

# Circular Agronomics Tech Study

## Solar drying of manure and digestates

*Semi-industrial pilot plant in Catalonia (ESP)*



### SOLAR DRYING

Livestock manure is a semi-liquid faecal product with about 3 - 8 % of dry matter content usually spread on agricultural fields to use the naturally present nutrients. It's high-water content and the difficulty of applying it when needed led to nutrient losses, mainly in the form of leaching and gaseous emissions, that can be up to 50 % in some cases. By fixing ammonium salts and reducing water content it is possible to obtain a dried product that remains stable for a long time, thus allowing to spread it according to crop needs and avoiding leaching of soluble compounds and gases volatilisation.

The drying line developed in the Circular Agronomics project comprises the following equipment: 1 centrifuge, 1 acidification unit, 1 mixer, 2 solar dryers, 2 biofilters, 1 air heat exchanger. Firstly, the digestate or the solid fraction are acidified

to avoid ammonia emissions during the drying process, thus fixing ammonia in the product. Secondly, the drying process evaporates water, and finally, the outgoing air is treated by biofiltration. A mechanical rotatory mixer that moves along the dryer breaks the crust that naturally appears on manure storages. This allows to improve the drying efficiency by increasing the contact surface between product and air.

Solar drying brings together calorific power and solar irradiation to obtain a stabilised product with a dry matter content higher than 65 % in about 10 - 30 days, depending on the solar irradiation and the temperature. This is a renewable technology that does not produce residual streams, with losses less than 1 %. It is estimated an operational cost of about 4 €/m<sup>3</sup>, considering 10 years of depreciation.

#### Operating conditions

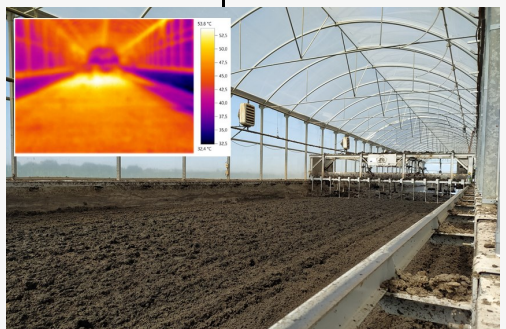
T (naturally achieved)	30-60 °C depending on solar irradiation
pH (after acidification)	5.5
Time	10-30 days depending on solar irradiation

#### Chemicals required

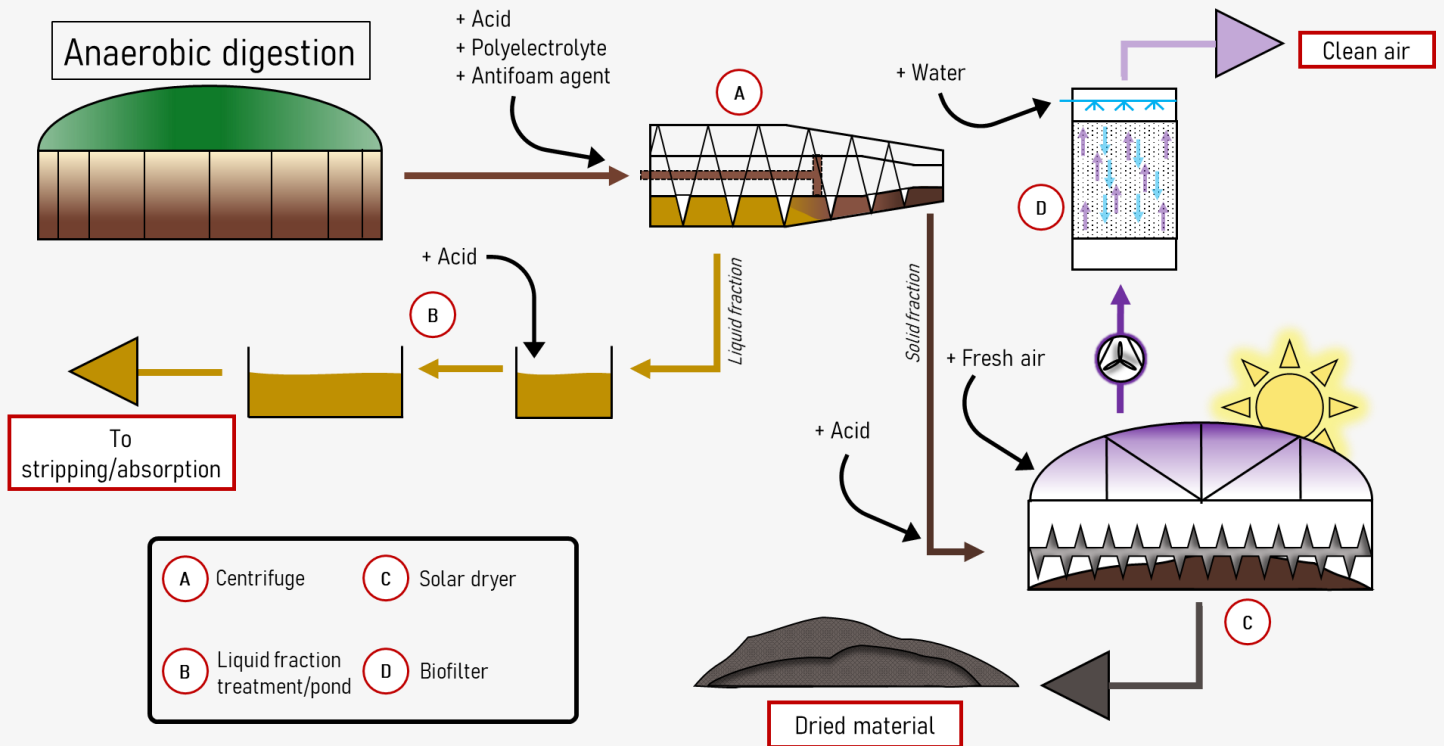
Polyacrylamide-type flocculants (XT653)	300 mg kg <sup>-1</sup> Digestate (Dilute solution: 0.3 % ww)
H <sub>2</sub> SO <sub>4</sub> (50% v/v)	1 m <sup>3</sup> /165 m <sup>3</sup> digestate 1 m <sup>3</sup> /21 t solid fraction

#### Water evaporation and nutrient recovery indexes

Removal water efficiency	up to 95 %
Nutrient Recovery	60 % of TN (TAN recovery of 51 %) 77% P <sub>2</sub> O <sub>5</sub> and 32 % K <sub>2</sub> O



# SOLAR DRYING



## Unique Selling Points



- ➡ More than 60 % removal of water.
- ➡ Treatment of solid fractions with high dry matter content but also raw manure and digestates
- ➡ Production of organic biofertilizers
- ➡ Recovery indexes from digestate of about 60 % of TN (TAN recovery of 51 %), 77 %  $P_2O_5$  and 32 %  $K_2O$
- ➡ These NPK recovery indexes make the final product suitable to be used on field for agronomic uses, according to European legislation on organic fertiliser products