Technology for Water
ENVIROCHEMIE

Developing a safe process for removing active ingredients from wastewater

EnviroChemie develops system solution for removing pharmaceutical ingredients from wastewater

A large producer of generic medicinal products has been required by authorities to pre-treat its production wastewater before discharging it into the municipal wastewater treatment plant. According to regulatory requirements, any active pharmaceutical ingredients (API) are to be reduced to a residual concentration of less than 3 µg of API per litre.

As the pharmaceutical company expects these regulatory requirements to be tightened even further, it was looking for a concept that allowed a further reduction in API content, down to a residual concentration of less than 0.5 µg/l.

The challenge in developing the right process solution is the large spectrum of different API that are produced, with production changing every day. The aim was to develop a reliable method for removing the API, while also ruling out the formation of toxic substances during the elimination process.

Development of customer-specific process technology

Having impressed the customer with its open approach to different technologies, EnviroChemie was asked to develop the process engineering concept. The water experts offer various treatment solutions, including chemical-physical, biological and membrane-based treatment. When it comes to wastewater oxidation (advanced oxidation process – AOP), EnviroChemie does not have just one AOP technology, but has already successfully implemented various processes including ozone, UV/hydrogen peroxide and special processes (e.g. Fenton).

Finding the perfect solution

Working together with the customer, a combination of Biomar® MBR membrane biology and Envochem® AOP ozone treatment was chosen as a possible solution. The method first had to be verified using tests with different types of process wastewater. The EnviroChemie technical centre spent eight weeks testing samples for 20 different API. The result:

- There was enormous fluctuation in the composition of the individual samples.
- Some of the API are biodegradable.
- The non-biodegradable API can be reliably eliminated with ozone.
- The elimination rate and residual concentration of API in the wastewater depends on the ozone dosage.
- A residual concentration of less than 3 µg of API/l is reliably achieved.
- With an increase in the ozone dosage, residual concentrations of less than 0.5 µg of API/l can also be guaranteed.

Accompanying analyses were conducted to determine whether direct or indirect discharge of the wastewater is harmful to the environment (PEC/PNEC tests). It will also be important to carry out further analysis of the treated wastewater to ensure that no toxic degradation products form during the treatment process. To this end, the treated wastewater was subsequently subjected to genotoxic testing (Umu Chromotest). The result showed that the treated wastewater is genotoxically safe.

Summary

Thanks to the joint expertise of the pharmaceutical producer and the EnviroChemie water experts, a reliable wastewater treatment process was successfully developed that will remain effective even if official requirements are tightened.

The design parameters required for the wastewater treatment plant were determined in practical tests on pilot plants. Accompanying analyses confirmed that the APIs had been reliably eliminated and ruled out the formation of toxic degradation products.

Image: In the EnviroChemie technical centre, the appropriate treatment steps and treatment parameters for process engineering are determined using wastewater samples provided by the customer.

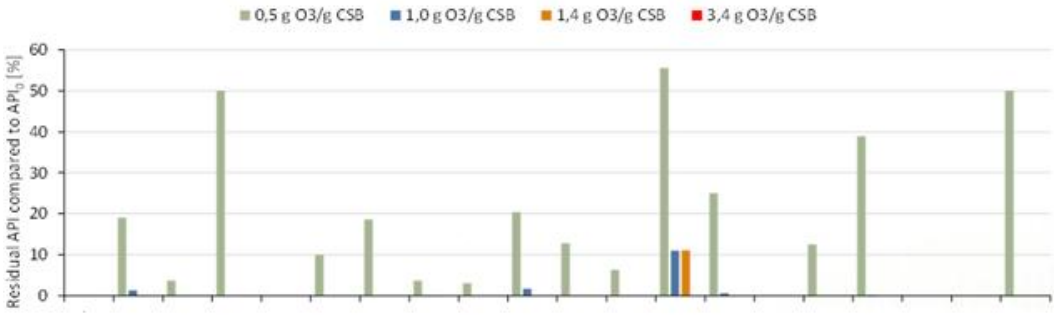

Image: API in the wastewater are removed depending on the amount of ozone added.

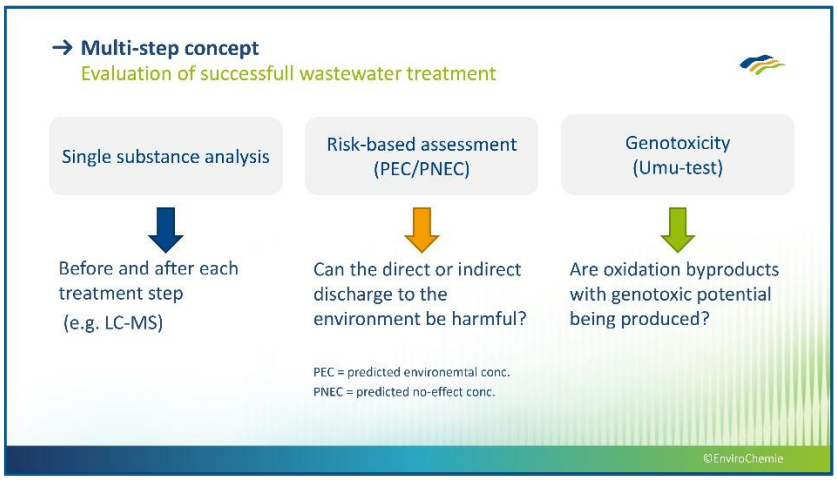

Image: The multi-stage concept shows how process engineering tests with accompanying analyses are examined for their effectiveness in removing APIs.

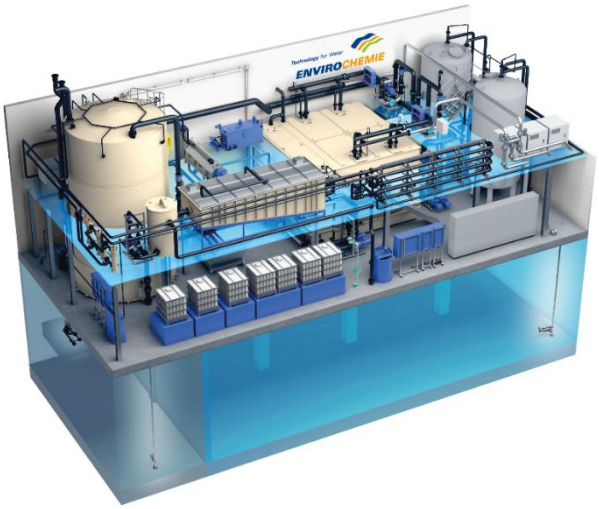

Image: After completing the process engineering tests and water analyses, the multi-stage system for the reliable removal of active pharmaceutical ingredients from wastewater is scaled up.

Press contact

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