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Technology Description (TD) for

Substrate Pre-Treatment Technologies

Contact Information:

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	Date (of filling the TD):	08.09.2017 (update)		

Technology Description:

NAME OF TECHNOLOGY	Device for ultrasound disintegration of organic matter
ASSIGNMENT OF TECHNOLOGY	Biomass disintegration, pre-treatment before methane fermentation.
TECHNICAL READINESS LEVEL **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)	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.)		This is a new, innovative solution of introducing ultrasounds to pretreatment substrate based on the vocal cords
Vision of the innovation (Please describe here what impact you see for the future)		It can be used for disintegration of high hydrated organic substrate : sewage sludge, manure, algae biomass
What are the R&D needs for your technology? (Are there any barriers or challenges which still need to be overcome?)		It needs to be tested in full technical scale with optimizing operating parameters in conditions close to reality. Limitation is the possibility to apply for substrates with low levels of hydration. Advantage is a simple construction and operation as well as reliability.
TECHNOLOGY/EQUIPMENT AVAILABILITY		technology licence sellers Technology supplier has a prototype functioning in fractional/quarter technical scale. It is possible to test the technology for potential customers. The technology supplier is not a producing company
PATENT RIGHTS		~~YES~~/NO
METHOD OF MAKING THE TECHNOLOGY AVAILABLE	*Licence selling*	YES/~~NO~~
	Licence granting	YES/~~NO~~
POSSIBLE END USERS OF TECHNOLOGY	*Please name end users/ contacts that should be invited to project workshops*	Biogas plant operators

Description of the technology/equipment:

The device for ultrasound disintegration of organic matter was developed by scientists at the University of Warmia and Mazury in Olsztyn and the authors are looking for potential investors willing to implement/develop the presented device. The purpose of the ultrasound disintegrator is to increase the susceptibility of substrate to anaerobic digestion due to disintegration of organic matter as a result of ultrasound-caused cavitation. The disintegration of substrates with dry mass up to 5% is possible.

The device compared to existing solutions reduces the demand for electricity at the same effectiveness. In this device, a significantly higher density of the introduced ultrasounds in comparison to other solutions, improves the efficiency of the disintegration process. Operation of the ultrasonic waves takes place almost at the whole flow through the device.

The device for ultrasound disintegration of the biomass (Fig. 1) consists of a cylindrical tank (1) with an inlet channel (2) and an outlet channel (3) on a side wall. Inside the tank (1), there are strings (4) fixed on two discs (5 and 6) that are located in the upper and lower part of the tank (1). The top disc (5) is connected to the disintegrating ultrasound generator (7), and the bottom disc (6) is connected with the instrument (8) that is used to pull the strings (4). The substrate with dry mass up to 5% flows by the inlet channel (2) to the tank (1). During the flow it contacts with vibrating strings (4). The conditioned substrate outflows from the tank by the outlet channel (3).

The device is patented (Patent No. 213950, decision from 2012).

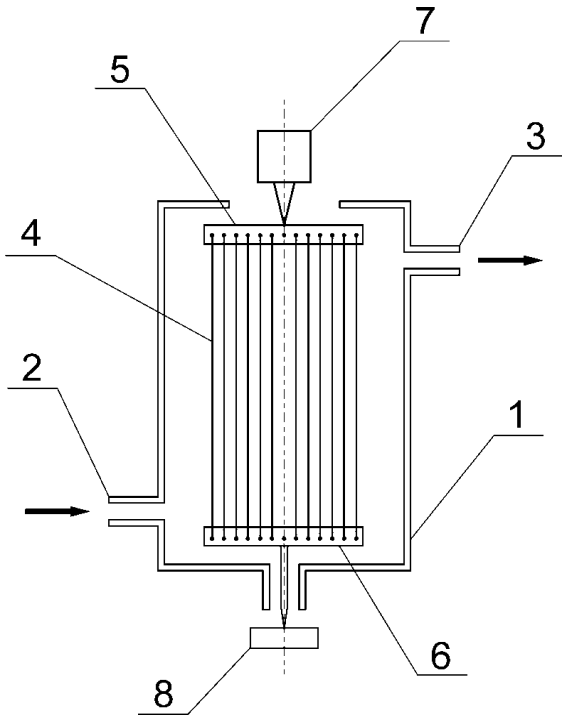

Fig. 1 Device for biomass disintegration

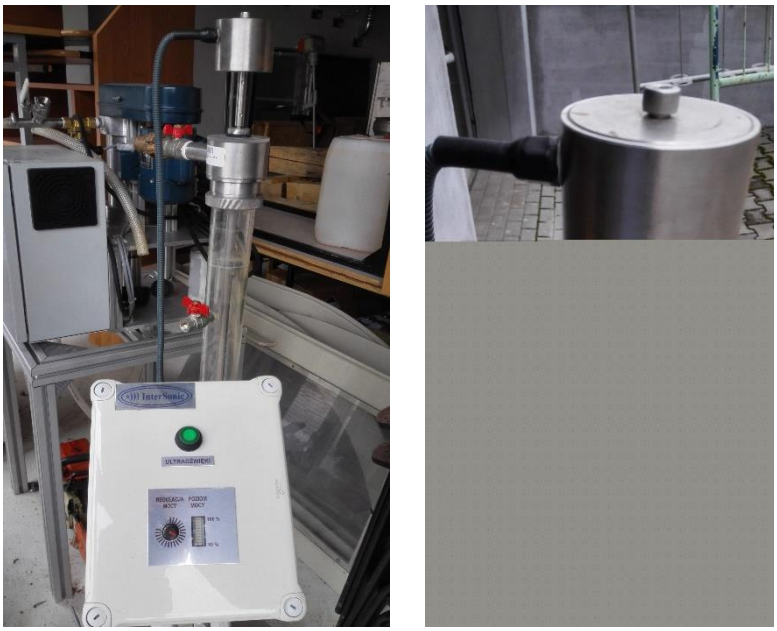

Fig. 2 Device for ultrasound disintegration of organic matter – photos of laboratory model

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?)
Current technology	Flow rate of technology at current TRL-level (Mg/h)	0,012 Mg/h		
Data basis for following data list	1.: market ready stage of technology (based on test runs of current techn.) **<u>Please only use 2. or 3. if 1. not at all possible.</u>** 2.: market ready stage of technology (based on estimate) 3.: current level (TRL) of	1 ☐ (preferably) 2 ☐ 3 ☒		

	technology		
Technical efficiency	Increase in biogas production through pre-treatment technology (%)	18 %	Depending on the kind of material
Capacity	Flow rate (range) (Mg/h)	0,012 Mg/h	The process is carried out for the substrates of liquid, depending on the needs of the recirculation should be used
	Possible range for upscaling	up to 0,3 Mg/h	
Data for assessment of economical added value, possible contribution to GHG-reduction and flexibility	Electricity demand (kWh$_{el}$/Mg Substrate)	1,3 kWh$_{el}$/Mg Substrate	
	Heat demand (kWh$_{th}$/Mg Substrate)	-	
	Chemical/additives demand (kg/h)	-	
	Demand of other substances (kg/h)	-	
	Full load hours (h/a)	8700	24h/7d
	Dry matter content (range) (%)	max. to 5 % dm	Device for liquid substrates
	Space requirement (m^2)	1,0 m^2	
	Staff requirement (excluding maintenance) (h/a)	300	The device does not need additional staff. The staff member of biogas plant simultaneously controls the disintegrator
	Specific capital costs (excluding project development, planning, permission and additional building costs) (€/Mg nominal capacity/h)	Please give exact specific cost if possible, if not please specify range. X < 5.000 €/Mg/h - 2 500 ☐ 5.000 - 10.000 €/Mg/h	Not determined on an industrial scale

		☐ 10.000 k€ - 15.000 €/Mg/h ☐ > 15.000 €/Mg/h	
	Maintenance costs (including spare parts, staff) (€/a or €/operating hour)	150	Not determined on an industrial scale
	Production costs (€/Mg)	0,18	Not determined on an industrial scale
	Expected lifetime of unit (years)	5	Not determined on an industrial scale
Flexibility	Types of substrate (solid and liquid)	Disintegrated substrates must be hydrated. There is no possibility of using substrates in powder form. The presence of air suppresses the action of ultrasound. The used substrates are pressed with a cam pump and in the case of silage there is a need for recirculation of sludge. silage, slurry, manure, wastewater sludge	
	Start-stop-flexibility	Not required	The device is ready for use immediately after installation
	Part-load possibility	☒Yes, 10% of full capacity ☐ No	With the part-load device is lower efficiency
	Is self-maintenance of technology possible?	☒Yes, 100% of total maintenance hours per year that can be done by operator himself ☐ No	
	Necessity for adaptions of other parts of the plant	no	
	Advantages/disadvantages of technology	<u>Advantages:</u> The simplicity of use, no need to add chemicals, a large increase in the amount of biogas. <u>Disadvantages:</u>	

		The high energy inputs	
	Special application area of technology	Biogas plants using a liquid substrate of poor quality	