WHAT ARE YOUR WATER TREATMENT GOALS?

The continued high cost of fresh water and environmental concerns are causing industrial plants to further expand and explore their wastewater reuse options. Many facilities are finding it can be more economical to reuse wastewater from specific process areas or from sources outside the petroleum refining or petrochemical facility than it is to reuse wastewater from centralized wastewater treatment plants. Performing water audits can help facilities develop appropriate programs to meet their water-intake-reduction and water reuse goals.

A well-performed water audit should identify water needs/uses and wastewater sources throughout a facility, characterize each of the identified streams by flowrate, type, concentrations, and variability of the substances and compounds. After determining the facility’s water reduction and wastewater recycle and reuse goals, the various sources of wastewater can then be matched with the facility’s water needs. An economic model for wastewater recycle and reuse can than be created.

By conducting timely water assessments, operators can identify opportunities for improvement and take steps to rectify sub-par performance in the most orderly and cost effective manner, thereby minimizing the risk of system failures or unscheduled downtime.
UNDERSTANDING WATER AUDITS

Engineers can conduct a comprehensive, onsite water audit to gain important insight into their operations, uncover ways to ensure cost effective operation, and guarantee consistent compliance with water quality standards, all while conserving water. In many cases, such an audit can help engineers improve operations and maintenance practices in a way that reduces cost and downtime.

What Does A Water Audit Consist Of?
A water audit consists of a review of all equipment that is used to treat process water and wastewater at the plant. Whoever conducts such assessments should have experience with the process units that use water and generate the wastewater. Many process units in petroleum and petrochemical facilities operate under variable conditions that can affect water needs and wastewater generation volume and quality. Comprehending these variables is key to understanding the options to reduce water usage and treatment required to recycle/reuse the wastewater and the total cost of water.

Process operators should conduct a water audit whenever they suspect a possible problem, either because they are using greater than expected quantities of water, or the quantity/quality of wastewater being generated is below expectations or specifications.

Don’t Wait Until Its Too Late!
Plant operators should not wait until there is a problem before conducting a water audit. An audit could help determine if it would make sense to upgrade or replace individual components or the whole system, or if a plant is using water in the most efficient manner to reduce operating costs and encourage recycling and reuse. Conducting an onsite water assessment can help identify equipment that needs to be upgraded or replaced, and determine whether additional equipment should be added to enhance the economical treatment capabilities of the existing system, throughput volume, or pollutant reduction capabilities.

The system wide evaluation will also provide plant personnel the opportunity to evaluate whether any additional equipment that may be needed as a result of the audit should be purchased and permanently installed, handled as a build-own-operate, or set up as a temporary mobile system. Such a decision will depend on the site-specific operational needs and budget. An audit should also generally be planned before every scheduled plant outage so that any necessary work can be done during the expected facility downtime.

Common Process & System Concerns
Some unit operations or processes are, by nature, prone to developing water related problems. For example, reverse osmosis (RO) and microfiltration systems may develop problems if their membranes are not cleaned correctly and at appropriate intervals, to maintain their design performance and throughput. Improper cleaning, or cleaning that is done too late, may cause irreversible damage to the RO and microfiltration membranes and result in compromised system flow or diminished product water quality.

Minimizing The Impact Of A Failure
Developing a timely, comprehensive water audit can help prepare plants for a short-term or emergency water system “outage.” The plan should take into account identified weaknesses in the existing system and provide for a way to address those component failures. Provisions could also be included for adding emergency mobile equipment, improving system redundancy, or simply making sure the plant has the proper inventory for high-wear spare parts. Detailed instructions, such as a checklist, on what is needed operationally to minimize the impact of a water related failure should also be included.

An audit can help improve operations and maintenance practices in a way that reduces cost and downtime.
DETERMINING THE LEVEL OF DETAIL

A water audit can be as inclusive as reviewing all process operations, including those related to process control, instrumentation, vessels, piping, influent and discharge water quality. It can also be as simple as reviewing one specific part of the process. In general, a full comprehensive water assessment is recommended if a system has been in service for more than five years, has been poorly maintained, is operating less efficiently, or is not meeting final water quality specifications.

A work team evaluates the facility’s water-related operation and maintenance activities, and reviews any seasonal variations in plant influent water quality or changes in demand for process or wastewater flows. The team reviews maintenance logs to make sure that proper maintenance has been carried out at appropriate intervals. Along with ensuring all systems are operating at the correct flows and pressure, according to design data and associated process and instrumentation drawings (P&IDs). Once the inspection is complete, the overall system operation should be verified against the system P&IDs. Modifications required to meet design flows or water quality can be implemented at this time.

ESTIMATING HOW LONG IT WILL TAKE

The time it takes to do an audit will vary, depending on who conducts it and whether it is carried out as a full comprehensive assessment of all water-related aspects of the entire facility, or one that reviews just a single part of the process. Assessments will proceed quickly when design drawings and other documentation are readily available from plant personnel. It may take longer when critical documentation has to be reconstructed.

Third-party service providers typically take 30 to 60 days to conduct an audit from start to finish. This includes developing the scope of the assessment, performing the equipment review, and creating a report. The latter verifies the project scope, details the current and desired condition of the system, and then outlines the remedial steps needed to reach the desired outcomes.

ASSESSING COST

Time spent by internal plant personnel or external third-party service providers to conduct the assessment is factored into the cost of a water audit. As the need for upgrades or repairs will likely be identified, costs associated to repair or replace any equipment also need to be considered.

Upgrading an older system that still produces water of sufficient quality could help prevent water related failures from occurring. In deciding whether or not to repair or upgrade the system, the cost of the repair must be weighed against the long-term potential gains in efficiency, or improvements in system performance, as well as costs associated with unscheduled interruptions in process water availability or insufficient water and wastewater treatment capabilities.

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GETTING ORGANIZED

When a petroleum/petrochemical facility decides to hire an outside water audit team, plant personnel should assemble the following types of plant documentation and data to help facilitate the assessment:

- System operating manuals
- P&IDs for the water treatment system
- Schedule of preventive maintenance done on the system
- Water consumption and wastewater produced by process area (compare actual performance with system design and analyze any excursions)
- System acid/caustic and other chemical consumption
- Replacement history for cartridge filters, resin, membranes and media
- Makeup water and product water quality measurements
- Operating schedule (hours/days/week/year)

Inlet water and wastewater are essential parts of most process unit operations, and the ability to treat water so that it meets process specifications and regulatory thresholds is of critical importance to the facility’s smooth operation. By conducting timely water assessments, operators can identify opportunities for improvement and take steps to rectify sub-par performance in the most orderly and cost effective manner, thereby minimizing the risk of system failures or unscheduled downtime.

Contact Us

Contact our team of water experts to learn how Evoqua water treatment solutions can help you meet your water treatment objectives!

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