Thermal Oxidisers and Incinerators
Europem: Higher safety levels, flexible and reliable operation, low emissions

Europem is a leading supplier of Environmental Payback Projects. Our Technologies and Processes transform an environmental problem into a revenue stream for our clients.

Since its foundation, Europem has consistently been at the forefront of technological innovation and today we offer Best Available Technologies to provide sustainable, reliable, flexible and robust solutions for

- **Energy production** using industrial effluents, waste streams and by-products
  - Advanced multifuel/flexifuel low NOx burners
  - Thermal oxidisers and incinerators including redu-reox systems, High Intensity Incinerators, tailgas incinerators for SRU’s, Recuperative thermal oxidisers, Ledenox incinerators, fluidised bed and rotary kiln furnaces
  - Heat recovery boilers and heaters including flame tube boilers, water tube boilers, thermal oil heat exchangers, bath heaters and tube and shell heat exchangers
  - Direct fired heaters and boilers

- **Product recovery**
  - Vapour recovery units (VRU) using adsorption and/or condensation technology
  - Flare gas recovery (FGRU)
  - Sulphur recovery units (SRU) including main reactor burner, main thermal reactor and tail gas incinerator w/wo waste heat recovery boiler

- **Safety and environmental protection**
  - ATEX zone 0 vapour extraction and treatment systems
  - Flare systems including elevated flares, air, gas or steam assisted flares, ground flares, enclosed ground flares, temperature controlled ground flares
  - deNOx and flue gas cleaning systems

Our team has built and commissioned over 300 installations in more than 35 countries worldwide.

Europem maintains an Environmental, Health and Safety Management System in accordance with ISO 14001, OHSAS 18001 and VCA-p. Our quality assurance and control plan is ISO 9001-2008 certified.
**Overview of incinerator systems and their optimal solutions for a variety of characteristics**

<table>
<thead>
<tr>
<th>Waste Types</th>
<th>Static Horizontal</th>
<th>Static Vertical</th>
<th>Rotary Kiln</th>
<th>Bubbling Fluidised Bed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sludge (low LHV)</td>
<td>-</td>
<td>+/-</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Sludge (high LHV)</td>
<td>-</td>
<td>+/-</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Solid waste (low LHV)</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Solid waste (high LHV)</td>
<td>-</td>
<td>-</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Liquid waste (low LHV)</td>
<td>++</td>
<td>++</td>
<td>+</td>
<td>+/-</td>
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<tr>
<td>Liquid waste (high LHV)</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+/-</td>
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<tr>
<td>Waste gas (low LHV)</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Waste gas (high LHV)</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+/-</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Waste Granulometry</th>
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</thead>
<tbody>
<tr>
<td>Small</td>
<td>++</td>
<td>++</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Medium</td>
<td>-</td>
<td>-</td>
<td>++</td>
<td>++</td>
</tr>
<tr>
<td>Big</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
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</table>

<table>
<thead>
<tr>
<th>Capacity</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Throughput</td>
<td>small to medium</td>
<td>small to medium</td>
<td>small to medium</td>
<td>small to medium</td>
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<tr>
<td>Flexibility</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Turn-down ratio</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>High</td>
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<tr>
<td>Continuous/Batch System</td>
<td>Batch</td>
<td>Batch</td>
<td>Continuous</td>
<td>Continuous / Batch</td>
</tr>
<tr>
<td>Waste profile range</td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>Medium</td>
</tr>
</tbody>
</table>

| Process                    |                   |                 |             |                        |
| High Intensity Oxidation   | ++                | ++              | -           | -                      |
| Redu-Rex                   | ++                | ++              | ++          | ++                     |
| LedeNOx                    | ++                | ++              | +           | +                      |
| SRU                        | ++                | ++              | +           | -                      |

| Thermal Destruction Efficiency | High       | High           | High       | High                   |
| Thermal Efficiency          | High       | High           | Low        | High                   |
| CAPEX                       | Low        | Moderate       | Moderate   | High                   |
| OPEX                        | Low        | Moderate       | High       | Low                    |

All systems comply with the most stringent emission requirements.
Incinerators

EUROPEM can offer a comprehensive range of gasification - combustion systems for a wide range of waste gases, waste liquids, sludge and solid waste.

These designs include amongst others:

- Horizontal incinerators for waste gases and liquids with minimal ash/salt formation
- Vertical incinerators including slagging furnaces for salt and ash containing wastes
- Vertical temperature controlled combustors/thermal oxidisers for waste gases and vapours
- High intensity incinerators for lean waste gases and liquids
- Recuperative thermal oxidisers for lean waste gases and liquids
- Reduction-reoxidation (Redu-Reox) low NOx incinerators for compounds containing bound-nitrogen
- Oxidation reduction low NOx incinerator for ammonia and waste streams containing bound-nitrogen (Ledenox incinerators)
- Oxidation reduction furnaces for sulphur recovery units (SRU)
- Tail gas incinerators for SRU’s or other processes
- Pyrolysis furnaces for hazardous waste
- Rotary kiln incinerators for mixed waste including drums and packaged waste, hospital waste, solid waste, sludge
- Fluidised bed incinerators for chemical and biological sludge, solid waste with high moisture content such as RDF from pulping operations, refuse derived fuel and bio-waste

All our designs are optimized towards flexibility, robustness, low emissions, high thermal efficiency and reliability. With over 100 incinerators in operation in over 20 countries Europem can demonstrate a solid track record.
Each Europem incinerator is designed to meet project specific requirements.

All systems meet the most stringent emission limits and have been developed to meet the stringent European emission limits as an absolute minimum. Most of the Europem incinerators are equipped with waste heat recovery boilers – steam or thermal oil – or air pre-heaters to improve the overall thermal efficiency of the plant.
High Intensity (HI) Incinerators

The HI Incinerator features a combustion chamber with a mixing wall which divides this chamber into a high temperature combustion HI zone and a lower temperature post-combustion zone. This particular configuration is most suited to the fuel efficient combustion of lean waste gases and effluents, as it reduces the need for any support fuel.

Key Features

• Combustion chamber with mixing wall
• High intensity combustion zone at elevated temperatures
• Waste gases and liquids are delivered to the HI zone through the burner and a series of injection lances.
• The mixing wall creates a high temperature zone around flame ensuring complete oxidisation and also to increase turbulence, thus avoiding cold spots and the formation of CO
• Post-combustion zone after the mixing wall to ensure residence time of two seconds at >850°C

Key Advantages

• All hydrocarbons are destroyed
• No CO formation
• Complete odour destruction
• Up to 20% fuel saving
• Destruction efficiency over 99.99%
Europem Redu-reox incinerators for complete oxidation and odour destruction

A Redu-reox incinerator features three reaction chambers for the low NOx combustion of waste streams and fuels with a high organically bound Nitrogen content. In the first reaction chamber a reducing environment is maintained to ensure that any free Oxygen will react with Hydrogen and Carbon to form water and CO₂. No Oxygen is left to combine with Nitrogen to form NOx. Complete combustion is achieved in the re-oxidation chamber, after the gases have been cooled in the quench stage. The temperature in the re-oxidation chamber is below 950°C to ensure that any Oxygen reacts with Carbon and Hydrogen and not Nitrogen, to minimize formation of thermal NOx.

Key Features
- Three reaction chambers with staged combustion and intermediate flue gas cooling
- First chamber operating under a reducing atmosphere at a temperature above 1250°C
- Second chamber to quench the flue gases to about 800°C by either injection of steam or recirculated flue gas
- Third or re-oxidation chamber for the post-combustion of remaining waste components at temperatures above 900°C

Key Advantages
- Ultra-low NOx combustion of waste streams with high bound Nitrogen contents
- Complete oxidation with all hydrocarbons destroyed
- No CO formation
- Complete odour destruction
- No need for SNCR or SCR deNOx to meet emission limits
- Destruction efficiency over 99.999%
A Europem LedeNOx incinerator is the ideal design to achieve low NOx emissions

LedeNOx Incinerators

A LedeNOx incinerator is an oxidisation-reduction reactor and is the ideal design to achieve low NOx emissions whilst burning waste streams that contain Ammonia and bound Nitrogen. Part of the waste stream containing Ammonia is oxidised and forms NOx in the process.

This NOx is then reduced by injecting the remaining Ammonia rich waste stream, where the Ammonia is used to promote a non-catalytic deNOx reaction and reduce NOx to Nitrogen and water.

Key Features

• One combustion chamber with two mixing walls
• Part of the Ammonia containing waste is injected through the burner, part between the mixing walls
• Part of the Ammonia is oxidised to form NOx, whilst the remaining Ammonia is used to react with NOx to form N₂
• The mixing walls ensure that the waste and combustion gases are mixed and also ensures a uniform temperature profile to improve the overall efficiency of the deNOx reaction

Key Advantages

• No need for SNCR or SCR deNOx to meet emission limits
• Ultra-low NOx combustion of waste streams with high bound Nitrogen or Ammonia contents
• Complete oxidisation and destruction of all hydrocarbons
• No CO formation
• Complete odour destruction
• Destruction efficiency over 99.999%
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