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Research area: General aims

Environmental technology // Water

Key words:

Algae, mixed algae-bacteria biomass, biological effluent treatment, paper industry

TITLE:**Algae-Bacteria operation processes for waste water treatment and biomass production (ALBAPRO)****Background/Problem area**

To date the conventional treatment for effluents in the paper industry and most other industrial sectors is biological purification. Biological wastewater treatment by sole bacterial activity is state of the art in Europe due to still lower operational costs compared to many commercially available technologies. However, biological effluent treatment still consumes a lot of energy and is unpopular for the producing industry due to unwanted costs not covering the core business of the producing industry. Multiple technologies for advanced effluent treatment (evaporation, membrane filtration, oxidation, precipitation...) have been in the focus of research for some years. Unfortunately, most of these technologies entail high investment and have even higher operating costs. Especially SMEs can hardly afford to implement highly sophisticated effluent treatment concepts to improve their effluent quality.

Therefore, 2008 the paper industry started in the project "ALBAQUA" the innovative and new effluent treatment with mixed (micro)algae-bacteria biomass flocs (ALBA-flocs). Since the submission of this CORNET project the importance and interest of ALBA-flocs has increased worldwide. In particular, the use of algae for the production of energy and biofuels, as raw material or to reduce greenhouse gases, has gained broad interest of researchers all over the world.

Objectives/Research results

The objectives of the research project are the technical utilisation of ALBA-floc systems to treat effluents and to produce valuable biomass for a further valorisation. For this, the technology should be developed further to realise ALBA application also in other industrial sectors like agro-food & meat processing and municipal effluent treatment.

Results of the ALBAQUA project showed that the dominant cost factors energy consumption and sludge disposal in biological effluent treatment can be reduced essentially with maintaining high purification efficiency. So, a successful transfer of mostly lab scale tests to technical scale operation should therefore lead to new and innovative concepts for effluent treatment combined with biomass valorisation, which is main aim of ALBAPRO.

Results of the project are so far:

- Lab scale tests had been successfully performed for optimisation of the ALBA treatment with the effluent planned for pilot trials.
- Lab scale tests with other suitable algae species are in operation to evaluate the best performance regarding start-up and operation of ALBA reactors.
- Extensive tests had been performed and the results validated. They are basis for the development of the methods for the image analysis of the ALBA biomass and the evaluation method of effluents for ALBA treatment. Some residual tests has to be done still in order to prepare a full and efficient method description.
- Composition of the ALBA-biomass had been analysed using different microbiological methods showing shifts in population during start-up period and digestion process.
- A small pilot scale ALBA plant had been constructed and is in operation during summer 2014. Recent results confirm lab test in most cases and still shows a high potential for paper mill effluent ALBA treatment.
- Tests for generation of ALBA biomass and preparation for later valorisation had been executed at Technical University of Hamburg-Harburg. Different pretreatment methods had been successfully tested to evaluate energy output from ALBA biomass.

Application/Economic benefits

The project ALBAPRO is in accordance with the Water Framework Directive (2000/60/EC) that aims to achieve sustainable water use, sustainable management and protection of freshwater resources by 2020. The proposed solutions are innovative and involve therefore a competitive advantage to economy and researchers in the participating countries. Positive results will represent a significant contribution to further understanding of the role of specific treatment constituents, such as algae in the reduction of water pollution, to the knowledge of the dynamics of pollutants and biodegradation or inhibiting processes. Additionally positive results will offer opportunities for all partners to improve services portfolio in implementing the new technology to the industry.

Period of time: 01.01.2013 – 31.12.2014

Remarks

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