3.7 Rinsing/Cleaning

A. Applicability

This BMP is intended for industrial water users that use rinsing or cleaning in processing, production or finishing operations.

B. Description

Rinsing and cleaning are important operations for a number of industries. Water conservation opportunities arise in improvements in flow rates, pressure, or timing. Many operations can also increase efficiency by recirculating water or by filtering contaminants and reclaiming water for reuse internally.

Specific processes in which this BMP can be implemented will have been identified in the Industrial Water Audit BMP. Each process requires careful evaluation to determine the most economical and efficient measures to implement. Initial cost-effectiveness analysis should begin with the simplest measures including adjusting operating parameters on existing equipment. Often reductions in water pressure, changes in timing or adjustments to nozzles can achieve measurable results in water savings. In container rinsing for reuse or disposal, immediate rinsing before products solidify or gel can reduce the amount of time and water required for cleaning. In multiple rinse processes, reducing the amount of "dragout" or contaminated rinse water carryover from one container to the next can reduce the total amount of water needed for the process.

Equipment upgrades can also be cost-effective, including use of smaller rinse or cleaning sinks and tanks, changes in pumps, nozzles, and pipes, and in the machinery that controls the timing of rinse or cleaning processes. Mechanical mixing, agitating rinse water in tanks, and counterflow rinsing processes have also been shown to improve effectiveness of cleaning and water use.

Reuse of water within a rinse or cleaning process is one of the most effective means of saving water. Sequential rinsing can often make use of spent water from one process in another. Filtering final rinse water for use in cleaning processes is also often done with minimal filtration.

When filtering of water is necessary, the simplest process is often just recirculation of water with dust or other solids removed in settling tanks. More sophisticated filtration may include oil/water separators, centrifugal separation, sand filters, bag filters, or even more sophisticated membrane filtration. In processes where ultra-pure or very high quality water is needed, careful engineering of treatment processes is necessary to ensure removal of organics and other materials which can damage membrane filters.

Adjusting the chemical requirements of the process can also lead to significant water savings. Often solids can be filtered from a cleaning process, leaving some detergents in the filtered water, thus reducing the addition of new cleaning chemicals while reusing the water. Some processes can be adjusted to use higher levels of chemicals in a process, reducing water pressure

and flow volumes used to scour a product. In these cases careful evaluation of the effluent water quality is important to ensure that water quality discharge constraints are met.

In facilities that filter rinsing and cleaning water for reuse, the water used to backwash the filter or RO reject water should be considered for use in other processes where lower quality water can be utilized.

C. Implementation

Implementation of this BMP should consist of the following actions:

1) Perform a water efficiency evaluation of each rinsing/cleaning process within a facility to identify areas of improvement for water savings. The evaluation should review amounts of water used, use of automatic controls, repair and maintenance schedules and procedures, and water quality characteristics. Where manufacturers' specifications or industry specific information is not available, company engineers or third party contractors should perform an empirical evaluation of existing equipment. Based on the requirements and uses of the system, alternative water supplies should be considered.
2) Water-using rinsing/cleaning processes should be operated in a water efficient manner with consideration for:
    a. Optimal repair and maintenance of rinsing/cleaning equipment and facilities to keep rinsing/cleaning equipment, lines and related equipment in good repair;
    b. Timing of existing equipment, reduction in flow rates by changes in nozzles, changes in sizing of rinse or cleaning tanks, the installation of positive shutoff valves;
    c. Upgrades of apparatus including tanks or sinks, nozzles, valves, pumps, and timing equipment;
    d. Optimal use of chemical additives to minimize water use; and
    e. Use of water quality instrumentation for more accurate determination of when rinsing baths should be replaced or recharged.
3) Within the water user's budget cycle, install or upgrade to the most cost-effective reuse and reclamation equipment system, with highest water efficiency.
4) When cost effective, reuse and reclamation equipment should be operated in a water efficient manner with consideration for:
    a. Optimal repair and maintenance to keep reuse and reclamation equipment, lines and related equipment in good repair; and
    b. Potential use of filter backwash or reject water in other operations.

D. Schedule

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

1) The efficiency evaluation of the rinsing/cleaning systems should be in a timely manner, generally within three (3) months of beginning this BMP.
2) The opportunities for water savings indicated by the efficiency evaluation should be implemented in a normal business cycle, and it is recommended within twelve (12) months after completion of the evaluation in order that the maximum water efficient benefit can be achieved in a reasonable time frame.
3) Water using rinsing/cleaning equipment should be operated optimally at all times following the guidelines of this BMP.

E. Scope

To accomplish this BMP, the industrial water user should do the following:

1) Industrial water users with water-using rinsing/cleaning systems which are operated with the same or very similar parameters should perform an efficiency evaluation and perform upgrades or replacements as outlined in the schedule of Section D;
2) For industrial water users with multiple systems, or multiple sites that have systems with significantly different operational parameters, a progressive implementation schedule should be followed, implementing the BMP in successive facilities until all facilities have been evaluated and conservation measures implemented; and
3) Cost-effectiveness considerations may result in partial implementation of this BMP at one or several of a large number of facilities.

F. Documentation

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

1) Operating information on the rinsing/cleaning systems, including capacity design, description of the process the rinsing/cleaning system is used for, system requirements for temperature, volume, and duration of flows (hours/day). Operating information should also include design information for maximum levels of contaminants that can be tolerated while maintaining an acceptable cleaning rate.
2) Water use records for each rinsing/cleaning system that include the frequency and number of gallons of make-up water used;
3) Description of chemical compounds and amounts used to affect water quality; and
4) When applicable, description of reclaim and reuse system and water savings achieved.

G. Determination of Water Savings

The industrial water user should calculate water savings based on the calculation methodology appropriate to the identified water efficiency opportunities. Estimated overall water savings for

implementing rinsing/cleaning efficiencies have been in the range of 10 percent to 15 percent for process adjustments and 50 percent to 85 percent for installing various reclaim systems. Actual water savings should be measured by comparing water use prior to implementation to water use after the measures are implemented.[1]

H. Cost-Effectiveness Considerations

The industrial water user should determine the cost effectiveness to implement each identified replacement, equipment upgrade, or change to its rinsing/cleaning operations, utilizing its own criteria for making capital improvement decisions. Many operating procedures and controls that improve the water use efficiency of rinsing/cleaning processes should be implemented simply as a matter of good practice. A cost effectiveness analysis under this BMP should consider capital equipment costs, staff and labor costs, chemical and treatment costs, additional costs or savings in energy use, costs for waste disposal, and potential savings in wastewater treatment costs.

I. 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. Available in PDF at 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*, Sate of California Department of Water Resources, October 1994.