Denitrification in closed rotating biological contactor: effect of disk submergence

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The increase in water nitrogen pollution led to the improvement of the existing nitrogen removal systems and to the design of new processes. The use of a closed rotating biological contactor (RBC) is a relatively new biological wastewater treatment process. In this reactor, the accumulation of biomass in disks surface is influenced by parameters such as substrate loading rate, hydraulic retention time, number of stages, disk rotational speed and disk submergence. RBC's have been employed for nitrogen removal. However, partially submerged disks are used for nitrification, while completely submerged disks are used for denitrification.

The purpose of this study was to investigate the effect of disk submergence in rotating biological contactors performance, in terms of the denitrification process.
Two closed RBCs were used, one with completely submerged disks and the other with 64.5 % of submergence (RBC1 and RBC2 respectively). RBC1 has a liquid volume of 16.35 l and RBC2 of 13 l. Both reactors were operated with a hydraulic retention time of 2 h, a rotational speed of 2 rpm and the temperature was maintained around 26ºC by means of a water jacket. They were fed with a synthetic medium containing 50 mg $N\text{-}NO_3^-$/l, using citrate as carbon source. A pure culture of *Alcaligenes denitrificans* was used as inoculum. The denitrification efficiency is expressed per unit disk area.
It was observed that the completely submersed biofilm was homogeneous, light yellow over the entire surface and approximately with the same thickness. The biofilm of RBC2 is darker and thicker in the non-immersed part and light yellow in the submersed zone. As denitrification efficiency is concerned, the RBC1 presented a $N\text{-}NO_3^-$ removal rate/biofilm area almost twice that of RBC2. Moreover, the biochemical analysis of the biofilm also elicits the conclusion that completely submergence is more efficient.