

**STUDY OF PROCESS TO MINIMIZE SLUDGE PRODUCTION, RECOVER THE NUTRIENTS AND OPTIMIZE ENERGY CONSUMPTION IN WASTEWATER TREATMENT**

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Anaerobic wastewater treatment process is characterized by its efficiency, as it allows methane production -and therefore energy- from the organic matter present in wastewater. However, this process is not able to eliminate some types of nutrients such as N or P.

While P can be removed by chemical precipitation, nitrogen removal in economically viable conditions is more complicated.



**Figure 1:** Pilot plant for N removal.

The main aim of the project is to remove nitrogen by conventional nitrification-denitrification processes, using a SBR reactor. A batch type reactor is chosen because of the advantages it offers such as flexibility, stability, high performance and its capacity to buffer loads and high flow rates.

Due to its operating flexibility, it is possible to introduce the requirements for nitrogen removal, which involve the aerobic and anoxic phases sequence during the operating cycle, and generate the required conditions for the development of processes such as nitrification and denitrification.

The system is made up of two peristaltic pumps, a compressor and a mechanical stirring system, all correctly temporized.

During the nitrification stage, the nitrogen passes through a range of reactions, to its most oxidized form and, during the denitrification, the nitrogen is reduced to its gas phase (N<sub>2</sub>).

**Aerobic Phase:**  $\text{NH}_4^+ \rightarrow \text{NO}_2^- \rightarrow \text{NO}_3^-$

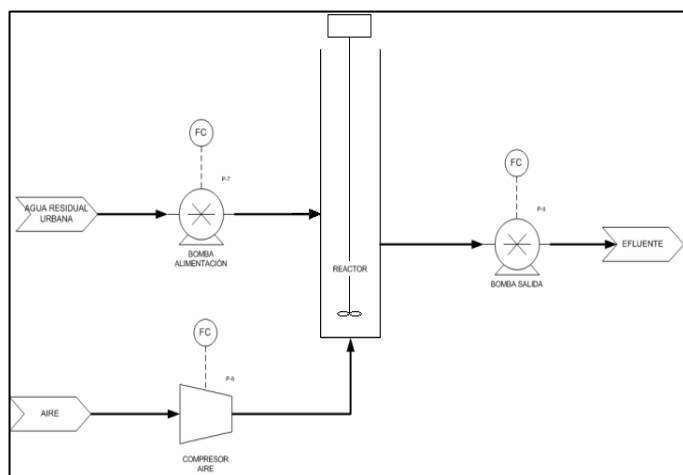
(With oxygen consumption at each step)

**Anoxic Phase:**

$\text{NO}_3^- \rightarrow \text{NO}_2^- \rightarrow \text{NO} \rightarrow \text{N}_2\text{O} \rightarrow \text{N}_2$

(With consumption of organic matter in each step)

The main disadvantages of this technology are the operating costs, due to the flow of oxygen required in the aerobic phase and that it is only suitable for wastewater with high C<sub>org</sub>/N coefficients, because the bacteria responsible for carrying out the process are heterotrophic so they require a high organic carbon content or an addition to it, if there is not enough.



**Figure 2:** Process scheme.