

31.- Ozone process

Title and name of product or technology
Water reuse with ozone as oxidant
Abstract
Regarding the new challenges coming with anthropogenic micropollutants and future regulations, the ozonation can be an option to solve these tasks especially in combination with biological treatment. Ozone has the ability to oxidise and disinfect simultaneously. Today, 40 technical applications of ozonation in combination with biological treatment already exist but a few are published. The experiences show, that treatment of wastewater with ozone and biology is an economical and promising technology, even in large scale.
Description including main features/advantages
Especially in combination with biological treatment, the ozonation is able to oxidise target compounds as pathogens, colours, pharmaceutical pesticides, herbicides at low dosage rates and other persistent COD at higher dosage rates meeting future standards as described in the European Water Framework Directive.
Innovative aspects
Combination of ozone and biological treatment.
Current and potential industrial users/domains of application
<p>The water treatment plant Kalundborg treats mixed sewage consisting of 20% municipal and 80% industrial wastewater. The industrial fraction largely derives from a international pharmaceutical company, which operates one of the largest insulin production plants worldwide at this site. Due to this, the treatment plant is designed to purify and clarify the wastewater of nearly 350,000 inhabitants resulting from the adjacent pharmaceutical company, although Kalundborg is a smallish town. The wastewater contains difficult-to-degrade organic impurities monitored as COD value. Due to the extension of production scheduled by the pharmaceutical company, it was decided to redevelop the treatment plant completely.</p> <p>As the last treatment step an ozone treatment was projected within the recirculation system, for degrading a load of up to 1.250 kg COD per day. Therefore the ozone system was designed for 180kg Ozone/h (2 times 90 kg/h).</p> <p>After passing through treatment steps typical for conventional wastewater treatment plants, the biologically pre-clarified wastewater is treated by ozone within the recirculation system. This ozonation takes place in six reaction vessels with a total volume of 300 m³. Within a period of only 15 minutes of total contact, a drastic reduction of the persistent organic impurities occurs. The COD could be reduced by 38 % from in average 120 mg/l to 75 mg/l in average. At the end of the trials, the COD could be reduced to approx. 68 mg/l. To improve the overall reduction capacity, a H₂O₂ dosage and an additional biological filtration after the O₃/H₂O₂ has been installed.</p> <p>A complete removal of furosemid, sulfamethizol and ibuprofen could be detected at ozone dosages of 21.5 to 53.5 gO₃/m³. These dosages are much lower than approx 180 gO₃/m³ needed for the elimination of the COD.</p> <p>Assuming energy costs of 0.07 €/kWh and costs for the oxygen-supply of 0.12 €/m³ oxygen, an exemplary rough cost-estimation of the ozonation step delivers specific operation-costs of approximately .to 01 to 0.3 €/m³ water treated.</p>
Current state of development
Waste water treatment plant is running with ozone treatment.

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