AquaNereda® Aerobic Granular Sludge Technology: An Innovative Biological Wastewater Treatment System

AQUA-AEROBIC SYSTEMS, INC.
A Metawater Company

LIFT affiliate

The INNOVATION & TECHNOLOGY COMMITTEE will regularly solicit articles for publication in the *Central States Water* magazine regarding new water technologies and innovation in the water field and will help promote CSWEA Leaders Innovation Forum for Technology (LIFT) engagement. This first article focuses on an innovative activated sludge process, a granular sludge process, which allows for multiple process benefits to be realized. This is one of the most followed innovative technologies in LIFT Link. LIFT Link was developed by the Water Research Foundation (WRF), then known as the Water Environment Research Foundation. LIFT Link is part of the WRF/WEF LIFT (*www.werf.org/lift*) program to accelerate innovation into practice. LIFT Link is an online platform which serves as a conduit of interaction among municipal and industrial water, wastewater, and stormwater agencies, technology providers, consultants, academics, investors, federal agencies, and others for advancing innovation. LIFT Link allows its users to discover new technologies and research needs; connect with others with similar needs, technology interests, and desired expertise; and collaborate on research and technology ideas, proposals, projects, demonstrations, and implementation. If interested in accessing LIFT and gaining a login please reach out to Mohammed Haque at *mhaque@cswea.org*. Look for more innovative articles in the near future.

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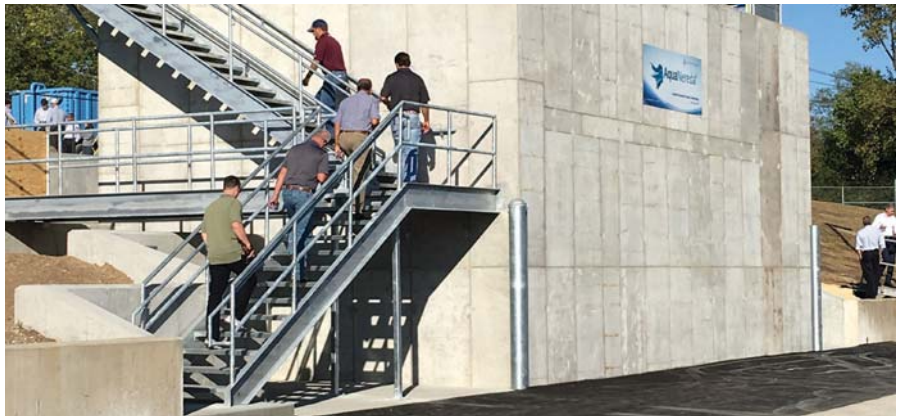
The AquaNereda® Technology provides advanced secondary wastewater treatment using the unique features of aerobic granular biomass, comprised of granules. The Nereda process was created by a public-private partnership with Delft University, Dutch Water Authorities and Royal HaskoningDHV in the Netherlands. The technology has been used successfully for more than 12 years in full scale wastewater treatment facilities with over 50 plants currently in operation or under design and construction. While these plants are located around the world, just recently the technology has become available in North America due to a partnership between Aqua-Aerobic Systems, Inc. and Royal HaskoningDHV, allowing Aqua-Aerobic to be the exclusive provider of Nereda technology in the U.S. and Canada, where it is marketed under the brand AquaNereda® Aerobic Granular Sludge Technology.

The main advantages of this innovative technology include up to 75% footprint reduction, 50% energy savings and chemical savings, compared to activated sludge systems, under a wide range of influent characteristics, applications, and climates.

The AquaNereda technology provides the ideal conditions (process and mechanical) to promote granulation. Under the proper selection pressures, granules are naturally formed and maintained without the addition of carriers. The system operates in phases, in which all the treatment including clarification occur in the same tank, without the need of recycle flows. The phases include anaerobic feed, react and fast settling (and sludge wasting). Based on the sequence of operation, slow growing organisms will thrive and produce excess of Extracellular Polymeric Substances (EPS) which is the backbone of the granule. One of the most prevalent slow growing organisms found in the granule are Phosphorus accumulating organisms (PAO), making this AquaNereda system ideal biological phosphorus removal. Also, due to the diffusion gradient, the granules include aerobic conditions on the outer portion and anoxic conditions in the inner portion. This layered structure allows for promoting nitrification and denitrification to occur simultaneously, while operating the system at lower dissolved oxygen (DO) concentrations.



One of the main characteristics of aerobic granular sludge is the settling properties. Based on the density of the granules, granular biomass settles significantly faster than flocculent sludge, with SVI values of 30 to 50 ml/g. These excellent settling properties allow for design MLSS concentrations of 8,000 mg/l or higher, leading to lower volumes required for treatment.

The capability of achieving biological nutrient removal (BNR) in a single tank concept, no sludge recirculation, operating at higher MLSS concentrations, efficient use of oxygen, and fast settling, makes the AquaNereda technology ideal for secondary advanced treatment in smaller footprint with the lowest life-cycles-costs.

To introduce the technology to the North American market, Aqua-Aerobic Systems has built a 200,000 gallon per day demonstration facility at the Rock River Water Reclamation District (RRWRD) in Rockford, IL. This fully automated system was put into operation in January 2018. The new AquaNereda demonstration facility is unique with the capability of operating at a range of water level depths, so that the distinctive advantages of AGS can be demonstrated at the various process depths often seen in retrofit applications. The demonstration facility will provide a site to grow and store seed granules for plants that need to accelerate biological nutrient removal during commissioning of new plants. Additionally, this facility will provide an easily accessible aerobic granular sludge site for engineers and plant operators to visit in North America. *www.aquanereda.com* CS

Aqua-Aerobic Systems, Inc. is the exclusive U.S. and Canada provider of Nereda® technology developed by Royal HaskoningDHV.