

Environmental Systems

Innovative VOC Abatement Systems



Leadership through innovation in Air Pollution Control





Spooner Industries Ltd



During its 75 year history Spooner Industries has been a leading innovator introducing pioneering technology in all of its industry sectors. Initially focused on forced air convection technology, the company has unrivalled worldwide experience in the drying, curing, baking, cooling and non-contact handling of a diverse range of products.

Today it continues to be at the forefront of technology providing the latest **environmental control systems** to solve pollution control needs either stand alone or as part of an integrated thermal package.

Spooner Industries also offers a Technical Services division to maximise the performance of existing process equipment, reduce downtime, increase energy efficiency and reduce running costs.

In addition to its new headquarters in Ilkley, UK, the company has appointed agents and representatives across the globe, providing a local point of contact for almost every client, wherever their location and bespoke solutions for their design, testing, manufacture and installation needs.



Anguil Environmental Systems

Established over 30 years ago by Gene Anguil, Anguil has developed a breadth of technologies that control harmful and regulated volatile organic compounds (VOCs), hazardous air pollutants (HAPs), process odours and nitrogen oxides (NOx). The result is over 1,600 installations around the world encompassing a wide range of applications and technology solutions. This experience provides us with the confidence to assess and resolve most air pollution issues.



Spooner Anguil

Spooner Industries Ltd is the European licensee of Anguil Environmental Systems. Anguil has a strong reputation and state of the art air pollution control technologies. The partnership allows Spooner to design, engineer and manufacture oxidiser equipment in-house, and offer industrial facilities a single source solution for their dryer, oven and air pollution control needs. The technologies now on offer from Spooner Industries include regenerative thermal oxidisers, recuperative thermal oxidisers, direct fired oxidisers and catalytic oxidisers as well as adsorption systems, rotor concentrators and energy recovery systems.

Spooner Anguil serves industries such as chemical, coating, composites/fibreglass, engine exhaust treatment, electronics, ethanol processing, food/bakery, metal decorating, paint, petroleum, pharmaceutical, printing, laminating, converting, coil coating, remediation and rubber curing.

Technologies

- Thermal Oxidisers
 - Regenerative Thermal Oxidisers (RTO)
 - Thermal Recuperative Oxidisers
 - Direct fired Thermal Oxidisers (DFTO)
- Catalytic Oxidisers
 - Regenerative Catalytic Oxidisers (RCO)
 - Catalytic Recuperative Oxidisers
- Adsorption Systems
 - Rotor Concentrator/Oxidiser
- Chlorinated Emission Control Systems
- Heat Exchangers
- Energy Recovery

Spooner Anguil is dedicated to a culture of creativity and innovation to maintain its position at the forefront of VOC abatement technology



Thermal and Catalytic Oxidisers



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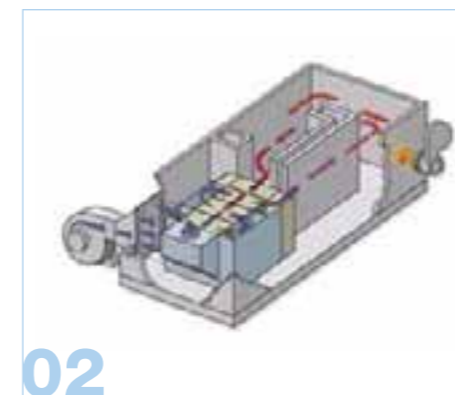
Thermal and Catalytic Oxidisers

Spooner Anguil offers a full range of proven emission control technologies which include Regenerative Thermal Oxidisers (RTOs), as well as Catalytic, Thermal Recuperative and Direct Fired oxidiser systems. This enables our engineers to design an unbiased solution that optimises the best technology for your company. Oxidisers destroy Hazardous Air Pollutants (HAPs), Volatile Organic Compounds (VOCs) and odorous emissions that are often discharged from industrial processes. Emission destruction is achieved through the process of high temperature thermal or catalytic oxidation, converting the pollutants to carbon dioxide and water vapour, due to the proper mix of temperature, residence time and turbulence within the reactor chamber.

Regenerative Thermal Oxidisers (RTO)

Regenerative Thermal Oxidisers consist of a number of ceramic media chambers or beds, connecting to the combustion chamber. The VOC and HAP laden process gas enters the oxidiser through an inlet manifold to flow control valves that direct the gas into one of the beds. The process gas is progressively heated in the ceramic media bed as it moves towards the combustion chamber. Once oxidised in the combustion chamber, the purified air releases thermal energy in the media beds that are in the outlet flow direction from the combustion chamber. Poppet or butterfly valves alternate the airflow direction into the media beds to maximise energy recovery within the oxidiser. The oxidation and high energy recovery within these oxidisers reduces the auxiliary fuel requirement and saves operating costs – the units can reach self-sustaining operation with no auxiliary fuel usage (auto-thermal) at low inlet VOC concentrations.

- Ceramic heat exchange media
- High thermal efficiency of 80 – 96+%
- Most suitable for low to medium VOC loading
- Hot side bypass for high VOC conditions
- High volumetric turn-down capacity
- High destruction rate efficiency



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Thermal Recuperative Oxidisers

During operation of a thermal recuperative oxidiser, VOC-laden air is drawn into the system fan and is discharged into the system's shell and tube heat exchanger. The air is preheated through the tube side of the heat exchanger and then passes the burner, where the contaminated air is raised to the thermal oxidation temperature. As the VOC-laden air is raised to the thermal oxidation temperature for the specified residence time (0.5 – 2.0 seconds), an exothermic reaction takes place. The VOCs in the air stream are converted to carbon dioxide and water vapour. The hot, purified air then passes on the shell side of the heat exchanger where the energy released by the reaction is used to preheat the incoming air. The heat exchanger minimises the system's fuel consumption with the system being self-sustaining at moderate LEL levels. Finally, the contaminant-free air is exhausted into the atmosphere.

- Stainless steel heat exchangers
- Up to 70% thermal efficiency
- Suitable for high VOC loading
- High destruction rate efficiency



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Direct-Fired Thermal Oxidisers (DFTO)

Sometimes referred to as an After-Burner, the direct fired thermal oxidiser uses a specially designed burner to raise the temperature of a pollutant laden air stream to a predetermined combustion temperature. In operation, the contaminated process exhaust is ducted into a burner chamber where the VOCs and HAPs are oxidised. The clean, heated exhaust gas can then be discharged to the atmosphere or sent through an optional heat recovery system.

To achieve a high destruction efficiency, the heated air is kept in the combustion chamber for a specified amount of time, called the residence or dwell time. At the inlet to the combustion chamber turbulence is generated to mix the pollutants and oxygen molecules. Proper mixing of the combustion air and process streams not only provides high destruction efficiencies but also safe operation. The Spooner Anguil design minimises the risk of explosion and takes complete advantage of the VOC laden exhaust stream to minimise auxiliary fuel needs. An optional burner system is available to burn inert process streams directly in the burner as fuel.

From a small tank vent to the largest of ethanol plant applications, each Spooner Anguil DFTO is designed around our customer's application. Special designs can be provided to handle process streams that contain acids such as carbonic, hydrochloric or sulphuric acid and also insert air streams. The DFTO is an ideal technology for process streams heavily laden with pollutants and intermittent batch processes where the oxidiser can come on-line relatively quickly.

Catalytic Oxidisers

Catalytic oxidation uses a catalyst to convert the contaminants to carbon dioxide and water at a lower temperature than that required for thermal oxidation. Catalysts can be of several different chemical types, each with its own operating temperature range.

Catalytic Recuperative Oxidisers

With a catalytic recuperative oxidiser, a catalyst bed is introduced into the combustion chamber. After pre-heating the VOC-laden air through the tube side of the heat exchanger, the air passes the burner

where the contaminated air is raised to the oxidising temperature of the catalyst. As the VOC-laden air passes through the catalyst, an exothermic reaction takes place and the VOCs are converted to carbon dioxide. Before going to atmosphere, the air then passes on the shell side of the heat exchanger where the energy released by the reaction is used to pre-heat the incoming air.

Regenerative Catalytic Oxidisers (RCO)

With a regenerative catalytic oxidiser, a catalyst is included in the combustion chamber of a regenerative thermal oxidiser. After being progressively heated in the ceramic media inlet bed, the VOCs are oxidised across the catalyst allowing destruction to occur at lower temperatures. The hot air then releases energy into the ceramic media as it passes through the outlet bed. The ceramic beds alternate between inlet and outlet modes to maintain system high thermal efficiency.

Adsorption Systems

Adsorption is a concentration process. In the first stage of the process, contaminants in the air stream are adsorbed onto the surface of the selected media. In the second stage, they are desorbed by a smaller, higher temperature stream and increased in concentration. After concentration, the VOC's are sent for destruction in an oxidiser system.

Rotor Concentrator/Oxidiser

The Spooner Anguil Rotor Concentrator/Oxidiser is designed to adsorb Volatile Organic Compounds (VOCs) from a high volume, low concentration airstream and to oxidise the VOCs in a reduced volume, high concentration process stream.

The high volume airstream is passed through a rotor concentrator wheel where the VOCs are adsorbed in the bed, purifying the high volume air. This high volume air is then exhausted to atmosphere. The concentrator wheel rotates continuously, transporting adsorbed VOCs into a desorption section. In the desorption section, the adsorbed organics are desorbed from the adsorptive media with a low volume heated airstream. This low volume, high VOC-laden air is then processed by an oxidiser. Regenerative, recuperative or catalytic oxidisers are all used for destruction of the VOC, depending upon the nature of the contaminants and the process. The operational cost of the oxidiser is substantially reduced via this concentration process.

The Rotor Concentrator/Oxidiser is often the most cost effective technology for processing high volume, low VOC concentration streams. While the capital cost of a system is competitive with other technologies, the true savings is realised in reduced operating costs.

Chlorinated Emission Control Systems

Spooner Anguil's Chlorinated Emission Control System destroys halogenated or mixed organic vapour contaminants that are discharged from a variety of industrial process streams.

The Chlorinated model is selected based on volume of airflow, contaminant type and desired destruction efficiency. Similar to a standard thermal or catalytic oxidiser, destruction of VOC-laden air is achieved through high temperature combustion with heat recovery to reduce operating costs by preheating incoming contaminants. When halogenated hydrocarbons such as chlorine, bromine and fluorine are present in the process gas, Spooner Anguil makes special considerations to design an emission control system that will not only protect against corrosion but also scrub the acids produced during oxidation.

Design Considerations:

- Temperature and residence times are increased to ensure halogen destruction efficiency
- Induced draft fan design is used to eliminate acid gas escape
- Critical components are upgraded to higher alloys to withstand the corrosive emissions

- External shrouds are added or vinyl ester coatings applied to prevent acid corrosion of the external shell
- Acid Gas Scrubbers are incorporated into the system for further treatment of acidic emissions
- FRP (Fiberglass Reinforced Plastics) fan and ductwork are used when appropriate

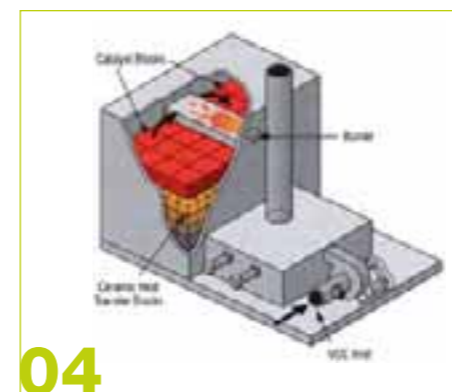
Heat Exchangers and Energy Recovery

Every energy demand is unique, as is every energy-efficiency improvement opportunity. Track records at both Spooner and Anguil include an ability to blend time-tested, standard products with innovative, custom engineered solutions. We design and install energy recovery systems that decrease your energy consumption, reduce operating costs and maximise return on investment.

Each system is custom engineered to address your energy needs with a solution based on your specific objectives.

Our energy recovery and heat transfer offerings include:

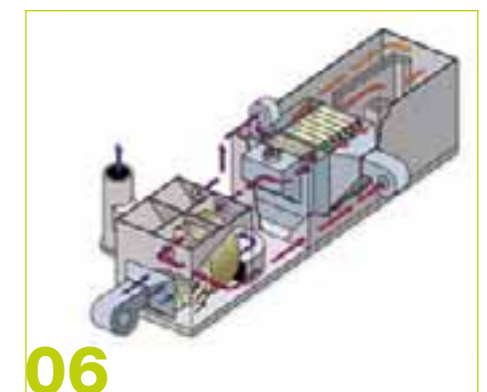
- Air-to-Air Heat Exchangers (Shell & Tube, Plate Type)
- Air-to-Water Heat Exchangers (Economisers)
- Air-to-Steam Heat Exchangers (Waste Heat Boilers)
- Air-to-Fluid Heat Exchangers (Oil, Glycol Loop)
- Power Generation
- Energy Audits



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General Services

- Turnkey design and installation of VOC abatement and odour control projects
- Troubleshooting Visits
- Remote System Evaluation Via Modem
- Maintenance Plans and Service Contracts
- Operator Training
- System Airflow Balancing
- Destruction Efficiency Check-ups
- Operating Cost Reviews

Spare Parts

- Individual Parts Requests
- Recommended Spare Parts Packages

Retrofits and Upgrades

- System Relocation
- Process Inspections
- Refurbishment of equipment
- Increased Capacity
- Improved Capture
- Increased Destruction Efficiency
- Reduced Operating Costs
- Reduce Downtime
- Improved Reliability

Preventive Maintenance Evaluation (PME)

A two-day, thorough maintenance inspection covering the mechanical, electrical, process control loops and efficiency of your oxidiser system

