated as listed below:

- 1) After completing this BMP, if unaccounted water is greater than 5 percent, the Water Waste BMP should be considered. At facilities, where no system of internal water measurement has been established, the determination to implement the Water Waste BMP should be delayed until the Submetering BMP is implemented.
- 2) The next step is to determine if the Submetering BMP needs to be implemented in order to be able to account for all water use within the facility.
- 3) If water use for irrigation represents a significant portion of demand, then the Landscape BMP should be considered and more detailed information on landscape irrigation and outdoor water use should be collected.

- 4) If the facility has a cooling tower, then the Cooling Towers BMP should be considered.
- 5) If there are cooling processes, then the Cooling Systems (other than Cooling Towers) BMP should be considered.
- 6) Finally, if there are opportunities to reuse water within the facility or reclaimed water is available from a utility provider, the Reuse of Process Water BMP should be considered.

### *Implementation*

Generally following the guidelines as outlined in this section, the industrial water user should conduct a facility audit. References that provide more detailed audit procedures are listed in Section I.

#### 1) Preparation and information gathering

The material collected should be used to implement this BMP and should be useful for other BMPs as well. Information that should be collected before beginning the audit includes maps of facilities with building sizes and locations of main water supply meters and any submeters, numbers of employees and work schedules, inventories of plumbing fixtures, inventories of water using equipment and processes including water quality limitations, and outdoor water use information including irrigation schedules and types and square footage of landscape materials. Also, water use and water quality data for the past three years should be collected such as utility records of water used and wastewater generated, actual water use on site including submetered use, and non-utility water use such as wells or storm water. Additionally, any prior water use surveys or energy audits should be obtained and reviewed since these reports may include useful and relevant information to determine the most appropriate water saving measures to implement. If the plant has a water right of greater than 1000 acre-feet per year, then it should have a water conservation plan submitted to the Texas Commission on Environmental Quality. If the plant has a waste discharge permit, the water balance diagram included with the permit should be obtained. All possible alternative sources of water should be inventoried.

#### 2) Conduct facility survey

The on-site physical examination and water use survey should identify and verify all equipment that uses water, noting discrepancies to update the inventory. Equipment information should be verified or measured for hours of operation, meter calibrations, and manufacturers' listed flow rates. If appropriate, water quality should be analyzed so that reuse of water can be assessed. Daily water usage for each major water use area should be determined and, when added together, total facility usage calculated on a monthly basis and compared with the utility measured sales to the facility. The quantity of water used by specific processes should be considered in developing the priority list of facility areas for the audit.

If water use for irrigation represents a significant portion of demand more detailed information on landscape irrigation and outdoor water use should be collected. When applicable, a determination of irrigation schedules from irrigation controllers should be made

along with a run of the irrigation system to measure the distribution efficiency as well as to identify leaks, overpressurization, and broken heads. The Landscape BMP should be considered if it is determined that improvements in irrigation practices may offer opportunities for significant water savings.

### 3) Prepare a facility audit report

The data gathering and the facility survey should be incorporated into a facility audit report that includes an updated set of facility diagrams and water flow charts broken down by water use areas, a current list of all water using equipment including actual and manufacturer recommended flow rates, a current schedule of operations for all manufacturing or process areas and equipment, a monthly landscaping irrigation schedule based on no more than 80 percent of historical ETo with recommended landscaping equipment repairs and upgrades, water use observations revealed by the walk-through of the facility, an analysis of water costs by operating area and for the entire facility, identification of waters that have the potential for conservation and reuse and calculations of the difference between water coming into the facility and a list of identified water uses throughout the facility. (Note: This is the amount of water that is potentially being lost by leaks, which could be underground.)

### 4) Prepare a cost-effectiveness analysis

The cost-effectiveness analysis should determine the water efficiency opportunities that are cost effective to implement. The analysis may also identify water efficiency opportunities that should be implemented even if not cost effective due to high visibility, ease of implementation, or general employee and customer goodwill. If landscaping water use is a large component of water use, or if high quality effluent from processes is available, consideration should be given for reuse water on the landscape. After confirming the cost effectiveness of the BMP, the action plan should then be prepared based on the water users' own decision criteria which may include considerations for available resources, safety, compatibility with manufacturing facilities, and management priorities.

### 5) Prepare recommendations for action

The facility audit report should contain proposals and a timetable to implement selected water efficiency measures. The report is the first step in preparing a water conservation plan. In addition to other BMPs which are indicated through the audit results, the plan should address a leak detection program if needed, installation of submeters if needed, a regular water audit checkup schedule (i.e., weekly during the spring and summer, and monthly during the cooler months) to check flow rates for specific equipment, and to identify leaks, to adjust irrigation equipment and schedules, communication of the action plan to employees, communication of successful implementation of plan to the public, and procedures and policies to repeat audit process on an annual basis.

## *Schedule*

- 1) The audit should be completed in a timely manner. Very large or complex audits should be completed within the first twelve (12) months of implementing this BMP.

- 2) The recommendations should be implemented within the first normal budget cycle following the conclusion of the audit. For most facilities, this should be a reasonable time period to implement the recommendations. Major projects may take additional time for audit and implementation. Obvious water leaks and problems found during the course of the audit should be repaired as soon after discovery as possible.
- 3) If determined to be necessary for very large or complex facilities or for more comprehensive conservation plans, the schedule can be extended. BMPs should be initiated in the second year and continued until the targeted efficiency is reached.

### *Scope*

To accomplish this BMP:

- 1) Industrial water users with one facility, or several facilities with the same or very similar industrial processes, should conduct a water audit following the schedule outlined in Section D.
- 2) For industrial water users with multiple facility sites, or multiple industrial processes, a progressive implementation schedule should be followed, implementing the BMP in successive facilities until all facilities have been audited and conservation measures implemented. Conservation measures implemented at one facility may not be applicable or cost-effective at another location.
- 3) Cost effectiveness considerations may result in partial implementation of this BMP at one or several of a large number of facilities.

### *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) The audit report;
- 2) Cost-effectiveness analysis;
- 3) The action plan;
- 4) Schedule for implementing the action plan;
- 5) Documentation of actual implementation of water efficiency measures contained in the action plan; and
- 6) Estimated water savings and actual water savings for each item implemented.

### *Determination of Water Savings*

In order to calculate water savings, the industrial water user should use the methodology appropriate to the identified water efficiency opportunities. Estimated overall water savings for implementing the recommendations from the audit should be in the range of 10 percent to 35 percent if a similar audit process has not previously taken place.<sup>1</sup>

### *Cost-Effectiveness Considerations*

The industrial water user should determine the cost effectiveness to implement each identified replacement or equipment upgrade, utilizing its own criteria for making capital improvement decisions. The facilities survey and audit report may be conducted and prepared by either the industrial water user's own staff or by specialized outside consultants. There may be additional one-time costs for equipment such as flow meters and additional costs for periodic inspections and audit updates. Some of the water savings opportunities found by the audit may require only minor capital expenditures and should be done simply as a matter of good practice.

### *References for Additional Information*

- 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>
- 3) *Water Efficiency Guide for Business Managers and Facility Engineers*, State of California Department of Water Resources, October 1994.
- 4) *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](http://www.pacinst.org/reports/urban_usage/waste_not_want_not_full_report.pdf)
- 5) *Commercial and Institutional End Uses of Water*, AWWA Research Foundation, Summer 2000.