

## TRAINING MATERIALS' template

### Title:

Technology for N recovery as microfiltered slurry/digestate/sludge starting from raw slurry/digestates/sewage sludge with microfiltration system

### Training:

#### What is the technology?

It is a microfiltration technology to allow the use of livestock slurry/digestate/sewage sludge in fertigation through drip lines. It's used for subjecting solid-liquid digestate to separation by means of a classic helical compression separator, and then to a clarifying phase undergoes with a microfiltration treatment in order to use the microfiltered liquid in fertirrigation.

**Who is the vendor of the technology?** The technology was developed within the project Digestate\_100%, under the 2014-2020 Regional Rural Development Program - Type of operation 16.1.01 - Operational groups of the European Innovation Partnership: "productivity and sustainability of agriculture" - Focus Area 4B - Water quality. The project was carried out by Netafim and WAM Group in collaboration with CRPA (Centro Ricerche Produzioni Animali). At present this technology is provided by Netafim, a multinational company active since 1965 in the precision farming systems, located in Monleone di Cicagna (GE).

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

##### Problems addressed

To date, in Emilia-Romagna, about 5 million tons of digestate are produced in agricultural biogas plants. The fertirrigation with digestate is a practice not yet widespread because the chemical physical characteristics of digestate, even if clarified, are such as to cause problems of clogging of the nozzles.

##### Advantages of the technology

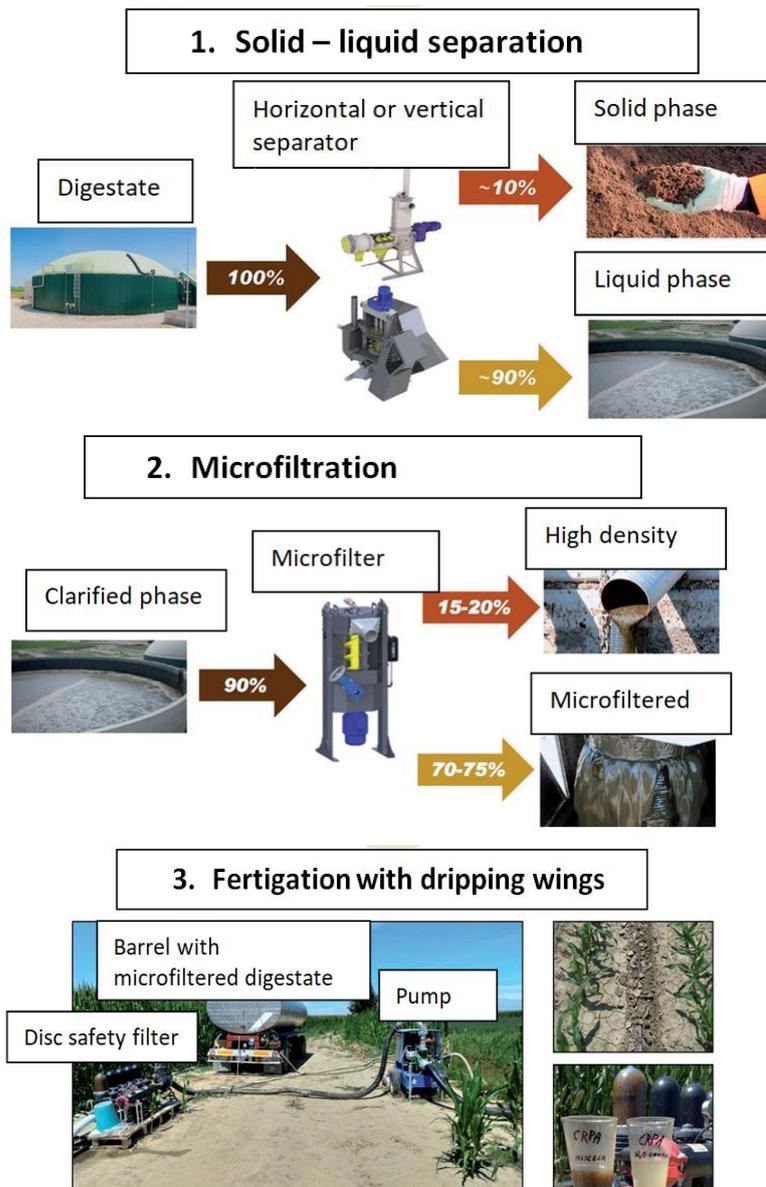
The main advantages of using this technology are:

- the increase in yield per hectare leads to a lower need for land for crop production and spreading;
- the possibility of injecting digestate along almost the entire maize cultivation cycle, without accessing the field, allows to extend the digestate spreading calendar;
- less water and nutrient stress allow to produce higher quality maize and therefore with higher methanogenic power;
- microfiltered digestate can be optimally combined with the drip lines for fertigation, as it is able to guarantee a microfiltered fraction in which all particles larger than a defined diameter (which depends on the spacing sieve) are excluded so they can't clog up the drippers;
- NH<sub>3</sub> and N<sub>2</sub>O air emissions can be reduced significantly thanks to digestate dilution and slow distribution;
- NO<sub>3</sub> leaching/runoff can be reduced too, compared to conventional digestate application.

### How does the technology work?

Digestate is the by-product of the anaerobic digestion plants where biogas is produced. Rich in elements of fertility, such as nitrogen, phosphorus, potassium and other meso and micronutrients, it appears as a dense and rather homogeneous liquid matrix compared to the biomass entering the plant. The digestate is generally subjected to solid-liquid separation, obtaining a solid fraction, which can be used as a conditioner in place of manure, and a clarified fraction with ready nourishing effect for crops.

In the Digestate\_100% innovative integrated system, after the solid-liquid separation with helical compression equipment, the clarified fraction was subjected to microfiltration by means of an innovative equipment, the SEPCOM® MFT microfilter, and the microfiltered fraction was used in the maize fertigation by Netafim dripping wings. Some experimental activities were conducted in the years 2017 and 2018 at the Maiero Energia and Fratelli Migliari farms, in Portomaggiore in the province of Ferrara.



The innovative SEPCOM® MFT microfilter exploits the action of a tool inside a filter with very low spacing (micrometers), to obtain a microfiltered fraction that can be used in fertigation without incurring the risk of clogging of nozzles or dripping mazes. In Digestate\_100% the microfilter was used in the treatment of digestate from vegetable crops and zootechnical effluents from the Maiero Energia company. The separation efficiency and the working capacity of the microfilter were monitored by the CRPA, characterizing the incoming digestate and the outgoing fractions, in order to fine-tune the best operating conditions of the machine.

Despite the high residual dry matter content (5-6%) of the clarified fraction that was sent to the microfilter from the helical compression separator, under the tested conditions, with a 50 micron filter, the machine produced up to 6 m<sup>3</sup>/hour of microfiltered digestate.

The microfiltered digestate had an average residual dry matter content of 4.6%, with 4.4kg of total nitrogen per ton, of which almost 70%, in ammonia form (the rest in organic form).

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

It is suitable for any company equipped with a biodigester who intends to use a method of sustainable fertigation of its crops. It is potentially useful not only in the field of industrial herbaceous crops but also on horticultural and fruit tree crops, even in organic farming. The following case study can be taken as a reference, consisting of a 1 MWe biogas plant that manages an agricultural area of 250 hectares of which 100 ha of first harvest maize and 150 ha of triticale (of which 75 ha for second harvest maize). The matrices entering the plant are zootechnical effluents, dedicated crops (maize and triticale) and agro-industrial by-products. The digestate produced is equal to about 60 t/day (22 000 t/year) with an average total nitrogen content of 5 kg/t (110000 kgN/year).

From the solid-liquid separation of the whole digested state, about 2 200 t/year of solid fraction with 6.1 kgN/t and 19800 t/year of clarified fraction with 4.8 kgN/t are obtained. From the microfiltration of the digestate, 12 100 t/year of microfiltrate with 4.7 kgN/t and 7 700 t/year of thickened with 4.9 kgN/t are obtained.

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

Digestate\_100% is technical innovation within the reach of the farm and actually applicable; a system capable of converting the burden of digestate into a valid corporate resource. Potentially usable not only in the field of maize culture but also on horticultural and tree crops, also in organic farming.

For more information: [https://nutriman.net/farmer-platform/technology/id\\_275](https://nutriman.net/farmer-platform/technology/id_275)