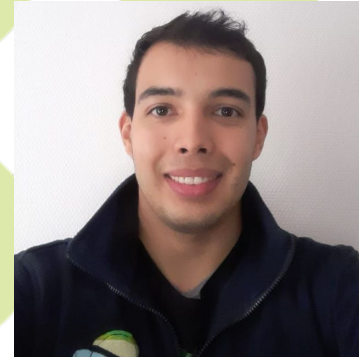


## Aldo Betancourt Sanchez, PhD

### Membrane fractionation of digestates for nutrient recovery and intensification of anaerobic digestion.



**Duration:** 2020-2023

#### Background

Digestates, liquid effluents and solid by-products, from methanization, are now most often considered as waste and managed as such through application/spreading plans. These digestates contain organic and inorganic compounds which should be used in the best possible conditions. From an environmental point of view, it is important to use these nutrients (N, P, K) as substitutes for chemical fertilizers whose supply is costly and unsustainable. Valorisation can be improved by separating the water and the different organic and mineral fractions of the digestate, facilitating the storage and agronomic valorisation but also the extraction of molecules with higher added value.

In this context, membrane processes, such as nanofiltration, are good alternatives to achieve this value chain. However, the implementation of these technologies must be subject to a design and operating conditions adaptable to the diversified typology of digestates, and to the clogging of membranes induced by their own retention, taking into account environmental and energy management constraints.

#### Objectives

To optimize this innovative fragmentation pathway based on physical separation process steps. Indeed, this process includes a nanofiltration process integrating ceramic membranes in the form of rotating discs whose working principle proves to be very relevant to limit clogging by digestates. The advantage is to be able to adapt the operating parameters according to the quality of the incoming product in order to maintain the productivity of the operation while limiting clogging. In addition, it is important to

- Use innovative ways to characterize digestate and find molecules that can be used
- Adapt the operating parameters according to the quality of the incoming product in order to maintain the productivity of the operation while limiting clogging.
- Analyze the effect of recirculation of certain filtration fractions (filtrate or concentrate) in the methanisation reactor.

#### Methodology

- Data compilation and statistical analysis.
- Innovative characterization methods
- Lab and pilot scale experiments of nanofiltration
- Mathematical modelling

#### Keywords

Nutrient separation, Dynamic nanofiltration, Digestate, Methanisation, Pretreatment.

**Partnership:**

My thesis is conceived due to a partnership between the university INSA of Toulouse, its laboratory Toulouse Biotechnology Institute, and Nereus an enterprise specialized in the extraction and recycling of very high-quality water from difficult resources such as wastewater, methanation sludge, agri-food and livestock effluents, microalgae, etc.