



FENTOX®

EFFECTIVE, COST-EFFICIENT TREATMENT OF WASTE WATER CONTAINING ORGANIC CONTAMINANTS

THE FENTOX® PROCESS OXIDIZES TOXIC CONTAMINANTS IN WATER, RENDERING THEM BIODEGRADABLE.

In recent years, thresholds for discharging contaminants into rivers and lakes have been lowered significantly across the globe. At the same time, industrial waste water from the production of chemicals, pharmaceuticals and cosmetics, from landfills and some types of metal processing, is often heavily contaminated with organic toxins that cannot be broken down in biological waste water treatment plants. In such cases, chemical oxygen demand (COD) can only be reduced to an acceptable level through chemical oxidation, for example by means of the Fentox® process.

The oxidation method

The Fentox® process developed and patented by Eisenmann exploits the reaction discovered by and named after Henry Fenton. The admixture of iron salts and hydrogen peroxide under acidic conditions releases hydroxyl radicals, which oxidize the contaminants in the waste water. The combination of acid cleavage, oxidation and precipitation makes the process extremely versatile. Capital expenditure is significantly lower than for incineration, for example, and this treatment method is much more flexible than alternatives.

The process: a two-stage reactor cascade

The unique feature of the Fentox® process is the two-stage reactor cascade. The waste water is heated to a temperature of 50 °C, taking reaction heat into account. Metered quantities of acid, iron (II) salts and hydrogen peroxide from upstream mixers are introduced into the first reactor. After a defined reaction time, the waste water is fed into the second reactor. Here, more hydrogen peroxide is added, which reacts with the remaining iron. The added chemicals cause the release of highly reactive hydroxyl radicals, which react with the organic contaminants in a chain reaction. Through this process, COD is significantly reduced and critical substances are oxidized to below the detection limit. The

oxidized compounds are generally readily biodegradable after this treatment. In the downstream neutralization stage, iron salts are precipitated out, further reducing COD through coprecipitation.

A wide range of applications

The Fentox® process is especially effective in treating waste water that has a COD between 1 and 30 g/l and contains substances which are not easy to biodegrade. The process oxidizes critical contaminants, rendering them biodegradable. In most applications, far higher removal rates are achieved in practice than would be expected in theory. This may be due to the chain reaction that takes place during oxidation and the removal of additional contaminants through coprecipitation.

The effects of the treatment can vary considerably according to the properties of the waste water. In some cases, certain substances are precipitated readily after oxidation. In others, it is possible to crosslink and remove dissolved silicone compounds after breakdown of the emulsifiers. In a current project, organic contaminants are oxidized and phosphorus recovered by precipitation from a highly toxic waste water stream. The remaining brine is reused in a different process.

Laboratory results confirm the efficacy of the Fentox® process

In Eisenmann's laboratories in Holzgerlingen, the process is tested with real waste water samples. The findings and experience obtained to date are utilized in the design of plants and calculation of operating costs. In laboratory trials, a large number of water samples, of diverse origin and composition, have been successfully used to reduce COD concentrations, adsorbable organic halogens (AOX), amines, phenols, and other unwanted organic contaminants, in some cases to below detection limits.



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Advantages at a glance

- Low capital expenditure as plant is simple to install
- Much more cost-efficient than waste water incineration
- Very effective in cases where a biological treatment alone is insufficient
- Effective reduction of COD and AOX
- Easily combined with physical/chemical precipitation or biological treatment
- Oxidation of toxic substances to below the detection limit
- Worldwide customer references underscore Eisenmann's deep process skills



Effective, cost-efficient treatment of waste water containing organic contaminants.

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