Anammox control strategy

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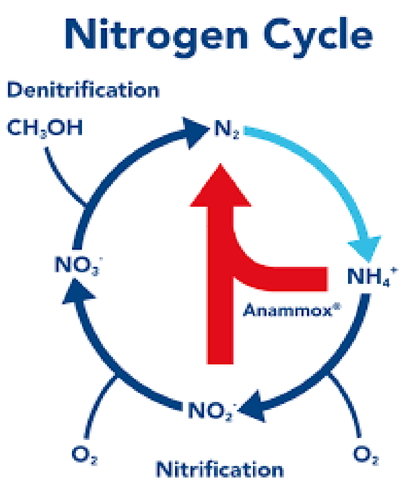
DESCRIPTION:

The anaerobic ammonium oxidation (anammox) process can serve as a replacement for conventional activated sludge processes (including nitrification/denitrification) for removal of nitrogen in wastewater.

The anammox process has proven successful in ammonium rich wastewater with temperatures above 25°C. Such wastewater can be reject water from anaerobic digestion or leachate from landfills.

The anammox process has recently received much attention and the following advantages have been confirmed:
*No carbon source is needed
*Reduced energy consumption by almost 60%
*Reduced sludge production
*Reduced emissions of CO_2 and N_2O



The anammox treatment process has traditionally been controlled by different parameters easy to measure such as by dissolved oxygen (DO) level, redox level or pH level. Control strategies are generally very simple and prefer process robustness to dynamic optimization of the biological process. Within R3Water, the aim is to design new algorithms that can include more advanced sensors such as NO2-N analyzers.

The main objective of developing new algorithms for anammox control is to offer process technologists a more advanced alternative for dynamic control of anammox sidestream reactors, such as reject water treatment.

APPLICABILITY AND PRE-REQUISITES:

Improved control strategies are applicable in all sidestream anammox reactors. The study is targeted for the following one-step anammox treatment reactors:

*Intermittently aerated sequential batch reactors
*Anammox reactors in suspended active sludge

Depending on the current implementation, there might be the need for additional sensors to control the process. The control system has to allow for implementation of changes.

ADVANTAGES AND DISADVANTAGES:

An advanced control strategy can be used to:

Improved treatment results

- Reach effluent targets

Increase the process reliability
*Let the biomass better adapt to inflow variations
*Reduce cases of process failure (pumps or aeration)

Improved know-how of the process

*Extract information on the biomass activity

Dynamic process control

*Dynamic adjustment of the reactor cycle

OPERATION AND MAINTENANCE:

For implementation of a control strategy, installation and maintenance of sensors are needed. Also, connection of the sensors to a control system is

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needed for a more advanced process control. Maintenance of connecting equipment, such as pumps, stirrers and aerators, might be reduced since possible breakdowns of these can be discovered earlier.

COSTS:

Advanced process control strategies might require an additional investment cost for extra sensors as well their connection to a control system. Costs for carbon source, aeration energy and sludge handling are excluded or heavily reduced.

REFERENCES:

Lackner, S. et al., 2014, Full scale partial nitritation/anammox experiences – An application survey, Water Research 55 p. 292-303.

Yang, J., 2012. Controlling and monitoring of deammonification process in moving bed biofilm reactor. Licentiate thesis. KTH TRITA LWR LIC 2065.

This technology will be demonstrated at two pilot scale anammox reactors.

Anammox pilot scale reactor (Leuven WWTP, Belgium)

Anammox pilot scale reactor (Hammarby Sjöstadsverk, Sweden)

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