Aerobic Granular Biomass Technology: recent performance data and lessons learnt

Andreas Giesen*, Mark van Loosdrecht**,
*Royal HaskoningDHV, P.O Box 1132, 3800 BC Amersfoort, The Netherlands
**Delft University of Technology, Kluyver Institute for Biotechnology, Julianalaan 67, 2628 BC, Delft, The Netherlands

INTRODUCTION

Aerobic granular sludge (AGS) is seen as the modern standard for wastewater treatment. Subsequently research efforts are quickly developing in this field. A coordinated research public-private partnership in the Netherlands led to the development of the Nereda® technology – a full-scale application of AGS.

Currently, over 30 full scale plants are operational or under construction across 5 continents. The operational full-scale plants have met effluent requirements whilst achieving more sustainable wastewater treatment with key advantages (compared to similarly loaded activated sludge systems):

- 25-75% reduction in treatment system footprints as a result of higher reactor biomass concentrations and the non-use of secondary settling tanks;
- 20-50% energy usage reduction and;
- Associated capital and operational cost savings.

In addition, a new possibility for extracting alginate like polymers from AGS has emerged which could provide sustainable reuse opportunities.

METHODS

In granular biomass 3 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.

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.

Several system configurations have been developed to suit a variety of scenarios experienced from site to site.

DISCUSSION & RESULTS

The results achieved at full-scale treatment plants show that AGS has clear and significant advantages over conventional activated sludge systems. Currently sustainability requirements (including cost-effectiveness) are driving technological advancement and innovation. The advantages of AGS technology in comparison to activated sludge systems ultimately translate into more sustainable and cost-effective wastewater treatment.

CONCLUSIONS

The results achieved at full-scale treatment plants show that AGS has clear and significant advantages over conventional activated sludge systems. Currently sustainability requirements (including cost-effectiveness) are driving technological advancement and innovation. The advantages of AGS technology in comparison to activated sludge systems ultimately translate into more sustainable and cost-effective wastewater treatment.