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Editorial

Anaerobic Ammonium Oxidation Process

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Editorial

Anammox means anaerobic ammonium oxidation. The process was discovered in the early 1990s and has a great potential to remove ammonia nitrogen in waste water. Appropriate bacteria transform ammonia and nitrogen dioxide into nitrogen and water. This saves costs as less energy for ventilation and does not require organic sources of carbon. Over the past 20 years, many research projects have been carried out on the Annamox Process. In 2007, the first major Anammox reactor was built in Rotterdam. It shows the enormous possibilities of this new process. Anamox, the process of anaerobic ammonia oxidation, is an innovative technological advancement in the removal of ammonia nitrogen in waste water. This whole new process combines ammonia and nitrite directly into dinitrogen gas instead of undergoing a two-stage process of aerobic nitrification and anaerobic denitrification. It was discovered about 15 years ago and has resulted in new opportunities for research and development of sustainable nitrogen removal systems [1,2]. Compared to conventional nitrification/denitrification in active sludge systems, Anammox eliminates the need for organic nitrification carbon, reduces the energy consumption of the aeration and has lower production of surplus sludge and lower CO_2 emissions. The Anammox reaction may be presented as $NH_4^- + NO_2^- = N_2 + 2H_20$. This reaction is carried out by Anammox bacteria belonging to planctomycetes. Various solutions for the use of Anammox in the treatment of waste water have been developed. In the "Two Reactor Nitrytic-Anammox Processes", ammonia is first partially oxidized to nitrite in an aerated reactor (partial nitration). In the second stage nitrite is reduced to the elemental nitrogen by the remaining ammonia in the Anammox reactor. So far it has been used only for rich wastewater. There are alternate names for these two-step processes, e.g SHARON-Anammox process.

There are some advantages along with disadvantages are described here:

Advantages

1. Adding oxygen can be reduced (results in energy savings and savings)
2. Anammox bacteria do not require organic carbon (eg Methanol) as well as nitrification
3. Production of surplus sludge is reduced
4. Reduces CO_2 emissions

Disadvantages

1. Not much knowledge is available
2. High construction costs if the Anammox process replaces conventional nitrification/denitrification in processing plants.

The process of the reactor in one step also has several names. The common name is the CANON process for completely removing autotrophic nitrides where aerobic ammonium oxidative bacteria and anammox bacteria simultaneously perform two-step reaction under the conditions of oxygen restricted in one reactor. However, this process is limited to the laboratory and pilot-plant scale due to complex control conditions and slow growth of anammox bacteria. One reactor denitrification annamox process is called DEAMOX and sates denitrifying Ammonium Oxidation. This is the connection between denitrification and Anammox processes. The research is still underway. It can be applied to the treatment of wastewater with high concentrations of nitrogen and high levels of organic carbon, landfill and waste water from digested animal waste. The Anammox process requires significantly less oxygen than conventional nitrification/denitrification processes resulting in significant energy savings. Because the autotrophic bacteria are performed by Anammox, there is no need for organic carbon sources, which saves the cost of chemical doses. Anamox biomass yield is very low, which saves the cost of treating the sludge. However, long run time and high sensitivity of bacteria to oxygen concentration and nitrite build up limit the use of Anammox

The discovery of the Anammox process offers new opportunities in the sewage treatment sector. This procedure generally has the potential to replace the usual nitrification/denitrification steps in large purification facilities.

References

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