

Biogas Digestate Concentration with Nutrient Recovery

Up to 75% reduction in Digestate Volume

Ammonium Sulphate Production

Efficient use of CHP Heat



The biogas digestate is processed with a two stage, partial vacuum evaporation system using waste heat from the CHP. This reduces the volume of the digest by up to 70%. This highly concentrated liquid contains all the nutrients of regular digestate except the ammonia which is stripped and converted to a separate valuable stream of Ammonia Sulphate solution. Further drying and pelletising of this product is available as an option.

The water vapour, having been stripped of ammonia, is condensed to clean water via heat exchangers with the recovered heat being used in the process.

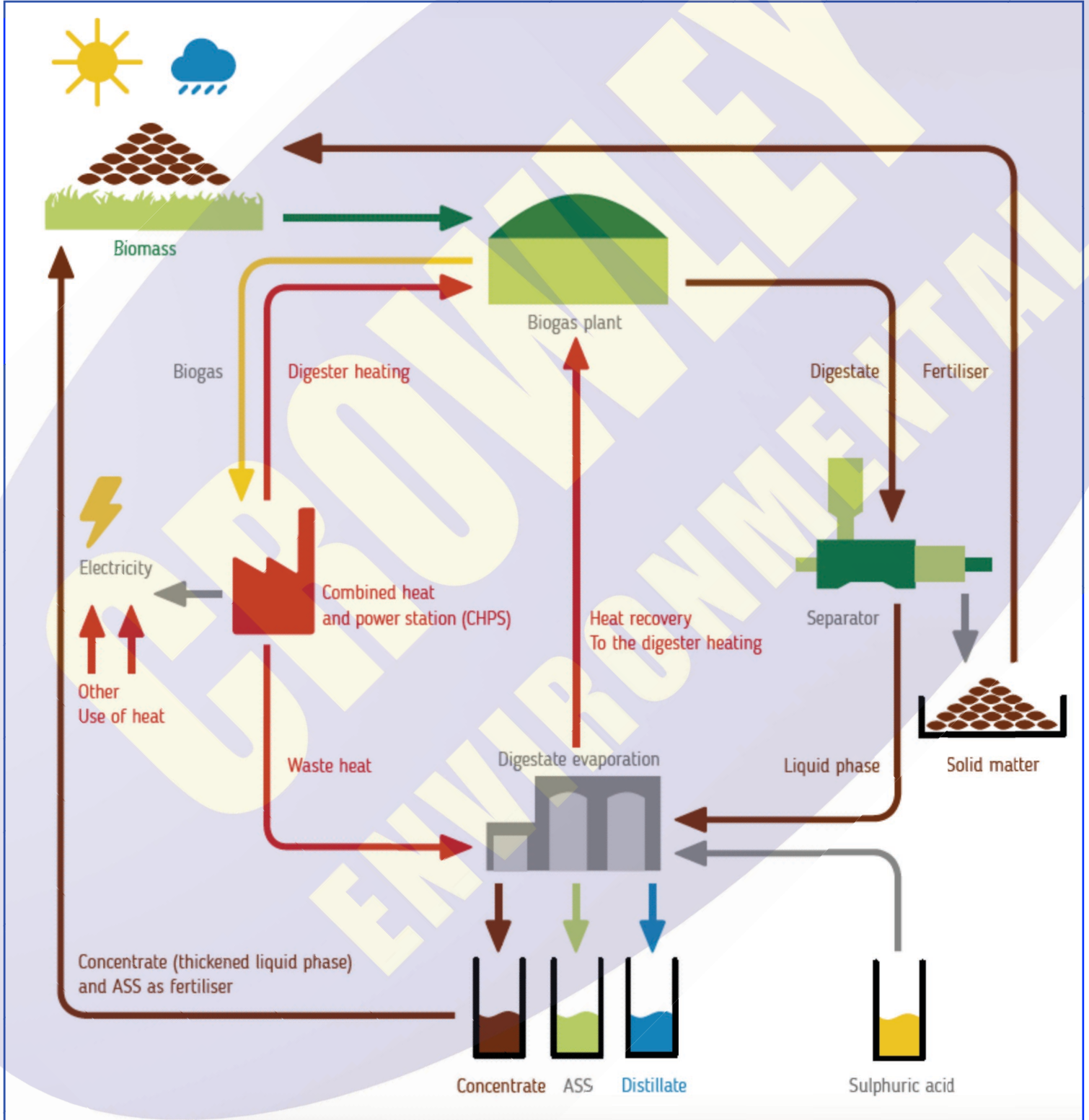
Typical evaporation capacity is up to 2.5 litres per kW_{thermal}

A standard, evaporation plant, utilising the heat from a 500 kW CHP, will process 12,000 m³ per year of digestate.



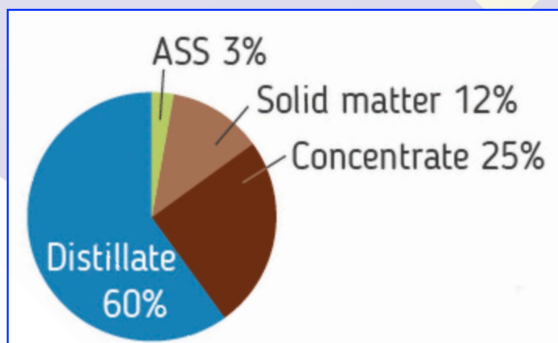
Minimise digests storage, haulage and spreading

Process Flow Schematic Diagram



Typical Heat Consumptions and Product Outputs for the Digestate Evaporator

Heat: 300 kW		
Digesate Flow	1.5 m ³ per hour	12,000 m ³ per annum
Solid matter	0.19 m ³ per hour	1,600 m ³ per annum
Concentrate Digestate	0.54 m ³ per hour	4,400 m ³ per annum
Distillate Water	0.71 m ³ per hour	5,800 m ³ per annum
Ammonium Sulphate production	39 l/hr	320 m ³ per annum
Sulphuric Acid consumption	9.7 kg/hr	79 tonnes per annum
Heat: 350kW		
Digesate Flow	1.5 m ³ per hour	12,000 m ³ per annum
Solid matter	0.19 m ³ per hour	1,600 m ³ per annum
Concentrate Digestate	0.42 m ³ per hour	3,400 m ³ per annum
Distillate Water	0.83 m ³ per hour	6,800 m ³ per annum
Ammonium Sulphate production	46 l/hr	370 m ³ per annum
Sulphuric Acid consumption	11 kg/hr	92 tonnes per annum
Heat: 400 kW		
Digesate Flow	1.5 m ³ per hour	12,000 m ³ per annum
Solid matter	0.19 m ³ per hour	1,600 m ³ per annum
Concentrate Digestate	0.29 m ³ per hour	2,400 m ³ per annum
Distillate Water	0.95 m ³ per hour	7,700 m ³ per annum
Ammonium Sulphate production	52 l/hr	420 m ³ per annum
Sulphuric Acid consumption	13 kg/hr	105 tonnes per annum

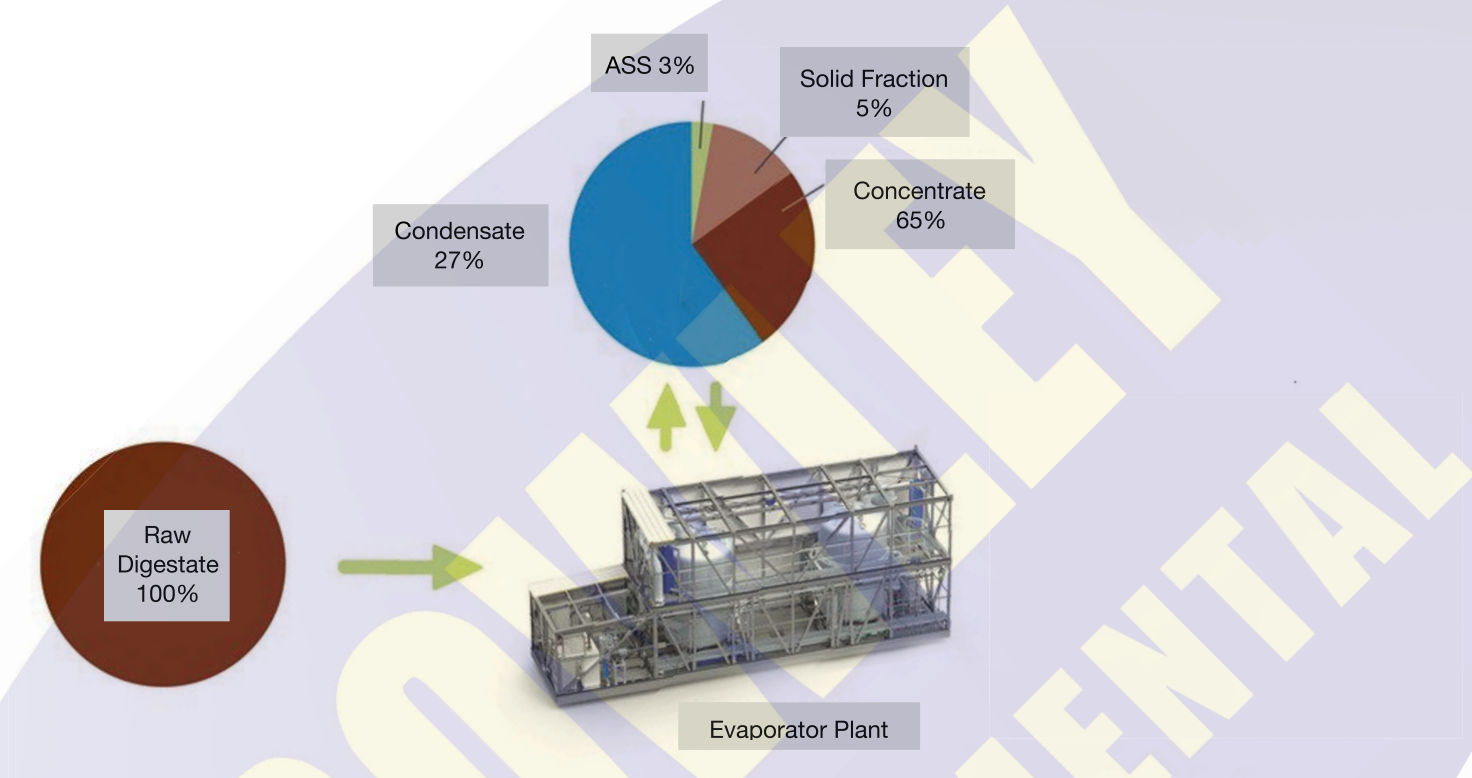


Typical product outputs of the Evaporator

Digesate feed	100%
Ammonium Sulphate Production	3%
Solid Matter Production	12%
Concentrated Digestate Production	25%
Distillate water	60%

The outputs depend upon the analysis of the raw digestate and

Mass Balance



Evaporator

Two stage low pressure, dual temperature evaporation vessels each complete with ammonia vapour stripping using sulphuric acid scrubbing to make an Ammonium Sulphate solution which is a liquid fertiliser.

The vapour is condensed in a chiller unit before discharge to drain or to the land. A small biological treatment step is included to convert any residual traces of ammonium in the condensate to nitrate.

The residual digestate concentrate can be reduced in volume by up to 75% depending on the amount of available heat from the CHP and the mode of operation.

Operation

The raw digestate from the biogas reactor tanks must first pass to an efficient screw press separator. This delivers a solid fraction and a filtrate called press-water. The solid fraction separated is dependent on the dry solids content of the raw digestate, the efficiency of the separator in terms of solids removal and also the separated solids dry matter. The relevant figures are provided in the table below.

Efficiency

The plant can evaporate up to 2.5 litres liquid digestate per kW of thermal energy supplied from the CHP. Up to 500 kW of heat can be applied to an individual evaporator. The amount of press-water concentration is dependent on its feed rate to the evaporator. The slower the feed, the higher the level of concentration and vice versa.

It is not always necessary to operate the plant with maximum evaporation, for example in the growing season when spreading is unrestricted. In this case, the plant can be operated at a greater throughput with down to zero concentration but with the benefit of capturing just the ammonia for the production of Ammonium Sulphate Solution which is a valuable fertiliser product to generate a revenue stream from sales to tillage farmers.



Biogas Digestate Evaporator



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