



Technology Description (TD) for Anaerobic Digestion Technologies

Contact Information:

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Technology Description:

NAME OF TECHNOLOGY	Micro-biogas plant with mixing/heating system
ASSIGNMENT OF TECHNOLOGY	Reactor for micro-biogas plant
TECHNICAL READINESS LEVEL	<p>TRL 1 - basic principles observed</p> <p>TRL 2 - technology concept formulated</p> <p>TRL 3 - experimental proof of concept</p> <p>TRL 4 - technology validated in lab</p> <p>TRL 5 - technology validated in relevant environment (industrially relevant environment in case of key enabling technologies)</p> <p>TRL 6 - technology demonstrated in relevant environment (industrially relevant environment in case of key enabling technologies)</p> <p>TRL 7 - system prototype demonstration in an operational environment</p> <p>TRL 8 - system completed and qualified</p> <p>TRL 9 - actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)</p>

1 2 **3** 4 5 6 7 8 9



What is the core innovation? (Please explain here what is innovative on this technology and which problem does the technology solve.)	It is very useful for fermentation of lignocellulosic biomass and substrates with high content of dry mass (organic wastes). Heating is integrated with the mixing in the fermentation reactors.	
Vision of the innovation (Please describe here what impact you see for the future)	Competitive for micro and small installations. It can be used for organic fraction of waste fermentation as well as agricultural organic wastes.	
What are the R&D needs for your technology? (Are there any barriers or challenges which still need to be overcome?)	High material costs which should be reduced.	
TECHNOLOGY/EQUIPMENT AVAILABILITY		
PATENT RIGHTS		YES/NO
METHOD OF MAKING THE TECHNOLOGY AVAILABLE	<i>Licence selling</i>	YES/NO
	<i>Licence granting</i>	YES/NO
POSSIBLE END USERS OF TECHNOLOGY	<i>Please name end users/ contacts that should be invited to project workshops</i>	This technology is recommended for micro and small biogas plant. Different kind of substrates can be used.

Description of the technology/equipment:

Micro biogas plant with simultaneously mixing and heating system is solution using substrates with high solids content, which are not pumpable even with positive displacement pumps. The reactor has the form of a concrete tank with a rectangular cross-section. On the cover are located the drive of screw pump and biogas intake. Substrates (solid and liquid) are delivered via a hopper (1). The level of the fermentation sludge inside the reactor chamber is above the bottom edge of the dome (8). A screw pump (5) driven by an electric motor (6) was installed inside the reactor. The pumped sludge, flowing through the screw pump, is simultaneously heated by a heat exchanger (9). The heated sludge goes back (7) to the digester (2). The post-fermented sludge is collected using a drain well (3 together with the cover (4)). The inlet to the drain well is below the level of the sludge in the digester. The biogas is discharged from the reactor by the biogas intake (10) located in the cover dome (8).

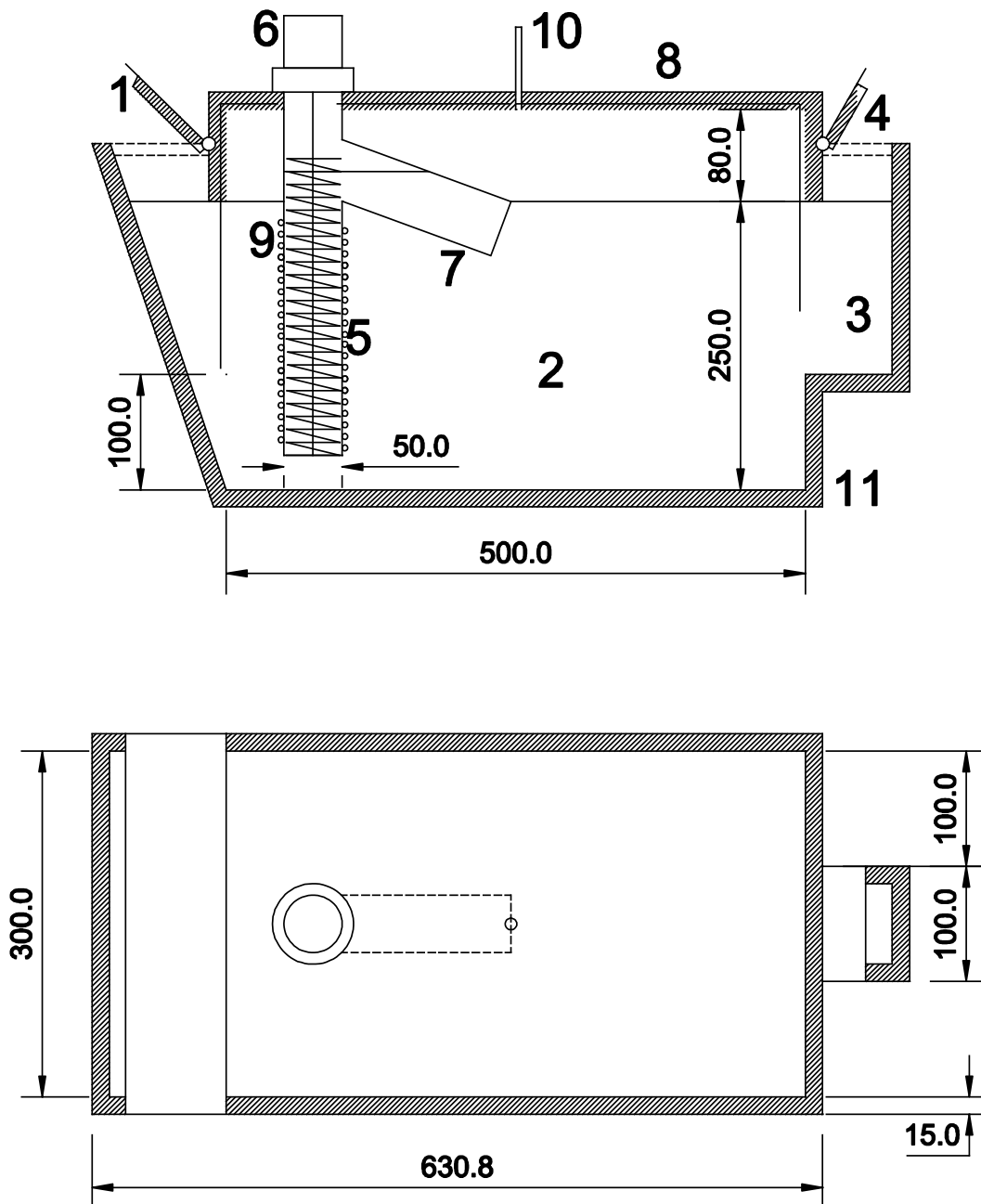


Fig. 1. Scheme of the micro biogas plant construction with simultaneously mixing and heating system

Technical Data:



Parameter		Value (please fill or tick) If value not available, please give estimate (and indicate with *).	Comments (e.g. which condition does the entered value correspond to?)
<i>Current technology</i>	Biogas production rate of technology at current TRL-level (Nm ³ /h)	1.75	
<i>Data basis for following data list</i>	1.: market ready stage of technology (based on test runs of current techn.)	1 <input type="checkbox"/> (preferably)	
	<u>Please only use 2. or 3. if 1. not at all possible.</u>		
	2.: market ready stage of technology (based on estimate)	2 <input checked="" type="checkbox"/>	
	3.: current level (TRL) of technology	3 <input type="checkbox"/>	
<i>Technical efficiency</i>	Methane content in biogas (%)	45-65	Depending on the substrate
<i>Capacity</i>	Flow rate and type per substrate (Mg/h)	0,020-0,045	
	Biogas production rate (range) (Nm ³ /h)	≈ 2,1	Depending on the substrate
	Possible range for upscaling	Up to 100 (Nm ³ /d)	
<i>Data for assessment of economical added value, possible contribution to GHG-reduction and availability</i>	Fermenter and biogas process technology (e.g. continuously stirred reactor, plug flow digester, box or garage type)	CSTR	
	Electricity demand (kWhel/Nm ³ biogas)	0,75	
	Heat demand (kWhth/Nm ³ biogas)	1,95	
	Chemical/additives demand (kg/h or kg/Nm ³ biogas)	not necessary	
	Demand of other substances (kg/h or kg/Nm ³ biogas)	not necessary	
	Temperature in fermenter (°C)	30 - 40	



	Pressure of biogas at exit of fermenter (bar _{abs})	0,02	
	m ³ fermenter volume used	37.5	
	Full load hours (h/a)	8000	
	Hydraulic retention time (days)	60	
	Max. dry matter content (%)	15	
	Organic loading rate (kg VS/m ³ d)	2-3	
	Space requirement (m ²)	24	
	Staff requirement (excluding maintenance) (h/a)	730	
	Specific capital costs (excluding project development, planning, permission and additional building costs) (€/Nm ³ /h)	<p>Please give exact specific cost if possible, if not please specify range.</p> <input type="checkbox"/> < 5.000 €/Nm ³ /h <input type="checkbox"/> 5.000 - 10.000 €/Nm ³ /h <input checked="" type="checkbox"/> 10.000 € - 15.000 €/Nm ³ /h <input type="checkbox"/> > 15.000 €/Nm ³ /h	
	Maintenance costs (including spare parts, staff) (€/a or €/operating hour)	2000	Costs have not been calculated yet. presented value it is approximation
	Production costs (€/Nm ³ biogas)	0,2-0,3	Costs have not been calculated yet. presented value it is approximation
	Expected lifetime of unit (years)	15	
<i>Flexibility</i>	Types of substrate (solid and liquid)	Solid and liquid	



	Start-stop-flexibility	low	
	Part-load possibility	<input checked="" type="checkbox"/> Yes, 50% of full capacity <input type="checkbox"/> No	
	Is self-maintenance of technology possible?	<input checked="" type="checkbox"/> Yes, 90% of total maintenance hours per year that can be done by operator himself <input type="checkbox"/> No	
	Necessity for adaptations of other parts of the plant	no	
	Advantages/disadvantages of technology	Advantages: possibility of different substrates using, simple operation /disadvantages using of mechanical devices (engine)	
	Special application area of technology	Technology for substrates with low level of hydration	