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European Commission

Science for Environment Policy

New wastewater treatment technology to produce less sludge

A major environmental challenge for wastewater treatment is the disposal of excess sludge produced during the process. The LIFE Perbiof project has been developing and testing a technology that will help to overcome this challenge. Results demonstrate it can perform highly effective treatment of municipal wastewater (removing 80% of the organic content) while producing low levels of sludge.

Central to wastewater treatment is the removal of organic matter occurring in the biological unit of the plant. This is usually performed by microbes (mainly bacteria) that degrade the organic matter under controlled conditions. However, this produces a sludge of the resulting biomass from the microbes (biological sludge) in addition to the sludge produced in the primary treatment unit (primary sludge). This sludge must undergo further treatment and disposal and can account for up to 60% of the operating costs of a wastewater treatment plant. Sludge production is increasing in Europe and so are the disposal costs, so its reduction is a priority.

The LIFE Perbiof project[1] has funded the continuing development of a new technology called the Sequencing Batch Biofilter Granular Reactor (SBBGR). SBBGR is a unique system because it allows the microbes to grow in the form of a mixture of biofilm and high-density granules which are packed in a plastic filling material in the reactor. This allows a longer retention and greater concentration of microbial biomass in the reactor, which means it does not have to be subjected to an additional clarifying process. As the sludge remains longer in the system, the production of biological sludge is reduced.

The technology has previously been tested at laboratory level, and the project went one step further to evaluate its effectiveness on a demonstration unit for treating municipal and tannery wastewater after primary treatment from the town of Bari in Italy. The plant operated on a succession of treatment cycles, each consisting of three consecutive phases: the wastewater was pumped into the reactor (filling phase) and circulated through the filling material of plastic pieces (reaction phase) before the effluent was discharged (drawing phase). For this study researchers varied the organic loading (a measure of the amount of organic matter) of the wastewater.

The results indicated that the SBBGR removed about 80% of the organic matter, (suspended solids and nitrogen content in the wastewater), regardless of the organic loading in the wastewater. In addition, organic content and suspended solids were removed in the first two hours of the cycle so it is likely that the plant would be able to treat greater volumes of wastewater. The system also had a very low sludge production; only 0.12 to 0.14 kilogrammes of biomass for every kilogramme of organic content it removed.

The results of the project highlight the effectiveness of the SBBGR system for treating wastewater while producing a low amount of sludge and therefore lowering environmental impacts.