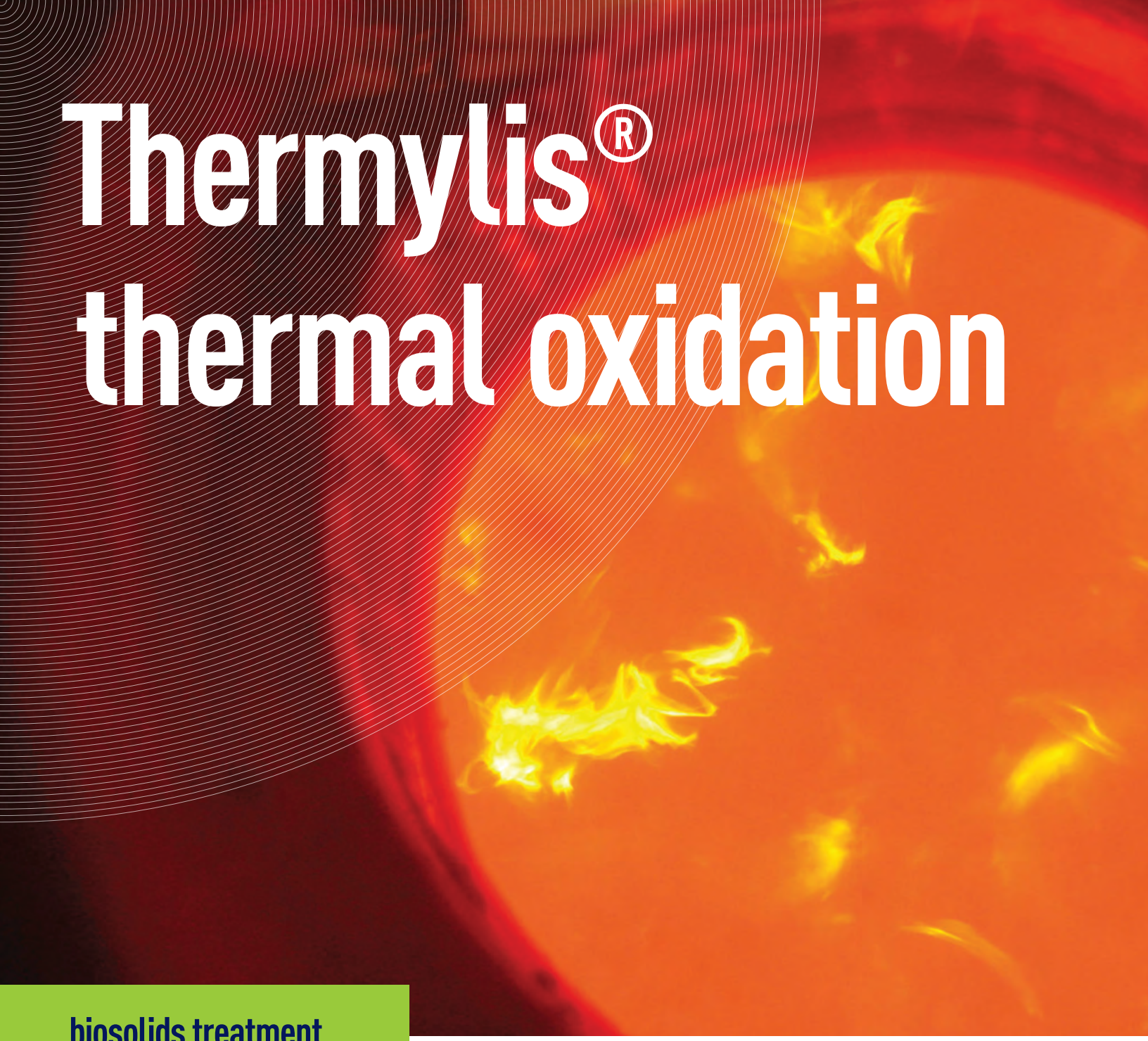
Thermylis® thermal oxidation



biosolids treatment

APPLICATIONS
best disposal method for:
- municipal wastewater solids
- pharmaceutical waste
- chemical and paper mill waste
- petrochemical waste

Thermylis™ High Temperature Fluid Bed (HTFB) thermal oxidation is the only final and sustainable sludge disposal method.

ready for the resource revolution

suez

thermal oxidation technology

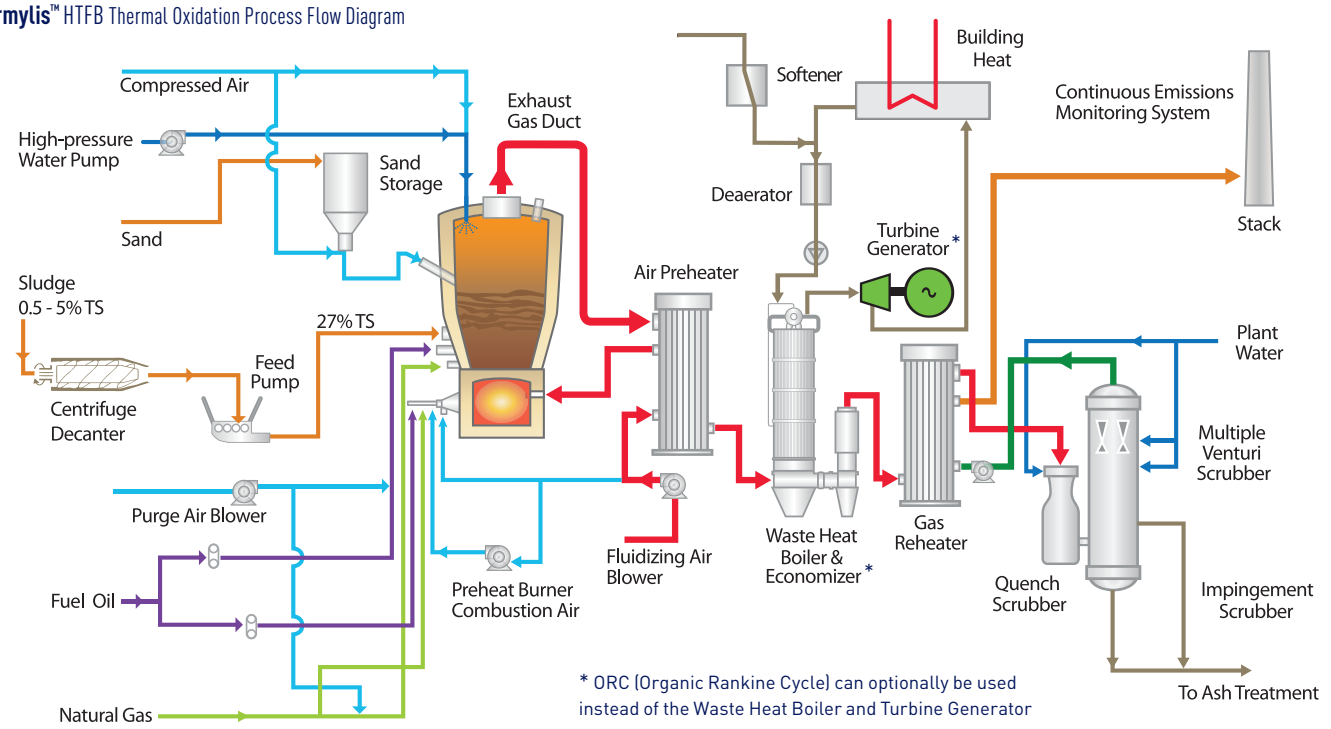
As land becomes more scarce and sludge handling regulations grow more stringent, fluid bed incineration is becoming widely accepted for sludge disposal. In a fluid bed incinerator, water is evaporated and organic materials are combusted, eliminating odors and reducing the dewatered sludge by 93% to a much smaller quantity of inert ash (as low as 7%). Land requirements and air pollution are reduced, protecting the environment.

how it works

Thermylis™ HTFB consists of three zones: a windbox, a sand bed, and a freeboard. The term "fluid bed"refers to the violent boiling action of the sand bed, which occurs when air is blown through from below. To ensure that the air passes evenly through the sand, it must first pass through the windbox and a refractory arch distributor, where special alloy tuyeres ensure even distribution of the air. To fully take advantage of the turbulent mixing, dewatered sludge and auxiliary fuel (if required) are introduced directly into the bed, where they are instantly combusted at above 1200°F.

In the next stage, combustion gas and evaporated water flow upward into the teardrop-shaped freeboard, where the bed material is disengaged. The tear drop shape freeboard provides a gas residence time of minimum 6.5 seconds. Operating at 1550°F, the freeboard provides sufficient residence time to polish the gas and to complete

Thermylis™ HTFB Thermal Oxidation Process Flow Diagram



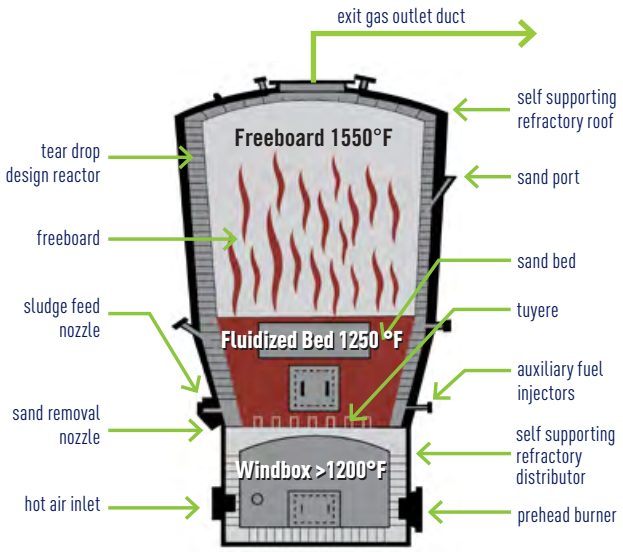
product highlights

- **complete and final disposal with 93% sludge reduction**
- **minimum use of auxiliary fuel**
- **sustainable with maximum heat recovery**
- **tolerant of sludge variation**
- **small footprint**
- **adaptable for continuous or intermittent operation**
- **safe to operate**

the combustion. The "three T's" - turbulence, time, and temperature - make fluid bed incineration the most economical and environmentally sound method of sludge disposal. Uniform bed temperature, the result of steady turbulence, simplifies PLC/PC automation and logic control systems. Data gathering for compliance reports becomes much easier.

Exhaust gas leaves the Thermylis™ Fluid Bed and enters the heat recovery and air pollution control systems. The heat recovery system can be composed of a primary heat exchanger to preheat the combustion/fluidizing air to minimizing auxiliary fuel requirement, a secondary heat exchanger for stack plume suppression or a waste heat boiler for steam generation and electric production.

Should local requirements or regulations demand it, the Thermylis™ HTFB air pollution control system can include wet (venturi scrubber), dry (bag-filter), or semi wet (bag-filter and wet scrubber) scrubbing systems for emission control. Each can be designed to meet or exceed the most stringent air emission standards.



Thermylis® reactor

technical arguments

Fluid Bed with Refractory Arch Distributor

In contrast to the metal plate distributor, the refractory arch allows much higher heat recovery from the flue gas to preheat combustion air and minimizing auxiliary fuel consumption. In such system, the temperature of the wind-box air is typically 1200 °F or higher when compared to the windbox temperature at plants equipped with a metal plate distributor. With a combustion air temperature of 1200 °F, the combustion process is autothermic (zero auxiliary fuel) with a typical undigested sludge at 26-28% TS. Sludge dewatering by centrifuge or belt filter press suffices.

mechanical advantages

The refractory arch distributor offers the best design to resist the thermal loads. The refractory arch distributor is proven.

95% of the sludge fluid bed oxidizer in North America are of type hot windbox equipped with refractory arch distributor and refractory lined windbox.

POLLUTANTS	EC Directive Dry gas, 11% 02	US EPA 503 Dry Gas, 7%02	Typical Emission (wet ash system)	
	mg/Nm³		*dry gas, 7%02	**dry gas, 11%02)
Total Dust	10	1.3 lb/dry Ton	Scrubber + wet ESP (0.024 lb/dry ton)	4mg/Nm3 **
Total Organic C	10	100 ppmv	1.95 ppmv*	0.7mg/Nm3 **
Carbon Monoxide	50	100 ppmv	7.5 ppmv *	6.7mg/Nm3 **
Hydrogen Chloride	10	35 ppmv State Req. if any	<0.002 ppmv *	<0.002mg/Nm3 **
Sulphur Dioxide	50	50 ppmv State Req. if any	22 ppmv *	44mg/Nm3 ** (without caustic)
Nitrogen Oxides as NO2	200	80 ppmv State Req. if any	31 ppmv *	45mg/Nm3 **

Thermylis®

HTFB thermal oxidation system

main features

- **autothermic combustion / maximum heat recovery:**
  The refractory lined windbox and stress free self supporting refractory arch distributor ensures maximum heat recovery and autothermic combustion of undigested sludge dewatered to 26-28% dry solids.
- **shorter startup and less fuel usage:**
  Preheat burner is installed in the windbox to facilitate cost efficient cold startups.
- **high efficiency:**
  Sludge is directly fed into the turbulent hot sand bed enhancing combustion and reducing the emission of pollutants.
- **minimal sand loss and optimal combustion:**
  Teardrop-shaped reactor decelerates the combustion gas, disengaging the sand and optimizing the combustion.

Thermylis® Advanced Control System (TACS)

TACS is the first automatic control system developed for HTFB to regulate and optimize the combustion process. This innovation promotes steady operation, minimizes water spray, increases the incineration system's capacity, lowers polymers and auxiliary fuel consumption, reduces air pollutant emissions, and ultimately yields an automatic and optimized incineration operation. TACS can be applied not only to dewatering followed by incineration, but also to other processes such as dewatering followed by drying, or drying followed by incineration. By controlling the HTFB heat and mass balance, TACS optimizes operational performance and is a valid and sustainable approach to wastewater solids treatment.

make your existing system MACT 129 compliant

United States Environmental Protection Agency (EPA) established Maximum Achievable Control Technology (MACT) as part of Clean Air Act (CAA) in December 2010. The regulation was published in Federal Register (40 CFR part 60) on March 21, 2011. The new regulations affect all sewage sludge incinerators irrespective of the process involved. They are much more stringent than all previous regulations and require plants to determine compliance needs, design solutions, and complete all upgrades prior to March 20, 2016.

SUEZ brings substantial cost and project experience from previous projects that include upgrades to Multiple Hearth incinerators and design/construction of Fluidized Bed incinerators. SUEZ can repair multiple hearths, offer state-of-art pollution control packages and even design and install fluid bed systems as an alternate to Multiple Hearth rehabilitation.

SUEZ's service includes process evaluation and optimization using virtual/simulation programs, control oxygen level within incinerator, upgrade pollution control system and offer replacement for all aging components required for safe and compliant operation of incinerators. SUEZ has the necessary expertise, experience and capability to bring existing plants to compliance before the 2016 deadline.

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