ENVIRONMENTAL TECHNOLOGY
EISENMANN DELIVERS CUSTOM-TAILORED, SUSTAINABLE SOLUTIONS FOR AN INTACT ENVIRONMENT.
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A healthy environment and state-of-the-art production are not a contradiction. Rather, they go hand in hand – thanks to sophisticated technologies that enable ecologically sound manufacturing.

Eisenmann customers stand to benefit in two ways: from our far-reaching experience with environmental technology, and from our comprehensive engineering skills in manufacturing and process technology.

The Eisenmann Environmental Technology business unit provides a wide spectrum of tailor-made solutions and optimum process designs in the following areas:

- Exhaust air purification and heat recovery
- Water and waste water treatment, water recycling
- Waste disposal and recycling of valuable materials
- Heat recovery from industrial and other waste
- Biogas plants
- Ammunition disposal
- Custom solutions for highly toxic waste
- End-to-end and integrated solutions
Customized solutions for industrial applications
While helping customers make their production processes cleaner and more environmentally friendly, our engineers first analyze the possible ways of preventing and reducing pollutants in the production facility. In close collaboration with our customers, our specialists develop customized solutions for water, air and waste treatment in line with the plant’s specific requirements and goals. Eisenmann can look back on about 55 years of success in environmental technology, with over 2,500 plants installed around the world.

EXAMPLE PLANT

1 Water treatment
2 Water recirculation
3 Exhaust air purification
4 Waste water treatment
5 Recycling of waste
6 Production facility
EXHAUST AIR PURIFICATION

In line with the “reduce, reuse, recycle” principle, we begin by examining the entire production process to gain a holistic picture of the current situation. We believe that the best way to protect the environment is to avoid emissions. To decide which measures and processes are best suited to a particular application in terms of effectiveness and cost, a number of factors must be considered. These include the temperature and volume of exhaust air to be treated, the type and concentration of pollutants, and opportunities for utilizing recovered energy.

**Thermal treatment**
The fastest and safest way to remove combustible organic contaminants is through oxidation. During this process, the polluted air is heated to a sufficiently high temperature to oxidize the organic compounds to mostly water and carbon dioxide.

**Thermal oxidation (TO)**
TO is ideal for applications where the waste heat can be recovered and directly utilized in other production processes. Thermal oxidation technology is regarded as robust, reliable, and universally deployable.

**Regenerative thermal oxidation (RTO)**
Due to its low supplemental energy requirements, and because in many cases, there are no suitable heat consumers on the same site. The RTO is a very efficient exhaust air treatment system. The Eisenmann solution features a special rotating air distribution system instead of a valve or damper system which gives you a system with very high reliability and low maintenance.
Adsorption
In contrast to the thermal methods described earlier, adsorption processes do not require high temperatures, and do not convert the contaminants.

Adsorption wheel
Adsorption systems are used to concentrate large volumes of exhaust air with few contaminants. Because smaller air volumes with a higher concentration can be treated more economically, concentrating the contaminants in a low-volume desorption stream is a logical first step in the treatment of exhaust air with a low pollutant load. This makes subsequent processes – such as combustion or solvent recovery – more cost effective.

Combustion chambers
Eisenmann combustion chambers are ideal for exhaust air with high concentrations of halogens and explosive air/solvent mixtures. Various configurations are available for a range of applications. For example, the Eisenmann Turaktor can be installed as a vertical or horizontal combustion chamber for the removal of pollutants.

The combustion chambers by Eisenmann will be integrated in your production with a customized heat recovery system and a flue gas cleaning which enables you to fulfill all clean gas values needed.
Eisenmann develops and designs tailor-made systems for process water supply and waste water treatment. Various processes can be combined for the development and installation of water management systems, and for the implementation of zero liquid discharge (ZLD) concepts. Our customer base includes leaders from the chemicals and automotive industries and all other sectors where water plays a major role in production processes.

**Inorganic contaminants in waste water**
For many decades now, Eisenmann has been delivering conventional chemical-physical processes, including precipitation, and subsequent flocculation, sedimentation and gravel filtration for removing heavy metals, fluorides and phosphates from industrial waste water and flue gas purification plants.

No matter what toxic inorganic substances the industrial waste water contains – cyanide, chromates, arsenates or nitrites – Eisenmann provides the specific solution to best fit the customers’ needs.
Organic contaminants in waste water

Eisenmann’s patented Fentox process is used for oxidizing toxic or non-degradable pollutants in the chemical industry. Biodegradable waste water can either be anaerobically digested, with biogas as a by-product, or purified in industrial water treatment facilities. In addition, Eisenmann offers processes for separating oil and water, and removing oil or grease.

Water management systems and ZLD concepts

Environmental laws and regulations are tightening in many parts of the world, and clean water is becoming increasingly scarce. As a result, our customers are growing aware of the need to optimize their consumption of this resource, and to minimize pollutants released into the environment. Eisenmann offers solutions tailored to your needs. We are intimately familiar with our customers’ production processes – which enables us to choose the most appropriate recycling methods. For sites where waste water cannot be discharged, Eisenmann closely collaborates with customers to implement zero liquid discharge concepts (ZLD).
Eisenmann Environmental Technology’s portfolio includes facilities for the thermal treatment of a wide range of residues in solid, liquid, viscous and gaseous form, such as industrial waste and sewage sludge from municipal and industrial waste water treatment plants. The technologies offered by Eisenmann can also be used for the inerting of non-recyclable materials for disposal in landfills, and for the incineration of hazardous waste such as toxic materials with combustible components, or substances containing persistent organic pollutants (POPs).

A wide variety of thermal waste disposal methods are available, depending on the customer’s requirements. These include drying, incineration, pyrolysis, torrefaction, gasification and the engineering and delivery of multi-stage processes.

**Turaktor**

The Turaktor high-turbulence combustion chamber was developed by Eisenmann for the thermal treatment of liquids, suspensions and contaminated gases. The Turaktor has been successfully employed for catalyst regeneration and precious metal recovery.

**Fluidized bed incineration (FBI)**

A wide array of applications, energy-efficient operation and considerable flexibility in terms of input materials and throughput rates – these are just some of the benefits of FBI. This process can be used for incineration of solids such as biomass, viscous waste, dewatered sewage sludge, and oil sludge.
Rotary kiln
Rotary kilns are employed for the thermal treatment of solid and viscous materials and can be all-steel or brick-lined. Depending on the calorific value of the input material, rotary kilns are designed for either co-current or counter-current operation. Especially advantageous is the rotary kiln in special waste applications.

Chambustor chamber kiln
The chamber kiln can be deployed for recovering precious metals from solid and viscous materials. It can also be used for environmental-friendly disposal of highly toxic or contaminated materials. Batch processing with the Chambustor is a highly cost-effective solution for the disposal of waste produced intermittently or in small quantities.

Pyrobustor
The Pyrobustor, a dual-chamber rotary kiln with no refractory lining, was specially developed by Eisenmann for decentralized sewage sludge incineration. It is particularly suitable for small- to mid-sized waste water treatment plants installed on-site. The Pyrobustor converts pre-dried sewage sludge into heat and inert ash that is suitable for landfill disposal.
DIGESTION

Biogas plants
Biogas is produced by the digestion of organic matter by organisms under anaerobic conditions. Typical feedstocks for this fermentation process include agricultural waste, biowaste from municipal refuse collection, and organic materials from industrial sources. Processing these substances in a biogas plant generates renewable energy. Moreover, it restores valuable resources such as soil nutrients to the environment. Correspondingly, the digestion of biowaste is a highly sustainable, eco-friendly form of refuse treatment.

Uses for biogas
Biogas can be employed in a combined heat and power (CHP) plant for the efficient generation of two forms of energy. Alternatively, it can be upgraded to biomethane, and injected into the natural gas grid or used as fuel for road vehicles.
A fully automated, modular system

Eisenmann solutions are deployed in a variety of scenarios. The engineering expert provides a broad range of services, including the design and implementation of new turnkey facilities, and the extension of existing composting or digestion plants. Certified sanitation technology in Eisenmann digestion systems ensures compliance with future legislation.

Digesters can be made of concrete or steel in line with specific needs – and the systems can be combined to create a tailored solution. A digestion plant can operate cost-effectively with 5,000 metric tons of substrate and waste annually. The modular system can be scaled up to process more than 300,000 metric tons per year.

The plants are fully automated and equipped with a process control system that constantly measures and manages digestion to enhance biogas yield.
Eisenmann plug-flow digester
The central feature of the Eisenmann biowaste plant is the horizontal plug-flow digester. This design delivers the best possible digestion results and reliable operation. The design prevents short-circuiting of feedstock, ensuring maximum biogas yield. The Eisenmann system design provides sufficient residence time to ensure full biowaste sanitization, allows high organic loads and continuous high solids digestion which tolerates contaminants.

Advantages at a glance
- Customer-specific solutions
- Over 65 years experience in industrial plant engineering
- Digestion of high-solids feedstocks
- High organic load with ideal residence time
- Maximized gas yield
- Minimized recirculation rates
- Sanitization in accordance with applicable legislation
- Rapid on-site construction
- Enclosed system prevents emission of offensive odors
Eisenmann’s extensive range of solutions for waste water, exhaust air and waste enables us to develop sophisticated plants that combine a variety of processes, and assume overall responsibility for their implementation. This ensures seamless dovetailed processes and minimized operating costs. The realized modular waste disposal plant described below is a prime example:

1. **Module 1: High-turbulence combustion chamber (Turaktor)**
   for incinerating liquid waste.

2. **Module 2: Exhaust air purification**
   for purifying flue gases produced by the Turaktor.

3. **Module 3: Waste water plant**
   for treating water after the flue gas purification line.

In these three steps, hazardous, highly toxic materials are converted into waste safe enough for landfill disposal. The treated water can be discharged to the drains, and the purified air can be released into the atmosphere.
AMMUNITION DISPOSAL

Eisenmann has been developing and building ammunition destruction plants tailored to customers’ requirements since 1990. In terms of the number of completed projects and technologies developed, Eisenmann is the world’s number-one specialist for designing, constructing and operating thermal ammunition treatment facilities.

Conventional ammunition
Eisenmann developed the patent-pending moving bed reactor for the safe, environmental-friendly and cost-effective destruction of conventional ammunition. To maximize sustainability and comply with emissions regulations, the reactor can be equipped with a flue gas purification unit, specially designed in accordance with the composition of the input stream.

Chemical ammunition
For the safe disposal of large amounts of centrally stored chemical ammunition, Eisenmann has developed fully automated plants that can be installed on-site. The individual components have been tested and proven in practice. These include high-tech solutions for process monitoring and for safe handling prior to the disposal process. During the detoxification/neutralization of chemical warfare agents, reaction products are produced that must then be disposed of safely. The Eisenmann Turaktor, a high-turbulence, brick-lined combustion chamber,
is a sound solution for the environmentally-friendly disposal of the liquid and gaseous residues generated by the hydrolysis process.

**Thermal disposal of rocket propellant and landmines**
Eisenmann developed a special-purpose rotary kiln engineered for the safe, effective and eco-friendly disposal of rocket propellant. As part of a disarmament project, Eisenmann designed and installed a disposal complex comprising a rotary kiln for intercontinental missile propellant, a detonation chamber for antipersonnel mines, and a shared flue gas purification unit for the two systems.

**Operator models**
In addition to designing, building and maintaining ammunition destruction plants, Eisenmann offers customized operator models. Qualified specialists are available for ensuring safe, reliable operations of disposal systems for both conventional and chemical ammunition.
Proper maintenance is key to the longevity and efficient operation of production plants. Opportunities for improvement or upgrades must be regularly examined to keep the technology up-to-date in every way. Eisenmann offers custom-tailored services:

**Standard after-sales service**
- Supply of spare parts
- Maintenance management
- Employee training and instruction

**Plant optimization**
- Retrofits and upgrades
- Plant modifications
- Process optimization
- Consulting

**Custom solution**
- Service modules
- Emergency on-call service
- Remote services
- Ramp-up support
- Support during production

**Full service and operator models**
Eisenmann is a leading global industrial solutions provider for surface finishing, material flow automation, environmental engineering and thermal process technology. The company develops and builds custom manufacturing, assembly and logistics plants that are highly flexible, energy- and resource-efficient. The family-run enterprise is headquartered in southern Germany and has been advising customers across the globe for more than 65 years. Today, Eisenmann has a workforce of approximately 3,600 worldwide, with 26 locations in 14 countries in Europe, the Americas and the BRIC countries. In 2015, Eisenmann generated annual revenues of 907 million euros.

Specialist engineers and technical staff comprise around half of the workforce. Thanks to their in-depth understanding of process engineering, they are able to develop plant configurations precisely tailored to each application. Prior to shipping, the systems are fully assembled and thoroughly tested at our dedicated Technology Center, ensuring problem-free installation and rapid commissioning at the customer site.

In short, Eisenmann offers cutting-edge technology, high customer satisfaction and exceptional value.