

Bioalchemy: turning sludge into clear water

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Biological treatment plus ozone can reduce the amount of sludge coming from wastewater treatment plants by a factor of ten

The process was developed by the Water Research Institute (WRI) of the Italian National Research Council and tested and scaled-up as part the EU-funded Innowatech project.

We know that biological processes offer the cheapest way to treat industrial wastewater. But pollutants from industries such as leather, textiles and pharmaceuticals are not easily broken down by [microbes](#).

WRI scientists have developed an innovative technology where the microbial biomass, which breaks down wastes, grows mainly as [granules](#); the process is known as SBBGR (Sequencing Batch Biofilter Granular Reactor). The granules are trapped in [pores](#) between plastic-support material in a reactor and the microbes are stressed so less sludge is produced. This is because the microbes are not given suitable conditions to proliferate, so fewer microbes and less waste results.

Removing one kilo of wastewater through a biological system, produces half a kilo of sludge, which then needs to be disposed of, according to Antonio Lopez, project coordinator at WRI. “With this technology, you produce only 50 grams of sludge.” A treatment plant using this technology could be ten times smaller than usual.

But there can be complicating factors such as what goes into the reactor and biomass concentration, comments Christoph Brepols, wastewater

expert at Erftverband, the Erft river water association, in Germany. If the sludge production is decreased by ten times, he believes, this would not necessarily mean that the bioreactor volume can be decreased by the same ratio.

Integrating [ozone](#) with the reactor allows effluents from leather and textile processing to be treated. Ozone is a costly but powerful oxidiser and can break down most organic compounds. In the new system, ozone does not completely break down the pollutants but transforms them into more biodegradable compounds. This means less ozone is needed, reducing treatment costs.

“Tannery wastewater is a sort of benchmark in the sector of industrial wastewater,” says Lopez, because its composition is complex and difficult to treat. At a pilot scale facility for treating tannery wastewater, the final effluent from the process looked like tap water, the WRI researchers reported. In Italy alone, leather processing has a turnover of around €5 billion, around 1,500 firms are involved, and about 20,000 workers employed.

Mark van Loosdrecht, environmental biotechnologist at Delft University of Technology, expressed concerns about the use of ozone. Using ozone is technically feasible, but it increases energy usage and treatment costs, so the net benefit for ecosystems is not very clear.

Granular sludge reactors will find their niche, along with other technologies, as there is no “one size fits all” solution to wastewater treatment, noted Brepols.

Sludge output in Europe is on the rise; 5.5 million tonnes of dry solids came from plants in 1992, increasing to 10 million by 2007. It’s expensive business. Each tonne of dry solids costs between 350 and 750 euros to dispose of, so new technology is vital.

Provided by Youris.com

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