TAKING CONTROL OF WASTEWATER TREATMENT

Considering Environmental Impact and Other Motivating Factors Beyond Mere Compliance

By Tim Hanna, Vice President of Business Development, PRAB

Introduction

On a global level, wastewater treatment is an increasingly critical topic of discussion that has been addressed at the very highest levels of government and major corporations. In order to find a sustainable approach, companies can employ many different strategies to help themselves go beyond mere compliance and begin the process of positively impacting global water quality.

According to the 2017 United Nations World Water Development Report, more than 80% of all the wastewater from industry, homes, cities and agriculture is released to the environment without adequate treatment and flows back into the ecosystem via lakes, rivers and other bodies of surface water. This process repeats every day across the planet, polluting the environment while losing valuable nutrients and other recoverable materials in the process.[1]

Often taken for granted, water is a finite resource with increasing international demand. Each year in March, World Water Day serves as a reminder from the United Nations that a daily commitment is necessary for the successful reduction and reuse of wastewater. The theme for World Water Day 2019 was Leaving No One Behind, the central promise of the UN's 2030 Agenda for Sustainable Development.

The goal of this agenda is to cut the proportion of untreated wastewater in half and increase safe water reuse by 2030.[2] Guy Ryder, the director-general of the UN International Labor Organization (ILO) and the Chairperson of UN-Water, believes that in order to achieve this goal, there must be a commitment to improve the management of wastewater from both the business community and the general public.[3]

Wastewater treatment has become an increasingly critical part of business operations over the last decade, and companies across all industrial sectors are prioritizing the reduction of water consumption. In this white paper, we will examine the motivating factors that are driving this prioritization and discuss how wastewater treatment systems can help an operation become more environmentally responsible while also increasing profitability.

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The Challenge

Compliance with ever-tightening federal regulations for wastewater treatment, handling and disposal – such as the Clean Water Act (CWA), the Resource Conservation and Recovery Act (RCRA) and the Safe Drinking Water Act (SDWA) – requires management to be focused on their wastewater issue. There are additional regulations at the state and local level that companies must adhere to as well.

Additional motivating factors that are potential drivers for recycling wastewater include:

- **Strengthening a company's public image.**
- **Boosting employee morale.**
- **Improving the overall working environment.**
- **Adhering to ISO 14001 initiatives.**

These days, promoting a "green" operation by putting a priority on environmental awareness and sustainable operations will translate to happy workers, loyal customers and satisfied investors.

Of course, the ultimate motivator is almost always related to cost. In a report from Canada's Ecofiscal Commission, an advocacy group that generates practical fiscal solutions for growing economic and environmental prosperity, the organization stresses the importance of putting a price on environmental risk in order to make disasters less likely. From a policy perspective, managing risk means getting incentives right. Companies already want to avoid disasters and environmental damage, given costs to their reputation and their bottom line. But those incentives can often be insufficient.

According to the commission, gaps in existing policies mean that companies are not always held fully accountable. These gaps can shift risk—and any related costs of environmental damage—away from manufacturers and onto taxpayers. When these companies do not bear the full cost of potential environmental damage, they have less incentive to reduce risk.

Better financial assurance policies—such as cash deposits, insurance, and industry funds—address this problem by putting a price on environmental risk. They create incentives for manufacturers to reduce risk and ensure that taxpayers do not end up bearing the costs of environmental damage, should those unlikely disasters occur.[4]

The Solution

Regardless of the motivation, it makes complete sense for companies to adopt a formal wastewater treatment and reuse policy, especially from a monetary standpoint. Such a policy allows them to dramatically cut rising operational costs while increasing profitability.

Disposing of wastewater is expensive. Companies must pay for handling, trucking and treatment by their local Publicly Operated Treatment Works (POTW). These costs can vary based on local water supplies, fuel prices, trucking prices and the edicts of the POTW. Adding to the expense is the cost of clean water required to replace the initial volume.

The obvious goal should always be to recycle and reuse fluids internally. This will reduce maintenance, decrease haul-away costs, and prolong the usage of fluids. Having a water or wastewater treatment process in place means when the time comes to dispose of waste water and fluids, companies will have a lower volume to discard, or a concentrated stream they can treat themselves for lower cost handling at the POTW.

At the heart of any process is the equipment. For companies that are concerned about the impact their wastewater has on both the environment and their bottom line, there are a variety of options available, each designed to perform specific types of treatment and deliver a quick return on investment (ROI) for a variety of industries and applications.

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WASTEWATER EQUIPMENT

Here are the most common types of wastewater equipment, how they operate, and how they impact a business' profitability:

Ultrafiltration (UF) Systems

Ultrafiltration (UF) is a pressure-driven process that uses a membrane to remove emulsified oils, metal hydroxides, emulsions, dispersed material, suspended solids, and other large molecular weight materials from wastewater, coolant and other solutions. UF excels at the clarification of solutions containing suspended solids, bacteria, and high concentrations of macromolecules, including oil and water.

UF systems are designed to reduce oily water volumes by as much as 98%, without the use of chemical additives. These systems are also capable of removing small fines. When calculating both heating and disposal expenses, companies have seen a reduction of wash water and detergent costs by as much as 75% and a reduction in waste disposal costs by as much as a 90%. For these reasons, UF membrane technology is quickly becoming the process of choice over conventional filtration methods.

Vacuum Evaporation and Distillation

Evaporation is a natural phenomenon and a clean separation technology recognized as a Best Available Technique (BAT) in several wastewater treatment processes. Because it removes the water from the contaminants, rather than filtering the contaminants from the water, it is distinct from other separation processes.

No other technology can attain such high water-recovery and concentration rates as vacuum evaporators, which accelerate the natural evaporation process to treat and distill industrial wastewater amounts from 1 to 120 tons per day. They are capable of achieving residual total solids concentrations of more than 85%.

The three primary vacuum evaporators are:

- **Heat Pumps** – Flexible and versatile with low electrical energy consumption and superior reliability.
- **Hot Water/Cold Water** – Reduce operating costs by utilizing existing excess hot water/steam and cooling water.
- **Mechanical Vapor Recompression (MVR)** – Engineered for the treatment of large wastewater flow rates with low boiling temperatures for reduced energy consumption.

Reverse Osmosis Systems

Reverse Osmosis (RO) technology removes dissolved solids and impurities from water by using a semi-permeable membrane, which allows the passage of water but leaves the majority of dissolved solids/salts and other contaminants behind. The RO membranes require a greater-than-osmotic pressure and high-pressure water to achieve the desired result. The water that passes through the RO membrane is called the permeate, and the dissolved salts that are rejected by the RO membrane are called the concentrate.

A properly designed and operated RO system can remove up to 99.5% of incoming dissolved salts and impurities, as well as virtually all colloidal and suspended matter from the most challenging waste and feed water applications. Typically for some industrial applications, RO technology is the final process after ultrafiltration or the chemical treatment of waste and feed water.

Paper Bed Filters

These types of filters work by gravity and utilize disposable paper media or permanent filter media to produce a positive barrier, which removes solids from all free-flowing industrial process liquids. Paper bed filters are suitable for applications involving low- to medium-stock removal of ferrous and non-ferrous metals, as well as organic and inorganic contaminants such as glass, rubber, and plastic. In metalworking operations, paper bed filters can extend coolant and tool life by an average of 27%, in addition to increasing surface finish quality.

Standard paper bed filtration units are available with (or without) magnetic separation and can handle flow rates of up to 130 gallons per minute (GPM). Different classes of filter media allow for adjustments of micron clarity. A drum-type model, which can process up to 500 GPM of fluid, occupies one-third the floor space of a paper-bed filter.

WASTEWATER EQUIPMENT (CONTINUED)

Solid Bowl Centrifuges

These units optimize centrifugal force (instead of consumable media) to separate solids from liquids in metal processing applications where removal of fines is important for recycle and reuse goals. Process liquid is either pumped or gravity-fed to the centrifuge inlet. Process solids are then centrifugally separated from the liquid phase and collected in an easily removable rotor, also known as a liner. Clarified liquid overflows the rotor into the outer case and is returned by gravity to the process, which minimizes the cost of hauling waste away from the facility.

Solid Bowl Centrifuges provide high-performance liquid/solid separation for all types of particles—metallic and non-metallic, ferrous and non-ferrous—and are available in both manually cleaned rotor style (with a reusable liner) and fully automatic self-cleaning designs.

Tramp-Oil Separators

In this wastewater treatment solution, contaminated fluid flows through a series of baffles and a porous media bed, where free and mechanically dispersed oils are separated from the fluid. The clarified fluid then flows over the effluent discharge weir back to the reservoir for reuse. The collected oils, inverted emulsions, and other waste materials are collected at the top of the separator and automatically discharged into a suitable receptacle. Using gravity flow and coalescence, these separators can reduce tramp-oils up to 99% in a single pass while utilizing no consumable products.

Tramp oil separators can also:

- Reduce the cost of wash water detergents, heating and disposal.
- Reduce hazardous waste volumes up to 90%.
- Achieve system payback (ROI) in 6 months or less.

Vacuum Filters

Capable of continuous operation, vacuum filtration systems can eliminate significant downtime. Virtually maintenance-free and delivering high-sludge-volume elimination, these systems will also deliver lower production costs. Disposable media vacuum filters utilize a vacuum chamber to draw contaminated coolant through the disposable filter media. By applying the proven principle of optimal filtration through contaminate or sludge build-up, a filter cake forms on the media. These units are capable of impressive flow rates of up to 2,000 GPM.

Semi-permanent vacuum filters further reduce operation costs by eliminating the need for disposable media. Back flushing with clean coolant keeps the filter clean without requiring large volumes of air. The back-flushed solids drop from the filter element and settle into a tank, where they are removed via a chain dragout/flight arrangement. These units require minimal floor space and are completely self-contained, simplifying maintenance, and operation.

Conclusion

Considered an increasingly critical topic of global concern, wastewater treatment is something industrial operations can address with any number of existing, efficient and effective systems. While it certainly makes business sense to implement such a process, it can appear to be a daunting task for companies that are unfamiliar with the treatment and re-use of in-house wastewater. On the surface, up-front costs often associated with adding a wastewater treatment system can seem prohibitive.

Companies can employ many different strategies to help themselves go beyond mere compliance and begin the process of positively affecting water quality. This can simultaneously bolster their brand, their ROI, and their bottom line.

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About the Author

Tim Hanna is the Vice President of Business Development for PRAB, a leading designer and manufacturer of wastewater recycling systems as well as engineered conveyors and equipment for processing turnings, chips, and metalworking fluids. Since graduating from Northwood University with a Marketing degree in 1970, Hanna has worked closely with companies and communities around the world who take advantage of the latest fluid filtration and chip handling technologies to both lower cost and increase environmental stewardship.

Sources:

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[4] *Ecofiscal.ca, Responsible Risk: How Putting a Price on Environmental Risk Makes Disasters Less Likely - https://ecofiscal.ca/reports/responsible-risk-putting-price-environmental-risk-makes-disasters-less-likely/*

About PRAB

PRAB has a portfolio of over 39 customizable equipment offerings across 4 divisions, all unified under the PRAB brand—offering metal chip processing equipment, fluid filtration equipment, conveyors, industrial water & wastewater treatment equipment, parts, services, and solutions to meet the unique needs of a variety of customers and industries around the world. Products are engineered and built to last. As testimony, PRAB has equipment still operating in the field that was installed over 57 years ago. For more information visit prab.com.

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