

Nereda® technology gains worldwide recognition

A cost-effective and sustainable biological treatment technology offers a natural way of treating wastewater using less energy, no chemicals, and a smaller footprint. **Annemie Otten** of Royal HaskoningDHV reports on the latest developments of Nereda technology.

International engineering and project management consultancy Royal HaskoningDHV's municipal and industrial wastewater treatment technology, Nereda, won three new awards in 2014.

Nereda is an aerobic granular sludge technology that purifies wastewater by controlling the growth and formation of microorganisms. The technology is more cost-effective than traditional water treatment methods, and Nereda plants are up to four times smaller, consume only half the energy, and require no chemicals for the treatment process. The technology was invented by the Netherlands' Delft University of Technology, and developed in a unique public private-partnership between the university, the Dutch Foundation for Applied Water Research (STOWA), the Dutch Water Boards, and Royal HaskoningDHV.

After 20 years of research, development, and implementation, the Dutch National Nereda Research Program NNOP (including the partnership members) won the European International Water Association Project Innovation Honour Award 2014 for applied research for aerobic wastewater treatment. The international Muelheim Water Award 2014 in Germany, for outstanding projects with applied research and implementation of innovative concepts for improvements in the water and wastewater industry, was added to Nereda's list of awards. And inventor, Delft University Professor Mark van Loosdrecht, won the prestigious Spinoza Prize of the Netherlands Organization for Scientific Research (NOW) for his outstanding contribution to scientific research.

Nereda installations

Nereda plants are currently under construction or treat wastewater across the world, in the Netherlands, Portugal, Poland, South Africa, Brazil, the United Kingdom, Ireland, Australia, and Switzerland. The first full-scale municipal installation at Epe Wastewater Treatment Plant in the Netherlands – designed to treat flows up to 1,500 cubic meters per hour (m³/h) – has been in operation for about four years. Extensive plant performance monitoring shows the Nereda installation exceeds expectations. The energy consumption of the facility including sand filtration and sludge treatment is approximately 40 percent lower than similar-sized and comparatively designed conventional treatment plants in the Netherlands. The effluent quality meets the highest standards in the Netherlands, of total nitrogen and phosphorous

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concentrations lower than 5.0 and 0.3 micrograms per liter (mg/l). Experiments with the produced granules showed that they were rich in polysaccharides that could be easily harvested, thereby contributing to the bio-based economy while decreasing operation costs for the wastewater treatment.

Another Nereda installation is operational at the Frielas wastewater treatment plant, a 70,000-cubic-meters-per-day (m³/d) plant receiving mainly domestic wastewater from 250,000 residents in the Greater Lisbon area in Portugal. Since startup in 1997, the Frielas plant suffered from several operational constraints – related to technological decisions made at the design phase, since the wastewater characteristics turned out to be quite different from those used for the original plant design. To determine if Nereda technology could improve plant performance under realistic field conditions, one of the six continuous activated sludge reactors was retrofitted into a Nereda reactor – with a volume of approximately 1,000 m³ – which was then run in parallel to the remaining five activated sludge reactors. This was the first continuous activated sludge Nereda® retrofit application.

Due to the positive results of this Nereda tank (and also because the excess granules coming out of the Nereda tank were improving the other lines of biological treatment, by effect of augmentation) the client upscaled the Nereda reactor to use 100 percent of one of the six tanks. Although using only 9 percent of the total biological volume of the plant, the Nereda technology treats 25 percent of the total flow, and produces a better quality effluent. This upgrade makes the Frielas plant able to meet current discharge requirements and operates as a hybrid Nereda plant.

One of the most recent Nereda startups is in the north of the Netherlands, in Garmerwolde. A Nereda addition was selected as part of an upgrade of the 375,000-person equivalent (pe) sewage treatment plant in Garmerwolde. A 150,000-pe Nereda unit was placed in parallel to the existing plant, with a capacity of 30,000 m³/d average and 4,200-m³/h peak flow. The overall plant capacity is 100,000 m³. Tank sizes in

Garmerwolde are similar to the world's largest sequencing batch reactor tanks, illustrating that the scale-up of this new technology is finalized. The energy consumption of both the Nereda and the existing system is closely monitored. A comparison of both systems shows that the Nereda treatment line is 50 to 60 percent more energy efficient.

An exciting global future

Also in 2014, Royal HaskoningDHV signed a 10-year cooperation agreement with VA TECH Wabag, based in Vienna, Austria, and Chennai, India. This agreement will introduce Nereda technology to the Indian market. Wabag is a global company that specializes in the design, construction, and operation of drinking water and wastewater plants for both the municipal and industrial sectors.

Wabag Managing Director and Group CEO Rajiv Mittal explained that wastewater management has been given a high priority in the recently adopted India National Water Policy. "This new addition to our technology portfolio shall meet the growing market expectations in terms of less power consumption, less footprint, and more cost-effective solutions for wastewater management," he said. Underpinned by a multi-billion dollar government program, municipal and industrial wastewater treatment will be one of the most exciting areas for future growth in India.

The challenge for many cities and industries around the world is to find cost-effective, sustainable, and simple solutions for sanitation that have a small footprint and meet stringent purification requirements. Nereda is providing that solution with 20 ongoing projects in 10 countries.



Left to right: COO Arnold Gmuender of WABAG Wassertechnik; Rajiv Mittal, CEO for Wabag; Lilianne Ploumen, Dutch Minister for Foreign Trade; and Global Director of Water Products, René Noppene, for Royal HaskoningDHV. Photo by Dutch Ministry of Foreign Affairs©