Electrochemical processes should be applied on a large scale to reduce our carbon footprint and chemical consumption. That is the guiding principle of Noah Water Solutions. The company has already developed a basic process for wastewater purification and a reactor for industrial use. At present, it is fine-tuning nitrogen removal and developing applications for smaller-scale use.

“Electrochemical purification is, for example, very suitable for sludge-like waste streams because it does not use membranes, which are prone to clogging,” explains founder and owner, civil engineer Rik Van Meirhaeghe. “Initially, we considered this technology for processing pig manure, since the pig farming sector in Belgium generates problematically large volumes. During our research, however, we found that nitrogen removal was the biggest bottleneck. That is one of the reasons why our first prototypes proved more suitable for industrial applications—such as the waste water coming from chocolate production, where fat emulsions can be separated electrochemically, or waste water from the galvanizing industry, and cleaning of oil and fat tanks.”

The Noah team - Dries Parmentier, Vivek Nair, Roemer Goossens, and Rik Van Meirhaeghe - at the International Water Association Congress in Bangkok, where Noah pitched for IWA and the Gates Foundation in order to secure funding. © Noah Water Solutions

From license to innovation

A Finnish inventor developed electrocoagulation flotation for the paper and pulp industry. He used it to rapidly separate paper fibres and dyes from wastewater, with the added potential of reusing the heat from treated water. Van Meirhaeghe – already known for his work in air purification – took interest, licensed the project, and transferred further research to Belgium, specifically to Ghent University’s Kortrijk Campus. There, Noah developed its purification reactor for industrial use.

Towards optimal sustainability

Traditional water purification relies mainly on iron chlorides and aluminium sulphates. A disadvantage is that high concentrations of anions from these additives remain in the purified water, causing corrosion in pipes and contributing to salinization.

“Our method uses no chemicals,” says Dr. Dries Parmentier, Head of Research and Development at Noah. “It makes the water easier and instantly applicable for reuse. The sludge it generates is also much more concentrated and dryer, opening opportunities to recover valuable components. The required electricity can be sourced from renewables. Purification can even be done in situ, eliminating the need for transporting large volumes. Altogether, this makes the technology an ideal candidate for truly sustainable water purification.”

Applications in industry and beyond

“But the incentive to change technology in the industry is low,” notes Van Meirhaeghe. “Unless legislation changes, industry – especially in economically difficult times – will not adopt electrochemical purification on a large scale. That is why we have also been working on solutions for volumes in litres rather than cubic meters. We have been looking for applications where devices can be sold in thousands and selected non-sewered sanitation as a first focus. We see applications when a connection to a sewage system is lacking such as yachts, houseboats, and remote homes.”

Parmentier adds: “Also for homes in densely populated areas, where existing sewer systems cannot handle peak loads. For instance, a Noah reactor has been operating on a houseboat in Rotterdam for two years. Other pilot projects include temporary sanitation blocks rented to construction sites or festivals.

IWA grant funded by the Gates Foundation

Since its inception, Noah has worked closely with Ghent University, resulting in several master’s theses and doctoral dissertations, while providing the company with substantial fundamental knowledge. Recently, the project has gained major momentum. “After the IWA (International Water Association) shortlisted us to pitch our solutions in a global call, we secured a major grant to finalise our developments,” Van Meirhaeghe explains.

While Gates’ focus is on applications in developing countries, the foundation recognized that introducing a brand-new product there would be too expensive initially. Noah was therefore given sixteen months to develop a commercial product for the market in a developed country. The choice fell on France, where many remote homes and small farms could benefit from such solutions.

Currently, wastewater treated by the Noah reactor already meets legal standards. “Our ambition is to make treatment so thorough that the water can be reused – for example, to flush toilets,” Parmentier says, looking ahead.

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