

## TRAINING MATERIAL

### Title:

Technology for P recovery as struvite starting from pig manure digestate with fluidized bed crystallization system

### Training:

#### **What is the technology?**

An own design reactor to recover, as a biofertilizer (struvite), P and N contained in the digestate resulting from the anaerobic digestion of pig slurry.

#### **Who is the vendor of the technology?**

Fundación Cartif.

CARTIF is a horizontal, private and non-profit technology center. Its mission is to offer innovative solutions to companies to improve their processes, systems and products, improving their competitiveness and creating new business opportunities.

CARTIF develops R&D projects, directly funded by companies or public funds raised through competitive calls for national and international level. CARTIF also advises public authorities (municipalities and regional governments) in the planning and development of innovative projects with high economic returns.

#### **Which other technologies are provided by the vendor?**

“Algaecan” process (Technology for N&P recovery as microalgae based biofertilisers starting from wastewater with heterotrophic microalgae).

“Mix-Fertilizer” process (Technology for N&P recovery as enriched compost from digestate of pig manure).

“Revawaste” process (Technology for P recovery as struvite starting from digestate coming from methanogenic reactor and manure).

“Valuvoil” process (Technology for N&P recovery as digestate starting from vegetable oil waste with pig manure with).

#### **Which are the advantages of the technology and the problems addressed?**

This technology (Figure 1) allows a good mixing of the digestate and the reagents by means of the air that acts as a fluidizing agent. This results in a uniform temperature throughout the reactor and high mass and heat transfer. The process does not require high-energy consumption or the addition of water.

**How does the technology work?**

Struvite ( $\text{MgNH}_4\text{PO}_4 \cdot 6\text{H}_2\text{O}$ ) is obtained through crystallization in a fluidized bed (Figure 1). The raw material (digestate) together with a magnesium salt circulates through a crystallizer. The air flow increases the turbulence in the reaction mass and pushes it upwards through the central part of the reactor. When the mass reaches the top, it descends through the sides to the bottom of the reactor. In this way, a circulation is created that favors the contact of all the reagents. As the reaction takes place, struvite crystals are formed. In the beginning the crystals are small, so they can be pushed upwards without problems by the air flow, as the weight of the crystals is low. At a certain point, the size and weight of the crystals will be large so that they cannot be pushed by the air flow and they will be deposited at the bottom of the reactor. At the end of the reaction, the crystals deposited at the bottom will be collected. The reaction yields for struvite crystallisation are typically between 80-90 %.

**How/where to use the technology?**

To carry out the reaction it is necessary to add the digestate, a magnesium salt (usually  $\text{MgCl}_2$ ) and NaOH in case it is necessary to increase the pH of the reaction. Struvite is obtained as main product and a liquid stream as by-product. Liquid can be used for fertigation (still containing N). The technology is suitable for installation in an anaerobic digestion plant.

**Which are the authority permits and in which EU countries?**

The technology is installed together with the anaerobic digestion plant where the digestate is generated. Therefore, the permits should be waste treatment facility permits.

**How much does it cost?**

The cost of manufacturing the product will depend on the amount of digestate treated as well as its composition (N and P content).

CAPEX: 50,000 € Capacity: 50 L/h digestate



Figure 1. Fluidized bed crystallization system

For more information: [https://nutriman.net/farmer-platform/technology/id\\_256](https://nutriman.net/farmer-platform/technology/id_256)