



USER OPERATIONS MANUAL

for the

Fre-energy 200kW Anaerobic Digester

located at

Y Maesydd, Pool Quay, Welshpool,
Powys SY21 9LA

Grid reference: SJ2627713321

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Glossary of Terms

Acetogenesis	Is the third stage of anaerobic digestion (AD) process, where remaining acidogenesis are transformed into hydrogen and acetic acid by acetogenic bacteria
Acidogenesis	Is the second stage of AD process, where acidogenic bacteria transform products into short chain volatile fatty acids, acetic acid, propionic acid, butyric acid and hydrogen
Active volume	The percentage of the digester tank that is actively being mixed
Alkalinity	Refers to the buffering alkalinity within the digester.
Anaerobic	In the absence of oxygen
Ammonia (NH_3)	It is toxic to many anaerobic bacteria. The amount of ammonia produced is dependent on the amount of total nitrogen in the feedstock and the fraction of organic matter converted to biogas in the digester, most ammonia will be produced after digestion in the presence of oxygen.
Ammonium	Is mineral nitrogen and is more plant available than Nitrate, (NO_3^-), during digestion a percentage of the Nitrate will be converted to Ammonium
Anaerobic digestion (AD)	A series of processes in which microorganisms break down biodegradable material in the absence of oxygen. It is used for industrial or domestic purposes to manage waste and/or to release energy The digestion process begins with bacterial hydrolysis of the input materials (feedstocks) to break down insoluble organic polymers, such as carbohydrates, and make them available for other bacteria Acidogenic bacteria then convert the sugars and amino acids into carbon dioxide, hydrogen, ammonia, and organic acids Acetogenic bacteria then convert these resulting organic acids into acetic acid, along with additional ammonia, hydrogen, and carbon dioxide Finally, methanogens convert these products to methane and carbon dioxide
Anaerobic digestion Quality Protocol	This document sets out the criteria for the production of quality products from anaerobically digested wastes that would otherwise fall under strict European Waste Regulations. It is related to two partner documents: Publicly Available Specification 110 (PAS 110), and the Animal By Products Regulations (ABPR).

BA	Breathing Apparatus used in confined space entry to protect the lungs of the operator from toxic Hydrogen Sulphide (H ₂ S).
Biodegradation	The dissolution of materials by bacteria or other biological means Biogas Gas produced from the decomposition of biomass. Typically, methane (CH₄) quantity is 60%, carbon dioxide (CO₂) 40%, with trace amounts of hydrogen (H₂), hydrogen sulphide (H₂S), ammonia (NH₃-), oxygen (O₂).
Biogas	Is gas produced from anaerobic digestion process the typical content of this bio gas is 60 – 70% methane, 30 – 40% carbon dioxide, ~500ppm hydrogen sulphide and other trace gasses.
Biomethane	Is Methane recovered from biogas
Biomethane potential	This is the potential methane from different feedstocks. This is carried out on Fre-energies mini digester first to enable the operator to get the highest biogas yields possible from his digester.
Calorific Value (CV)	The amount of energy that is within the biomass/waste feedstock, CV is usually stated as kJ/kg or MJ/kg. There are two CVs, the Upper or Higher CV and the Lower CV. The higher the CV value of the feedstock the higher the potential biogas yields.
CHP	Combined Heat and Power
Digestate	High grade organic fertilizer after feedstock has passed through the digester
Feedstock	Materials suitable to add to an anaerobic digester: Feedstock needs have energy potential to generate biogas.
G59	Part of the Electrical generation equipment. Safety device monitoring the mains power to detect problems on the incoming power lines, disconnecting the generator from the mains should a fault condition occur.
ICP	Interface Control Panel
PLC	Programmable Logic Controller
Retention time (RT)	This is the notional average time in days that material spends in the digester calculated by (digester volume ÷ material loaded). For example, for Slurry RT=18days, Chicken Litter RT=30 days, Maize RT= 90 days.

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