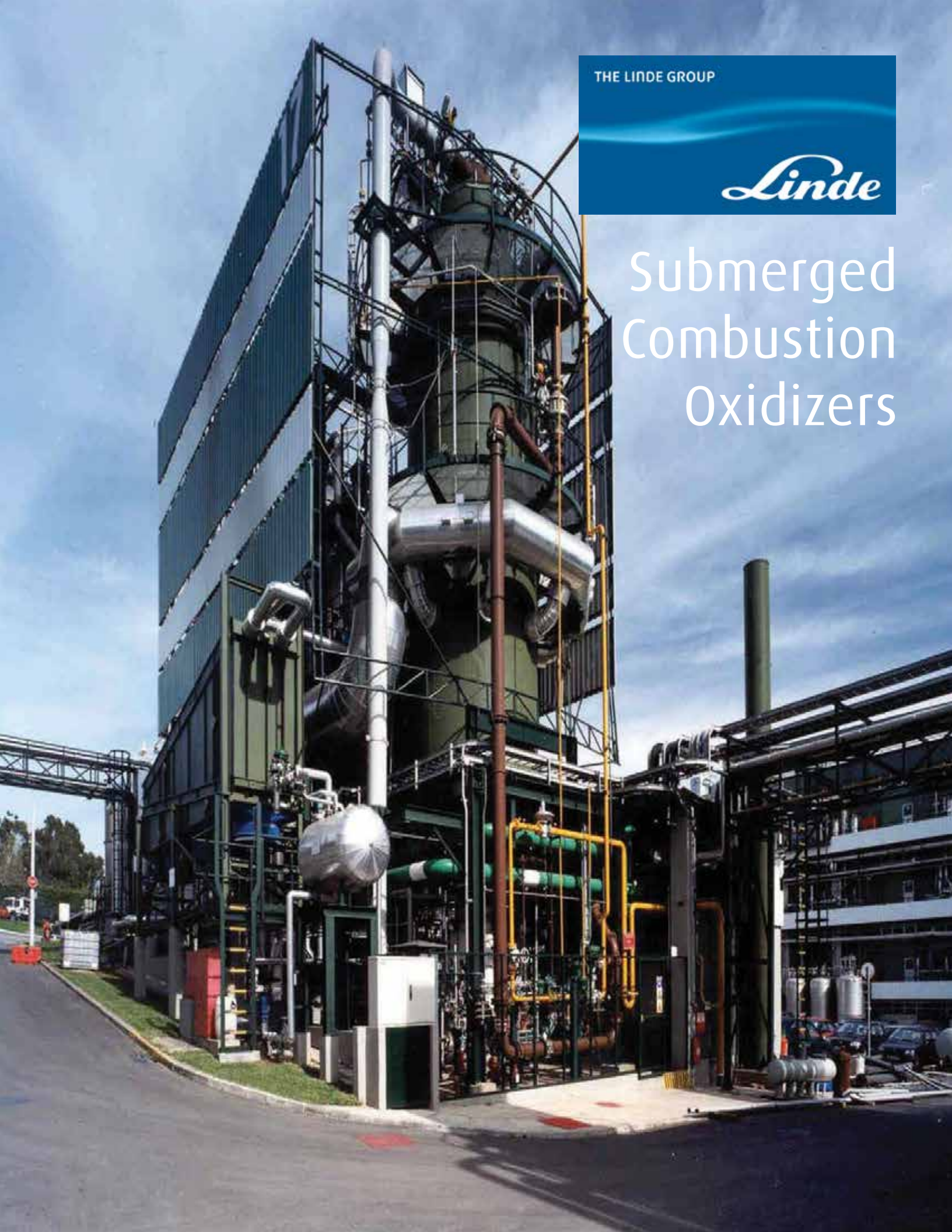


THE LINDE GROUP

Linde

Submerged Combustion Oxidizers



Exclusive submerged exhaust (Sub-X[®]) oxidizers for waste disposal and product recovery.

Selas Linde North America's T-Thermal brand of exclusive Sub-X[®] systems are proven for the safe and economical treatment of gaseous and liquid waste streams. With installed duty ratings from 1 MM Btu/hr (0.3 MW) to 140 MM Btu/hr (42 MW), the Sub-X[®] is particularly suited for wastes containing organo-metallic compounds, salts, halogens, and aqueous streams. This versatile, integrated waste combustor and quench makes full use of the energy contained in high organic waste streams, as well as destroying highly inert wastes. Organic destruction efficiencies in excess of 99.99% are proven and guaranteed.

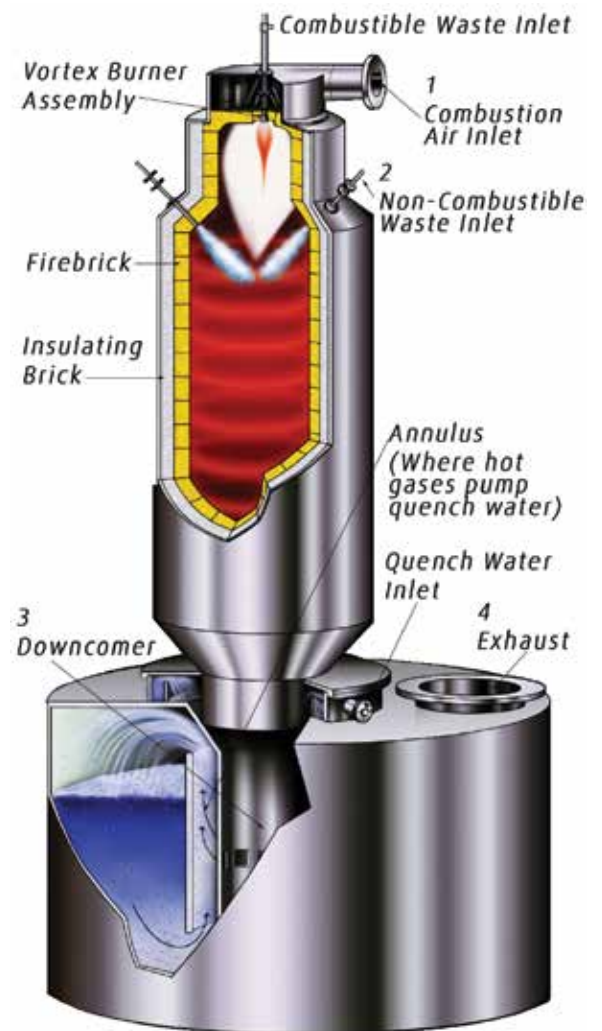
Frequently, valuable by-products can be recovered from the waste streams. Examples include the recovery of concentrated hydrofluoric and hydrochloric acids, sodium bromide, sodium iodide, catalyst oxides, potassium carbonate, and various salt compounds. With the addition of other unit operations, by-products such as calcium fluoride filter cake and steam generation have also been produced.

System description

1. Finely atomized combustible waste is nozzle mixed with combustion air and injected into the Vortex burner. Unlike most conventional burners, the Vortex has the necessary turbulence and swirl action to oxidize the mixture efficiently.
2. The reaction chamber is usually vertical. When aqueous wastes containing inorganic compounds are present, they are injected below the flame zone. Resultant molten salts flow down the refractory wall to the quench chamber.
3. Hot gases pass through a water-cooled downcomer tube and are quenched in the Sub-X[®] quench tank. The integral tank is a primary scrubber recovering a high percentage of acids and particulates. The tank also acts as a safety device: if quench water supply is lost, the water in the tank will serve as a heat sink until the malfunction is corrected. Additionally, this serves as a seal against natural convection of hot gases throughout the APC during an emergency shutdown.
4. Other auxiliaries, including exhaust gas treatment and product recovery equipment, can increase the versatility and profitability of the Sub-X[®] system.

Sub-X[®] advantages

- Rapid quench - cooling occurs in milliseconds, minimizing the reformation of dioxins and furans
- Direct contact mixing in the quench - maximizes acid absorption and increases efficiency of particulate removal
- Deep submergence of the downcomer - an added safety feature that protects downstream equipment from overheating should loss of water flow occur



Safe, economical destruction of wastes

Liquid & Gaseous

- High- and Low-Calorific

Organic Compounds

- Acids
- Alcohols
- Amines
- Organo-metallic
- Maleic Anhydrides
- Mercaptans
- Nitrogen-bound
- Sulfonated

Inorganic (Aqueous) Streams

- Alkali Salts
- Suspended Solids

Halogenated Compounds

- Chlorides
- Fluorides
- Bromides
- Iodides
- Mixed Halogens

PCBs

Di-isocyanates

Recovery Systems

- Acids
- Energy
- Metals
- Salts

Dioxins and Furans

99.9999% Organic DRE

Aqueous organic and inorganic wastes

In Puerto Rico, this installation utilizes a Sub-X® system as described on the preceding page, coupled with a venturi and packed tower scrubber to destroy complex waste streams from drug manufacturing. Combustible waste is used directly in the burner as fuel. Aqueous wastes are injected downstream of the burner; these contain organic compounds such as alcohols, organic sodium salts, amines, mercaptans and acids, and inorganic compounds such as sodium and potassium salts and suspended solids. Scrubbing produces an inert bleed which complies with the most stringent regulations.

This system is representative of over 150 successful Sub-X® installations around the world.

Mixed halogens

A 5 MM Btu/hr Sub-X® system for liquid and gaseous hydrocarbons containing fluorine and chlorine. Due to the intense mixing of the wastes and combustion air, organic destruction efficiencies exceeding 99.99% are achieved with less than two seconds of retention time. Downstream treatment is carried out in venturi and packed column scrubbers.

Industries served

- Chemical
- Petrochemical
- Pharmaceutical
- Chemical weapons/munitions
- Metals processing



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