CASE STUDY

RTO Provides 99%+ VOC Destruction for Biofuel Recycling Facility

CECO ENVIRONMENTAL

CASE STUDY: ***Ethanol and Biofuels Recycling Facility***

LOCATION: California

SOLUTION DATE: In service since 2005

THE CHALLENGE: Established in 1970, the Clean Air Act has provided the U.S. Environmental Protection Agency with the authority to set limits on the emission of certain air pollutants nationwide, including those from chemical plants, utilities, and steel mills. With an expanding process fermentation and storage tank venting system, the California-based biofuel and ethanol recycling facility needed to ensure compliance using maximum achievable control technology (MACT) for the control of volatile organic compounds (VOCs). It also was subject to stringent South Coast Air Quality Management District (SCAQMD) standards for Southern California.

THE SOLUTION: With several VOC abatement technologies to choose from, CECO Environmental's regenerative thermal oxidizer (RTO) technology was selected by the facility due to the lowest combination of high VOC and hydrocarbon destruction, energy usage, capital cost, and minimal maintenance and component replacement cost. Furthermore, a dual chamber RTO system with poppet valve flow control provided extremely low energy input and flameless NOx-free operation, and offered extreme simplicity and almost zero maintenance compared to complex rotary and indexing flow control design RTOs.

The ethanol process VOCs enter the dual chamber RTO through the fan inlet and are ducted to a zero leakage metallic poppet valve flow control system that alternates the inlet VOCs through two beds approximately every four to six minutes.

The solvent heat of combustion that is liberated in the combustion chamber of the RTO then remains centered in the combustion chamber and stabilizes temperatures throughout each of the two low-pressure drop ceramic heat recovery beds. Each bed utilizes a custom-engineered

blend of random packing ceramic media, which provides for an exceptionally low RTO pressure drop at 95% thermal efficiency. This allows for lower main RTO fan motor electric and horsepower usage.

The RTO system operates almost automatically with a programmable logic control (PLC) control system that is integrated with the facility data management and process control system. Remote telemetry service diagnostics and/or RTO set points can be changed online 24 hours a day, seven days a week, if needed. Further maintenance flexibility is provided by the unique low-profile RTO design, which allows access to all major components from grade level without the need to have access ladders or stair towers.

The RTO also has an integral offline "bakeout" feature that operates like a self-cleaning oven and allows the plant engineering team to burn off and volatilize any organic condensables that may build up in the heat recovery beds.

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THE RESULTS: With 100% run time, the RTO system has helped the ethanol and biofuel recycling facility to achieve more than 99% VOC destruction without emitting any nitrous oxide (NOx) byproducts of combination. Once the combustion chamber is heated to 1500°F oxidation temperature, the combustion process operates fuel free at 3% lower explosive limits (LEL) and greater inlet VOC loadings from the ethanol recycling process.

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