

34.- Biofilm bioreactor using naturally immobilized tailor-made microorganisms

Title and name of product or technology
Technology for treatment of toxic wastewaters in biofilm bioreactor using naturally immobilized tailor-made microorganisms.
Abstract
A new modular technology for wastewater treatment applies tailor-made microorganisms with ability to create natural biofilm. Technology use natural immobilization of special xenobiotics biodegraders in the form of natural biofilm on the carrier (AnoxKaldnes or newly developed nanofibres). Natural immobilization increase resistance of microorganisms to the toxic compounds and extreme physiological conditions and allows survival of slowly growing microorganisms. The evaluation of this technology take place in Chemical-biological wastewater treatment plant from production of diphenylguanidine (DPG) containing cyanides, aniline, phenylurea, DPG, other accompanying organics and extremely high salinity.
Description including main features/advantages
<p>Main goal of this technology, developed in the frame of R&D project EUREKA E! 3100 CAWAB, is to provide the tools needed by water bio-treatment designers and operators to manage a tailor-made innovations creating more efficient wastewater treatment processes. Involving university based and company research from tree countries the CAWAB meets the need to construct aimly attached consortia of prokaryotic or eukaryotic degraders to remove very complex and rare mixtures of organic water contaminants.</p> <p>Results of the project as the technology verification were implemented for the treatment of wastewaters in the chemical industry: Lucebni zavody Draslovka Kolin (Cyanides producer). Wastewaters containing cyanides, aniline and phenylurea from parts of the production facilities (production of diphenylguanidine – accelerator of rubber vulcanization) were not being treated properly. Small-scale biological treatment of wastewater, subsequent pilot tests carried out in the plant revealed satisfactory results and the construction of a wastewater treatment plant was planned, projected and subsequently carried out.</p> <p>This wastewater treatment plant is currently in the full scale operation after successful 2years testing phase. All produced wastewaters are treated in accordance with designed effluent concentrations. Present xenobiotics are the only carbon and nitrogen source for microorganisms.</p> <p>The implementation of the new technology contributes to general objectives of sustainable development. Implementation of biological treatment of wastewater also resulted in the possibility to innovate production of the plant. Innovation of production will lead to an increase in production. Therefore, the plant management decided to combine the innovation of production with the construction of the new water treatment plant. The whole investment deals with modernization of Chlorcyane and Diphenylguinidine (DPG) production with the aim of increasing process safety, production capacity, and continuity of Chlorcyane production. The environmental safety of production is secured by non-waste combined physico-chemical and biological treatment of wastewater in the newly established wastewater treatment plant.</p> <p>Diphenylguinidine is a highly sophisticated component used in the rubber industry (tire production) costing approx. 2500 EUR per ton. The reconstruction of the production unit enables the plant to increase production twofold (from 900 t/year to almost 2000 t/year) together with the implementation of a safety system for wastewater treatment. Implementation of new water treatment technology enables the plant to fulfill the requirements of the Integrated Pollution Prevention and Control (IPPC) Act, as well as the requirements of the new Water and Waste Acts.</p> <p>The company produces about 20 % of the worldwide production of DPG. The DPG market is stable and has an annual increase of approx. 5 %. The prognoses revealed the same increase in demand of DPG in the coming years. Investment into</p>

modernizing the production and improvement of the wastewater treatment create the possibility for sustainable development of the company, maintain existing jobs, and bring the possibility for new jobs in the coming years.

Innovative aspects

Engaging of tailor-made microorganisms creating natural biofilm under extreme physical-chemical conditions to common wastewater treatment lines. Application of the nanofibres as a carrier for microorganisms.

Current and potential industrial users/domains of application

Lucebni zavody Draslovka a.s. Kolin (www.draslovka.cz) –current user

Potential users:

producers of wastewaters containing toxic xenobiotics or extremely high salinity with negative impact on common biological treatment plants.

Current state of development

Evaluated, verified

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