

Ask Tom! Column

A Case for Thermal Oxidization of Wastewater

Guest article by Ronald G. Fink, Andrew C. Hyatt and Michael L. Chaudron

“Imagine yourself completely separating the water from the plant waste stream and then paying only for the disposal of the dry contaminants...”



Introduction

Thermal Oxidization, a technology used for many years to control plant air emissions, now economically eliminates wastewater. With the standards for wastewater discharge into municipal sewers tightening, sewer costs skyrocketing, and wastewater hauling charges ranging from \$0.25 to \$2.50 per gallon, onsite treatment often makes sense. The hauling of wastewater also puts your company at risk for clean up costs if your wastewater is not disposed of correctly or accidentally discharged.

Wastewater treatment systems are plentiful, using roughly 25 basic water technologies in various combinations including; absorption, nanofiltration, aeration, oxidization, bag/screen clarifier, air stripping, centrifugal separation, dissolved air floatation, precipitators, ion exchange, ozone, membranes floccing/clay systems, reverse osmosis, oil water separators, distillation and ultra filtration to name but a few.

Facing a barrage of conflicting demands and options, a plant manager usually ends up hiring an engineering firm to make the right choice for the plant. In recent years, wastewater recycling has become a politically correct buzzword. And rightly so.

Two Reasons to Recycle Water

The first is economic. Sewer costs are calculated on the basis of your water meter readings. Every gallon you recycle also saves the sewer discharge cost.

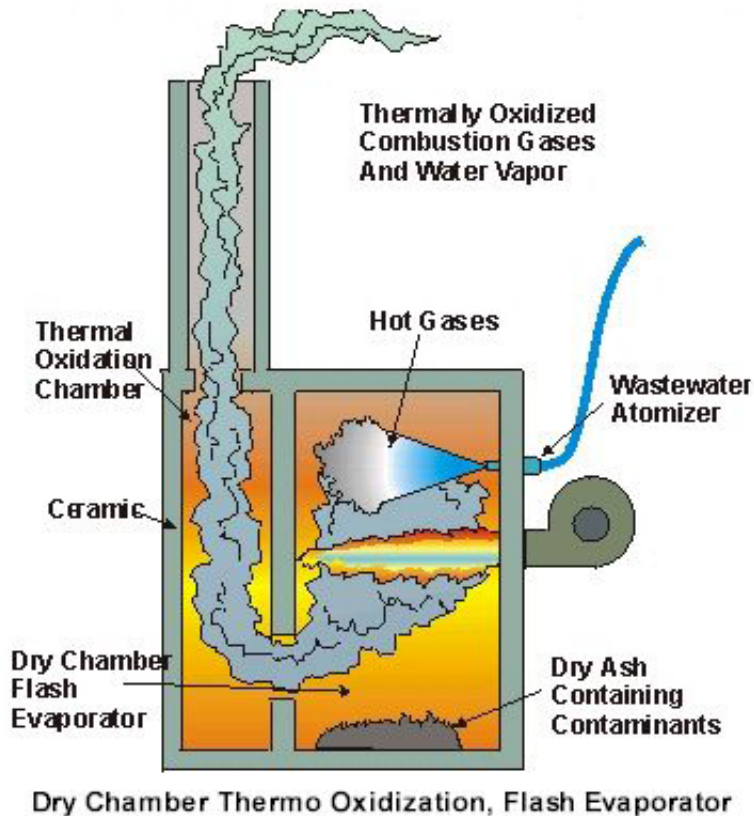
The second is moral. With the world population doubling every 30 years, water becomes an increasingly valuable resource. This is especially true when you consider there is not one more drop of water today than there was a million years ago.

The likelihood of science developing a synthetic substitute is highly improbable. Whenever possible, we must recycle and conserve our water. At the present rate of water pollution and consumption, we are rapidly running out of our most precious natural resource.

How Thermal Oxidization Works

Most packaged water treatment systems have one thing in common: separation. The system must separate the effluent water from the contaminants to meet its goal. This usually generates two water streams- one of cleaned water, the other containing concentrated contaminants. There are problems associated with the concentrated waste stream. In addition, plants are often plagued with highly contaminated water that defies any practical water treatment technology.

For these cases, thermal oxidization may be the answer. Thermal Oxidization is the complete breakdown of the wastewater to hydrogen, oxygen, and the contaminants using extreme heat. Thermal Oxidization could also be referred to liquid incineration. Unlike most separation technologies, thermal oxidization leaves nothing to dispose of but a dry ash. Thousands of gallons of water can be reduced to a few ounces of dry power.



Comparing With Evaporation

Thermal Oxidization is often compared to evaporation, and it can effectively replace or augment evaporation in many cases. Evaporation technology has been around for 100 years and has always had the following inherent four (4) problems:

1. **Fuel Cost:** Traditional evaporators maintain a wastewater reservoir of 100 or more gallons. This reservoir must be heated, brought to temperature, and maintained at 212 degrees Fahrenheit. This involves a lot of wasted energy. Continual "shrinks" (evaporating and refilling while in automatic operation) concentrates solid content, which absorbs heat and reduces efficiency. The first shrink will be the most efficient.
2. **Corrosion:** Traditional evaporators usually rely on a heat source (flame) to heat steel to boil the wastewater. Flame impingement causes corrosion problems. In addition, the combination of water, chlorides, sodium, and heat create the most corrosive atmosphere known to man. Even stainless steel develops stress corrosion cracking, inter-granular corrosion and carbide precipitation – all of which result in premature metal failure. No matter what type of steel is used, the continuous cycles of heating and cooling coupled with the very corrosive elements will lead to early metal failure.
3. **Residual Slurry:** Traditional evaporators present a handling and disposal problem because they require the periodic removal of the concentrated slurry that can consist of highly concentrated wastes. In order to facilitate ease in removal, the concentrated slurry must consist of 60% water. Even then solids will remain that will need to be washed with fresh water, adding to amount to be hauled. Another solid present is the free oil content in the system that floats on the surface. This material will coat level sensing devices causing malfunctions and also contributes to emissions concerns.
4. **Air Emissions:** Traditional evaporators simply heat water to boiling, which evaporates the wastewater. This drives off volatile organic compounds with the steam, producing potential air pollution problems. As the evaporator concentrates the waste, the emissions increase.

Thermal oxidization alleviates the four long-standing evaporator problems. Spraying an atomized flow of wastewater directly into the combustion chamber eliminates the need to maintain a hot reservoir of water at the boiling point, thereby reducing fuel consumption.

The Thermo Oxidizer meets the strict NFPA 86 gas train regulations while utilizing the latest in control functions, including programmable logic controllers that receive information from various monitoring sources to control temperature, air flow, and fuel flow to provide extremely efficient operations. So efficient, that the system will oscillate 50 degrees +/- the desired temperature. The waste streams solids content dictates the amount of heat required to evaporate it. The Thermo Oxidizer can be programmed to operate at the optimum temperature for the waste stream. The Thermo Oxidizer also captures and utilizes convected heat to further increase efficiency.



Residue of 2,000 gallons of heavy equipment wash water

Costs as low as \$0.06 per gallon of oxidized wastewater has been achieved by using natural gas fuel. By using a waste oil burner, operating costs can be even lower. If you are presently paying to have waste oil removed, using a waste oil fired burner could actually save money and resources. The PLC and burner controller detect the presence of additional heat from the waste oil source and automatically reduce main fuel consumption. A dual-pour high temperature cast ceramic liner eliminates the corrosion problem by eliminating any water to steel contact.

It is relatively easy to treat wastewater with very small levels of insoluble suspended contaminates. The oxidization process using atomizers is very effective on waste streams pretreated to remove suspended solids larger than 200 microns. The atomization nozzles are automatically cleaned during its operating cycle, ensuring a consistent process flow.

Dissolved Solids

Dissolved solids, on the other hand, are very difficult to remove. These are soluble contaminates that dissolve in water much like salt in seawater, which can be crystal clear yet contain 35,000 ppm of salt. Thermal Oxidization is a viable technology for highly concentrated waste streams with high levels of dissolved solids. Thermal Oxidization literally incinerates the wastewater, leaving the dissolved and suspended solids as a dry ash. Tests on water with dissolved solids as high as 65,000 ppm has been successful.

Thermal Oxidization, at temperatures between 300 and 1400 F completely oxidize most waste streams leaving only a dry ash. It is no longer necessary to deal with the concentrated slurry associated with traditional evaporators. Thermal Oxidization also eliminates air emission problems. The atomized wastewater is sprayed directly into the combustion chamber, then burning any volatile material in a 300 to 400 F secondary chamber. Subjecting difficult waste streams to temperatures of 1400 to 1600F totally oxidizes contaminates and eliminates any air emission problems. When dealing with combustion, safety is always a major concern.

Waste Haulage

Another major issue is hauling waste. The "cradle to grave" issue, until recently, has been lessened to the point that generators have become complacent to the fact that you own the waste. Many companies that haul wastewater can provide a certificate of indemnity to cover any spills or mismanagement while disposing. More companies do not and that would mean that if they spill or mismanage your waste, you, the generator, are responsible for cleanup costs. Forever.

Imagine the company that offers their certificate of indemnity goes out of business or bankrupt. If it is found that they engaged in practices that lead to mismanagement of your wastewater, you will be responsible for clean up. Remember the paper you signed when they carted off your wastewater? From a risk management standpoint it would stand to reason that if you are going to be held responsible, why not do the job yourself on site and avoid the transportation issue.

Thermal Oxidization is a viable option to consider for eliminating difficult or highly concentrated wastewater streams.

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Welcome to Ask Tom!, a monthly column by our resident water treatment guru, Tom Keenan of National Environmental Services Agency (NESA). Tom addresses the issues that bug you the most. And Tom knows!! With 35 years experience in providing environmental support services to public and private sector clients on a wide range of environmental issues.

Help others by posting your comments, suggestions and experiences with water or wastewater treatment or any other concerns you may have on our On-Line Help Forum. For past **Ask Tom!** Articles, visit the **Ask Tom! Archive**.

Guest articles for the **Ask Tom!** Column are always welcome, for more information please contact Tom Keenan directly at his email address: info@nesa.ie

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