

**Thermal Oxidizers • Burners • Burner Systems • Air Heaters**

*From design to commissioning, PCC has the specialists in engineering project management.*



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## **Custom Designed Pollution Control Solutions**



# Thermal Oxidation Systems for Liquids and Gases

## Why Thermal Oxidation?

The basis of any gaseous or liquid waste incineration system is a thermal oxidizer.

The thermal oxidizer is a thermal reactor where the hazardous compounds of the waste stream are converted by combustion to harmless compounds (usually carbon dioxide, water vapour, nitrogen and oxygen).

Combined with other techniques (e.g. wet or dry flue gas scrubbing), an incineration system often provide the most effective and least expensive method of pollution control.

## Why PCC?

PCC has many years of experience with all types of abatement systems, ranging from simple hydrocarbon waste incinerators, to halogenic wastes, nitrogenous wastes, aqueous wastes and water containing inorganic salts. Each waste stream demands a different approach in order to provide the best solution.

## Simple Thermal Oxidizer

The simple thermal oxidizer consists of a refractory lined cylinder, into which waste, air and fuel are introduced.

Temperature and residence time are selected to give the degree of destruction efficiency required.

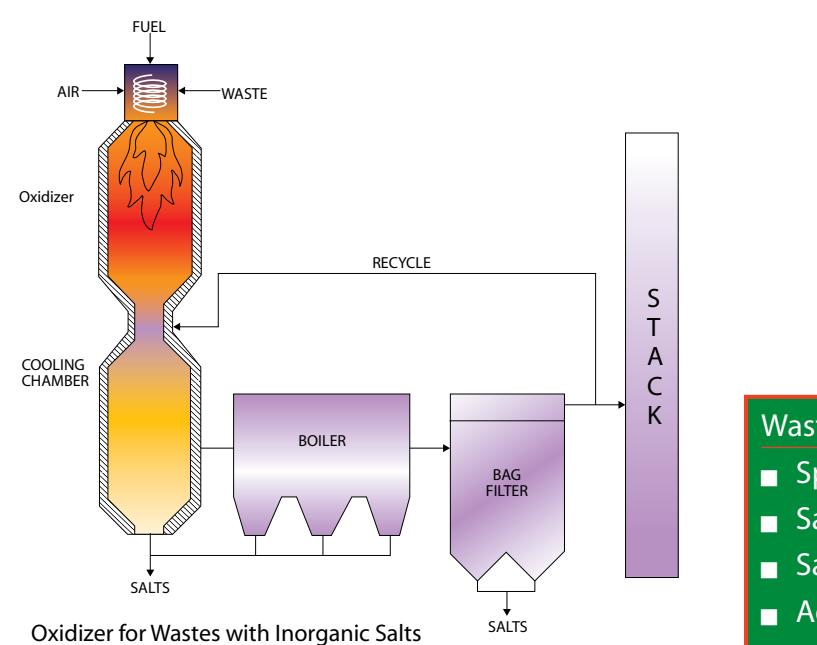
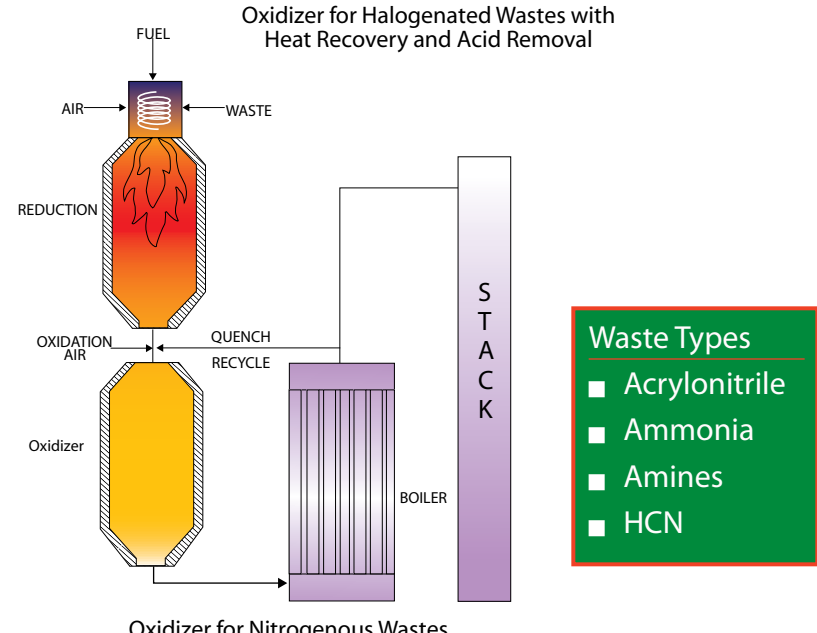
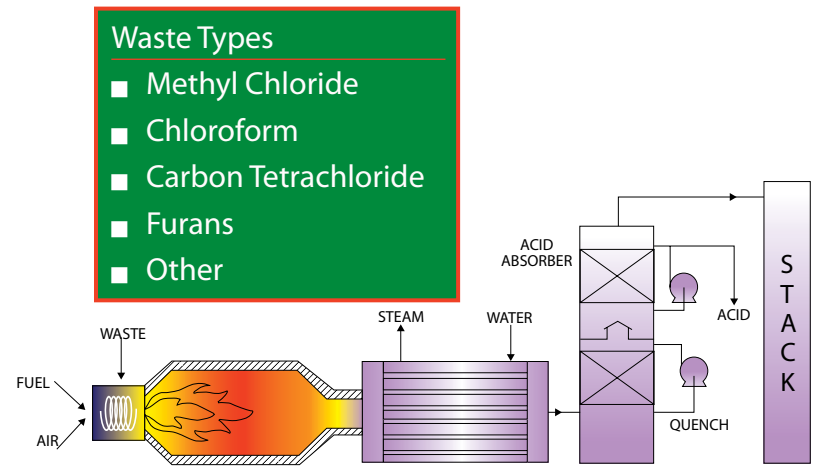
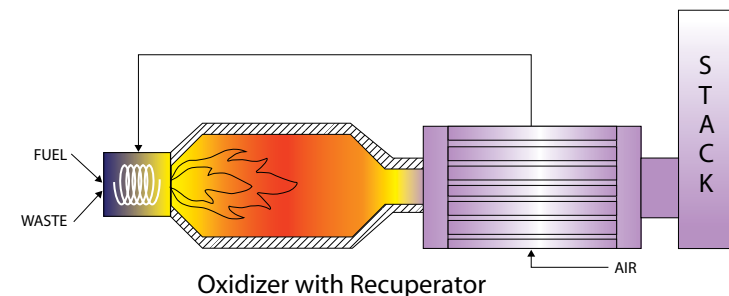
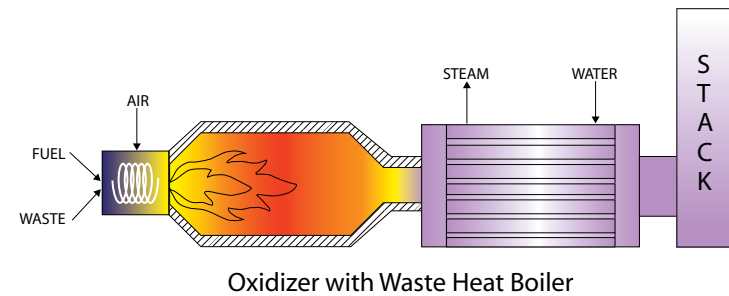
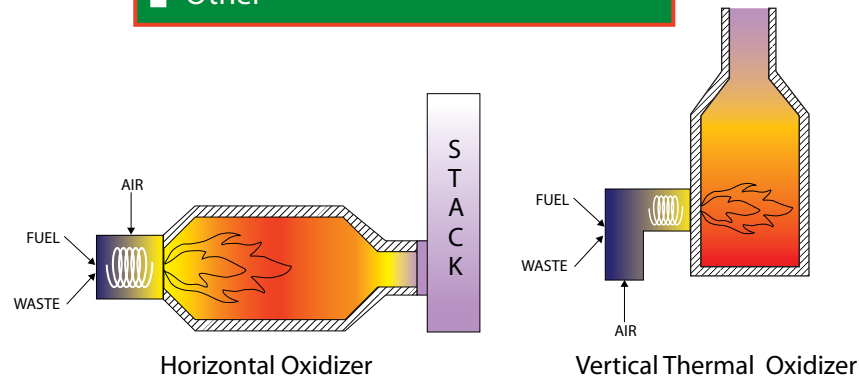
## Thermal Oxidation with Heat Recovery

It is often desirable, especially with larger units, to generate some useful heat from the thermal oxidation, which will otherwise be wasted.

Heat may be recovered in the form of hot water, steam, hot oil, hot asphalt, heated process air, or the efficiency of the unit may be improved by preheating the incoming air or waste stream.

- Systems to:
- EC Hazwaste
  - IPC Guidance Note S25.01
  - TA Luft
  - NER
  - EPA
  - Other International Standards

- Waste Types
- Liquid and Gaseous Hydrocarbons
  - Solvent Fumes
  - SRU Tail Gas
  - Acid Gas
  - Waste Oil
  - Other



## Thermal Oxidation for Wastes Containing Halogens

If a waste stream contains a halogenated compound (containing chlorine, bromine, fluorine etc), a high temperature (1100°C) is required to oxidize these thermally resistant compounds, HCl, HBr or HF etc will be produced as a product of thermal oxidation.

The acid gas must be removed prior to emission to the atmosphere, usually using a wet scrubbing technique.

The gases are cooled by water quenching, sometimes in conjunction with a waste heat boiler, before the acid gas is removed in a packed bed absorber and the clean gas allowed to exit to atmosphere.

## Thermal Oxidation for Waste Containing Bound Nitrogen

Where a waste contains chemically combined nitrogen, then a high emission of oxides of nitrogen (NOx) is possible. PCC provide a solution by introducing a reducing zone, where combined nitrogen is reduced at high temperature to molecular nitrogen without forming NOx. The products are quenched with recycled flue gas to freeze the equilibrium prior to oxidation of the remaining products with air in the oxidizing zone.

## Thermal Oxidation for Waste Containing Inorganic salts

Inorganic salts present in waste streams give rise to particular problems to which PCC have solutions

The salts tend to form a eutectic mixture, which is molten at the oxidation temperature. Without careful design the salts will crystallize on downstream heat transfer surfaces etc.

The PCC solution is to cool the gases to below the eutectic temperature using recycled flue gases. Salts are then collected and removed using a hopper arrangement. Particulate is removed down-stream using a bag filter.

- Waste Types
- Methyl Chloride
  - Chloroform
  - Carbon Tetrachloride
  - Furans
  - Other

- Waste Types
- Acrylonitrile
  - Ammonia
  - Amines
  - HCN

- Waste Types
- Spent Caustic
  - Salt Containing Solvents
  - Salt Contaminated Oils
  - Aqueous Salt Solutions