

# Aerobic Granular Biomass Technology

Aerobic granular sludge is seen as the modern standard for wastewater treatment. Subsequently research efforts are quickly developing in this field. As an outcome of a Dutch research and development program, an aerobic granular biomass technology has been scaled-up and is being applied widely to treat urban and industrial wastewater since 2005.

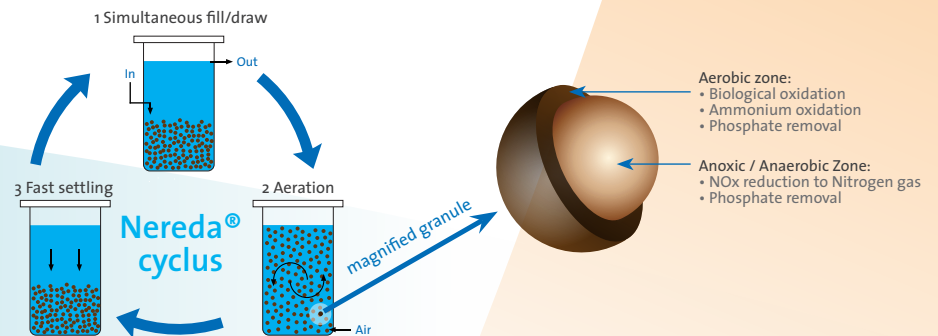
settling properties. In granular biomass three process zones are present in different layers inside the granular particles, with diffusion connecting the reaction zones, thus allowing simultaneous anaerobic, aerobic and anoxic conditions to co-exist in the granules resulting in superb biological nutrient removal capabilities.

In this Nereda® Technology, using natural selection processes, biomass is growing as granules with excellent

The process operates intermittently, with the fill and decant phase occurring simultaneously and hence no moving decanters are required to ensure low solids in the effluent.

## Advantages

- Up to 50% energy savings
- Plant footprint up to a factor 4 smaller
- Cost-effective in CAPEX and OPEX
- Excellent effluent quality
- Robust during chemical spikes, load, salt, pH and T fluctuations
- No/minimal chemicals consumption
- Easy to operate
- Aquasuite® Nereda® Controller inside



More than 30 plants in operation or under construction worldwide

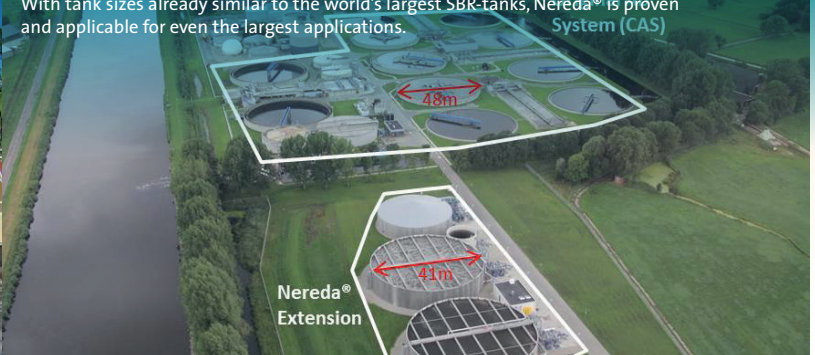
### CAS RETROFIT Nereda® Frielas, Lisbon (Portugal)

Although using only 9% of the total biological volume of the plant, the Nereda® technology will treat 25% of the total flow and produces effluent with a better quality.



### GREENFIELD Nereda® Garmerwolde (the Netherlands)

With tank sizes already similar to the world's largest SBR-tanks, Nereda® is proven and applicable for even the largest applications.



### GREENFIELD Nereda® Deodoro, Rio de Janeiro (Brazil)

Average capacity: 86,400 m³/day, 480,000 p.e., Peak flow: 6,120 m³/hour



### CAPACITY UPGRADE Nereda® Ringsend, (Ireland)

The Ringsend Plant will have the capacity to treat the wastewater of 2.4 million p.e. population equivalent (PE) in compliance with the EU water quality directives.



## Advantages

### Cost-effective

Nereda enables extensive treatment in compact and uncomplicated designs. The amount of mechanical equipment is much less than in conventional processes. For example, separate clarifiers, return sludge pumping stations or moving decanters are not necessary. What's more, the concentrated biomass substantially reduces tank volume and easily makes the plant footprint a factor 4 smaller. This lowers the direct plant costs (CAPEX) for greenfield, brownfield, retrofit or capacity extension applications and often enables that existing treatment sites can be utilized rather than purchasing new land. Operation & Maintenance costs (OPEX) are much lower thanks to the reduction in mechanical equipment, chemical-free operation and the remarkably high energy efficiency of the process.

### Small physical footprint

Because of the high biomass concentration in a single tank, and the redundancy of selectors, compartments or separate clarifiers Nereda® treatment installations require a fraction of the build area of traditional plants – up to 75% less space. In urban areas or mountain areas where land is at a premium, this is a major benefit. Also existing conventional continuous or SBR wastewater plants can be retrofitted into Nereda® technology enabling treatment to significantly higher quantities or quality of wastewater.

### Easy to operate

Nereda® has proved in operation to satisfy the most stringent purification requirements. Thanks to the nature of the technology, plant operation is easy and process performance robust. Every Nereda® plant is equipped with an Aquasuite® Nereda® Controller, a smart, integrated process controller. This ensures fully automated plant operation, reliable performance and ease-of-operation. It even enables unmanned or remote control.

### Sustainable

Extensive life cycle analyses reveal Nereda® as a truly sustainable technology. Compared to conventional processes, Nereda® not only has significantly lower energy consumption (up to 50%) and associated greenhouse gas emission, but also produces, commonly without use of waste generating chemicals, a remarkably high effluent quality. In addition, the technology requires less construction materials and less mechanical equipment resulting in a better environmental construction profile and a small physical footprint.

## Applications

### Greenfields

Depending on the wastewater flow and characteristics, a Nereda® plant comprises multiple modular reactors (often 3) or a combination of a feed buffer tank plus one or two reactors.

### Retrofit CAS or SBR

Since the detailed configuration of Nereda® is quite flexible, the technology can often be used to convert existing conventional CAS or SBR plants into a Nereda®. Often the technology enables the use of approximately a two times higher biomass concentration, with outstanding biomass settling characteristics. As result of a retrofit to Nereda®, the biological and/or hydraulic capacity of existing plants will be significantly increased and/or the effluent quality will be considerably improved.

### Hybrid capacity extension

In a hybrid application, a new Nereda® plant is fed with only part of the plants raw wastewater while the remaining part is treated by the existing conventional treatment system. An important additional advantage of such a hybrid extension is that by feeding of granular surplus sludge from the Nereda into the conventional activated sludge reactors will augment the activated sludge. By this inoculation process, the sludge characteristics and settling performance of the activated sludge will improve, resulting in improved sludge settling characteristics, increased capacity and enhanced biological nutrient removal.

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