



Gulf Coast Environmental  
Systems

## CASE STUDY

PRE-OWNED REGENERATIVE THERMAL OXIDIZER  
WASTEWATER TREATMENT | AUGUST 2020

### WASTEWATER

**Location:** Multiple

**Industry:** Municipal Wastewater

**Project Type:** Sludge Dryer Exhaust

**Project Goal:** Create Fertilizer From  
Bio-solids

**Equipment Type:** Pre-Owned  
Regenerative Thermal Oxidizer

### EXECUTIVE SUMMARY:

Gulf Coast Environmental Systems was tasked with finding the best available solution for sludge drying exhaust at a wastewater facility that allows for clean fertilizer production.

### CLIENT OVERVIEW:

This client is a long-standing customer of GCES having purchased 7 units since 2014. They are an engineering firm that is active in 5 major industries: hydrogen, pulp and paper, metals, separation, and biofuels. With over 30,00 employees worldwide, they have over 250 facilities currently operating. Their presence in the wastewater industry is quite strong offering a comprehensive range of technologies for screening, thickening, dewatering, and drying industrial wastewater and sludge in the most economical and environmentally sound way. They are known for providing state of the art equipment for a variety of different wastewater related applications, including sludge thickening/dewatering, biosolids drying, manure processing, water intake, potable water treatment, and biogas handling. Gulf Coast Environmental Systems has assisted this customer with several different municipal wastewater separation projects. All of the units provided for this customer have to be specially designed to extend water drainage and handling capabilities. GCES continues to provide support and new equipment for this customer today.



## PROJECT OVERVIEW:

For a number of facilities, Gulf Coast Environmental Systems was asked to find a solution for a sludge drying application from municipalities. The process in which solids and waste are separated from influent streams creates an organic material known as sludge. This sludge, also known as slurry or biomass, is stored in the liquid manure storage area where feeding liquid material and additional biomass quantities are fed into the system. It is then processed through a heated digester where the odorous waste gases must be treated before being released into the atmosphere.

## SOLUTION:

Through the customer's provided details, and their interest in energy recovery, GCES engineers decided a 3-canister Regenerative Thermal Oxidizer as the best option for this application. This oxidizer uses extremely high heat to clean the exhaust gases. Three canister RTO systems are the best solution for high odor applications where consideration must be made for high moisture content. The high Destruction Removal Efficiency (DRE) ensures the odor and organic material is almost completely destroyed. Through this process, the RTO converts the pollutants in the stream into carbon dioxide and water vapor all while recovering thermal energy that could be used to reduce the cost of operating the equipment. The process in which this is accomplished is very similar to that of a two-canister RTO. The exhaust stream, laden with VOCs, enters the heat exchange bed using a high-pressure fan.

The waste gas stream passes directly through the media, heating it in preparation for the combustion chamber. The combustion chamber then heats the stream further using burner(s) to the optimal temperature for combustion to complete the oxidation process. Afterwards the clean gas is exhausted through another packed media bed which cools the air and heats the media. The final step, which makes the 3-can regenerative thermal oxidizer more efficient, occurs in the final chamber, which traps any remaining VOCs in the "clean" stream, by purging the dirty gases with clean air for further combustion.





Many of these units are built with specific design considerations in order to handle the siloxanes in the stream. Over-sized heat recovery canisters are typically used, packed with an increased volume of ceramic media. Without these considerations, the siloxane byproducts will quickly gather enough accumulation that it blocks the airflow through the media. This accumulation also interferes with heat transfer and will eventually cause an RTO to be inoperable.

Additional design considerations include:

- Ultra-low NOx burners
- Extended water drainage and handling capabilities

### **What Value is There in Wastewater?**

- **Methane Abatement & Beneficial Use**

- Methane can be incredibly valuable as there are several ways to abate it and use it as fuel or an energy source. What most people do not know is that methane can be converted into Renewable Natural Gas (RNG), electricity, or heat.

- **Heat Recovery**

- An oxidizer uses extremely high temperatures as a means of destruction. Heat recovery in oxidizers can be accomplished in two different ways; Extracting heat from the stack or extracting heat directly from the combustion chamber. Dryer exhaust air temperature, solvent concentration, and heat exchanger efficiency determine the oxidizer stack air temperature. As oxidizer efficiency is increased, the stack temperature will decrease. Destruction efficiency requirements determine the combustion chamber temperature. When concentrations rise above the minimum energy required for self-sustaining operation, excess heat is generated in the combustion chamber. This excess heat presents a great opportunity for heat recovery.

- **Hydrogen Production**

- There are certain abatement processes that result in a waste byproduct. In some cases, this byproduct can be repurposed, and even sold. Recent developments between leading worldwide governments are revolving around the desire to create 'Hydrogen Cities'. This is already occurring in Europe and China. The use of GCES and partner technologies while consuming wastewater creates a large opportunity to turn wastewater into a profit.

- **Carbon Trading**

- A facility that implements a green energy program is eligible to receive carbon credits. Carbon credits can be sold or traded between participating facilities. One ton of carbon equates to a single carbon credit, which is worth between \$10 and \$30, depending on the market.



- **Tax Incentives**

- Countries on nearly every continent are changing their regulations and attempting to incentivize industry to get on board with pollution reduction. These tax breaks and incentives are completely different for each country, and in some cases, even by state and county levels.

- **RNG + Green Energy**

- RNG stands for renewable natural gas. Renewable natural gas, also known as sustainable natural gas (SNG), or biomethane, is a biogas that can now be used as a pipeline energy source. Natural gas and energy companies can purchase the waste gas from landfill gas abatement or anaerobic digestors and sell it to their customers. RNG qualifies as an advanced biofuel under the Renewable Fuel Standard.