



Technology Description (TD) for Anaerobic Digestion Technologies

Contact Information:

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<i>Date (of filling the TD):</i>	23.05.2018			

Technology Description:

NAME OF TECHNOLOGY	Reactor with double pneumatic mixing system
ASSIGNMENT OF TECHNOLOGY	Reactor for micro-biogaz plant
TECHNICAL READINESS LEVEL	<p>1 2 3 4 5 6 7 8 9</p>
<p>TRL 1 - basic principles observed TRL 2 - technology concept formulated TRL 3 - experimental proof of concept TRL 4 - technology validated in lab TRL 5 - technology validated in relevant environment (industrially relevant environment in case of key enabling technologies) TRL 6 - technology demonstrated in relevant environment (industrially relevant environment in case of key enabling technologies) TRL 7 - system prototype demonstration in an operational environment TRL 8 - system completed and qualified TRL 9 - actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)</p>	
What is the core innovation? (Please explain here what is innovative on this	The solution works without mechanical parts. No need to use electricity. Very low operating costs.



technology and which problem does the technology solve.)		
Vision of the innovation (Please describe here what impact you see for the future)		Competitive for micro 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?)		The solution for sealing the reactor cover should be further developed
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 biogas plant. Different kind of substrates can be used.

Description of the technology/equipment:

The reactor with a double pneumatic mixing system is a concrete tank with two working chambers with a round cross-section. At the top of each cover there is a biogas discharge. In addition, the reactor is equipped with a substrate supply chamber along with a pneumatic closure and a substrate removal well.

Organic substrates are introduced periodically through the substrate feed chamber (1) into the first working chamber (2). The substrate feed chamber is sealed with a pneumatic closure. Using the biogas pump (8) from the gas part of the first working chamber (2), the biogas is pumped to the gas part of the second working chamber (3). Increased pressure in the working chamber (3) and reduced in the working chamber (2) causes the movement of the fermentation sludge. Then the biogas pumping direction is reversed and the biogas is pumped from the working chamber (3) to the working chamber (2). The produced biogas is discharged via check valves (9). Periodically, by closing (10) the fermentation sludge is discharged into the collecting well (11).

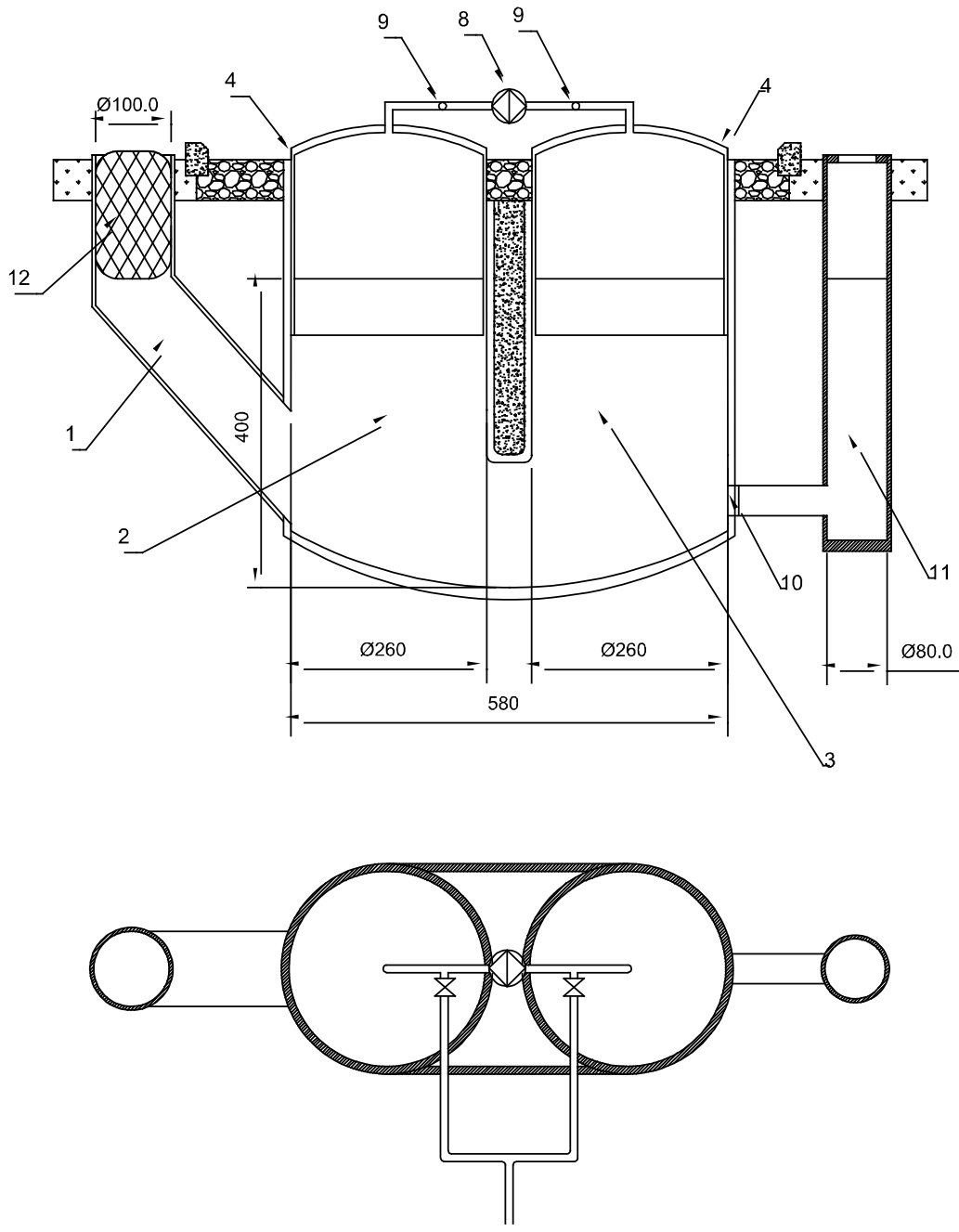


Fig. 1 Scheme of the reactor with a double pneumatic mixing system

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)	2 Nm ³ /h	
<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)	0.016-0.032	
	Biogas production rate (range) (Nm ³ /h)	≈ 2.0	Depending on the substrate
	Possible range for upscaling		Increasing the scale is possible by adding next reactors of the same construction
<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)	semi-plug flow digester	
	Electricity demand (kWhel/Nm ³ biogas)	0,3	
	Heat demand (kWhth/Nm ³ biogas)	1.30	
	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})		should be establish during test in full scale
	m ³ fermenter volume used	45	
	Full load hours (h/a)	8000	
	Hydraulic retention time (days)	≈60	
	Max. dry matter content (%)	10	
	Organic loading rate (kg VS/m ³ d)	2-3	
	Space requirement (m ²)	20	
	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> <p>x < 5.000 €/Nm³/h <input type="checkbox"/> 5.000 - 10.000 €/Nm³/h <input checked="" type="checkbox"/> 10.000 € - 15.000 €/Nm³/h <input type="checkbox"/> > 15.000 €/Nm³/h</p>	
	Maintenance costs (including spare parts, staff) (€/a or €/operating hour)	3650	Costs have not been calculated yet. presented value it is approximation
	Production costs (€/Nm ³ biogas)	0.3-0.5	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: simple mixing system /disadvantages durability and tightness.	
	Special application area of technology		