Industrial BMPs

**BMP Recommendations**

To best accomplish developing a set of Best Management Practices for the wide range of industries and industrial facilities in Texas, the Council recommends the use of a combination of technical and procedural BMPs. Procedural BMPs would provide general information on practices that likely apply across a wide range of industries, e.g. water audits. Most industrial water conservation efforts will naturally start by doing a water audit to understand how water is utilized in the industry and how much is used in various aspects of the operations. The technical BMPs would provide industry specific discussion of the various industrial sectors describing the general nature of the sector in the State and providing a perspective of the business and economic impact to the State. The technical BMPs can incorporate the procedural BMPs, in whole or in part, either by inclusion in the technical BMP or by reference. Following are the recommended technical BMPs that should be considered for development based on the business impact and water consumption in the State:

* Mining and mineral extraction
* Electric Power Generation
* Petroleum Refining
* Chemical Manufacture
* Electronics Manufacture
* Food Processing and Beverage Manufacture
* Timber & Wood Products
* Equipment/Tools/Automotive Manufacturing

Procedural BMPs currently included in the BMP Guide:

• BMPs for Industrial Water Users

• Industrial Water Audits

• Industrial Site Specific Conservation

• Cost-Effective Analysis

• Management and Employee Programs

• Industrial Water Waste Reduction

• Industrial Submetering

• Rinsing/Cleaning

• Water Treatment

• Boiler and Steam Systems

• Refrigeration (including Chilled Water)

• Industrial Alternative Sources and Reuse of Process Water

• Once-Through Cooling

• Cooling Towers

• Cooling Systems (other than Cooling Towers)

• Industrial Landscaping

**Introduction**

Industrial operations are unique, even more so, than commercial and institutional operations. Although the processes are generally the same in a specific type of industry, the uniqueness comes in the configuration or layout of the actual facility and the design of equipment, which is often proprietary. As a result, "cookie cutter" assumptions on payback or the implementation of a specific BMP are impractical. The following three concepts should serve as guiding principles when considering industrial facilities:

1. **One size does not fit all** – For any given industry, there may be a dozen potential BMPs. Not all will be applicable. In many cases, establishing one BMP will make another one inapplicable because they will “be saving the same water.”
2. **Every plant is unique** - Analyzing potential payback is unique to each plant and situation. Unlike many commercial situations, manufacturing plants vary in manufacturing techniques and design, even in the same industry. As a result, what may work at one vegetable processing plant may not be applicable at another.
3. **The BMP should be used only as a guide in developing a site water conservation program** - The intent of the technical BMPs is to provide an overview of possible measures that plants can adopt for their specific situation.

Technical BMPs should address issues such as the following for the specific industrial sector:

* Introduction, overview and Purpose
* Applicability
* Economic Impact to Texas
* Employment Impact in Texas
* Cost Effectiveness Considerations
* Implementation, Scope, and Scheduling
* Water Use and Conservation Metrics
* Practices and Activities
* Determination on Other Resources
* Definitions
* References for Additional Information
* Acknowledgements

**Economic and Employment Impact**

It is very important for the technical BMPs for industry to extensively document both the economic and employment impact that the industry sector has in the State of Texas. The impact of the specific industry will have a profound impact on how the water use by that industrial sector is viewed. Water conservation is about making the most efficient use of water. It is very important to recognize that every water user has the responsibility to reduce water consumption, eliminate waste and make the most efficient use of water. It is not acceptable to opt out of water conservation simply because your water use is very small compared to the water used by other industries of by other water user groups such as municipal or agriculture.

Industrial water is used in eight basic ways:

* 1. Cooling & boilers
	2. Cogeneration and energy recovery
	3. Process
	4. In-plant conveyance
	5. Cleaning
	6. Environmental controls
	7. Sanitation
	8. Irrigation of landscape

To properly evaluate industrial water using operations, two terms must be defined: use and consumption.

1. ***USE*** means the total water purchased or withdrawn from a fresh or saline body of water or from a well.

2. ***CONSUMPTION*** refers to water that is either included in the product, evaporated, or otherwise not returned as an effluent from the facility. Some food processors, especially fruit and vegetable processors and wineries, use their effluent for irrigation of corps. In the final analysis, the water is consumed for crop production, but not in the facility.

The percent of water use that is consumed and not returned depends on the type of use, the industry, and the specific process. For example, in efficient carbonated beverage (soda) manufacturing, total water use per gallon of soda produced is about 1.7 gallons. This figure includes one gallon in the product and 0.7 gallons used in the plant. In petroleum refineries, over 75 percent of the water use is typically for cooling towers and boilers. Figure 6 shows that the amount of water consumed in various types of industrial and commercial operations can vary considerably.



One of the consequences of water consumption is that the remaining water contains the concentrated minerals and salts that were in the water source and the chemicals that were added.

When examining industrial use, the potential source of that water will also have an impact on overall water costs. Industry can often use water that is not suitable for other uses. Saline water from coastal areas is often used for cooling and recycled water and water from on-site sources can often be beneficially used.

**Technical Feasibility, Benefits and Cost**

Industrial water efficiency efforts can result in significant water and monetary savings to the industrial water user. Determining the cost and benefits of each BMP depends on a number of factors. In most cases, the solutions must be engineered to the specific facility design and layout. For example, the cost of two-inch industrial piping within a facility depends on the type of pipe material that can be used, the length of the pipe needed, and the hurdles it must overcome to be installed along with the labyrinth of other piping in the plant. The cost per foot of pipe can be as low as $25 or more than $300. The same variations are true for even the same equipment.

Another example is the installation of a water recycle system to recover water from the processing of wafers in a microelectronics fabrication facility (fab). For a large fab, recycling could save half a million gallons of water a day or more, but costs could range from a few hundred thousand dollars to several million dollars depending on plant design.

The technical feasibility can also be limited by a number of parameters. Water quality, available space, regulatory and code requirements, and technical limitations specific to a given industry or process may limit applications of a BMP. These factors are different for each type of industry, even between similar facilities producing the same products.

The benefits of a given BMP also depend on a number of factors including:

• The cost of water and wastewater source for that plant

• Associated energy savings or costs

• The value of any products recovered or saved as a result of the BMP

• Potentially incurred labor, solid waste, air quality, or related costs.

Other important factors include:

• The degree to which a facility has already implemented water efficiency measures

• The specific type and model of process equipment used within the same industry

• The life expectancy of the plant, process, or equipment to be modified.

Case studies are very useful in conjunction with BMPs to illustrate the feasibility and record potential costs and savings for specific examples. Where cost ranges for specific measures are available, they should be included in the text for each BMP section.