



Technology Description (TD) for Substrate Pre-Treatment Technologies

Contact Information:

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<i>Date (of filling the TD):</i>	08.09.2017			

Technology Description:

NAME OF TECHNOLOGY	Ultrasound disintegrator
ASSIGNMENT OF TECHNOLOGY	Biomass disintegration, pre-treatment before methane fermentation.
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	Solutions adapted to the disintegration of organic substrates with relatively high density



technology and which problem does the technology solve.)		and low hydration
Vision of the innovation (Please describe here what impact you see for the future)		The device can be used for installations of the fermentation of sewage sludge and the typical small agricultural biogas plants.
What are the R&D needs for your technology? (Are there any barriers or challenges which still need to be overcome?)		Currently the device does not compete on market in terms of operating costs. It needs optimization research of the unit in order to reduce the energy consumption per unit substrate mass.
TECHNOLOGY/EQUIPMENT AVAILABILITY		technology licence sellers Technology supplier has a prototype functioning in 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	<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>	

Description of the technology/equipment:

Device for ultrasound disintegration consists of 5 pipe segments of rectangular section. A single segment has dimensions of 100 x 100 x 850 mm. The active capacity of one segment is 8 liters. The segments are made of stainless steel. Subsequent segments are connected to each other by fitting with cross-section identical to segments of ultrasound. Each segment is equipped with 12 pieces of ultrasonic transducers. Transmitters are placed evenly on opposite walls of disintegrants in sets of 6 pieces. Between the transducers lying on opposite sides of the segment the shift is used. The positioning of transducers provides uniform ultrasonic throughout the volume of the liquid inside the segment disintegrator (fig. 3).

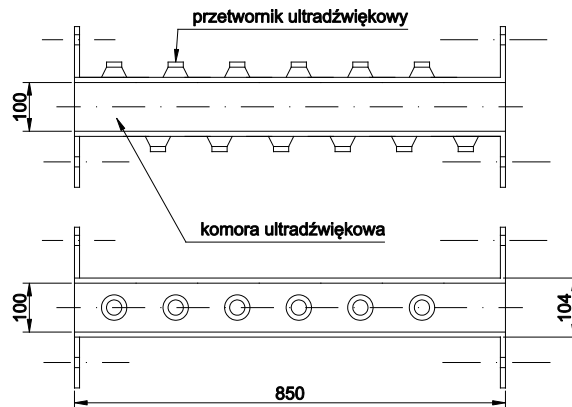


Fig. 3. Construction of a single segment of the ultrasound disintegrator

Disintegrator is operating in a batch cycle in successive phases of the filling (15 sec) disintegration (900 s) and draining (15 s). The total number of industrial pieces of ultrasonic transducers is 60 and 10 kW is the power of the device which allows to obtain a unit dose of energy at $55.5 \text{ Wh/l} = 200 \text{ kJ/l}$. Controlling the operation of the ultrasonic generator is connected to automatic electrovalves on upstream and downstream of the reactor and permits any change in the length of the phase, and thus the amount of energy supplied. The inflow to the device takes place from the bottom, and disintegrated substrate flows into the fermentation reactor (Fig. 4). The 40 L of the substrate is disintegrated at the same time. Segments of the reactor are completely filled with disintegrated liquid without air phase that could suppress the propagation of ultrasound. Cross-section of the reactor is 100 x 100 mm and it has been chosen for industrial ultrasonic transducers with frequency of $23 \text{ kHz} \pm 2\%$.

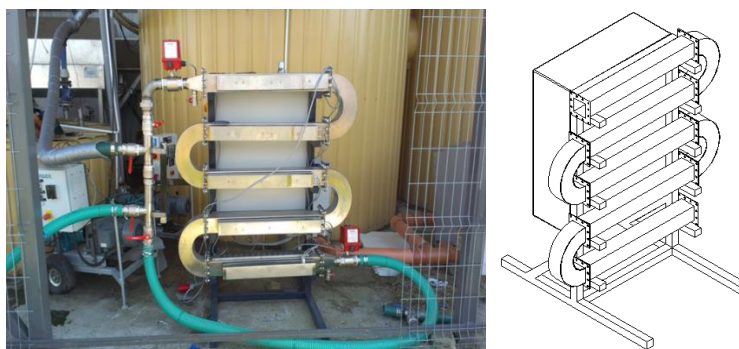


Fig. 4. Ultrasound disintegrator in technical scale



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>	Flow rate of technology at current TRL-level (Mg/h)	0,15 Mg/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 type="checkbox"/>	
	3.: current level (TRL) of technology	3 <input checked="" type="checkbox"/>	
<i>Technical efficiency</i>	Increase in biogas production through pre-treatment technology (%)	20 %	Depending on the kind of material
<i>Capacity</i>	Flow rate (range) (Mg/h)	0,15 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 0,4 Mg/h	
<i>Data for assessment of economical added value, possible contribution to GHG-reduction and flexibility</i>	Electricity demand (kWhel/Mg Substrate)	1,5 kWhel/Mg Substrate	
	Heat demand (kWhth/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 5-6% dm	
	Space requirement (m ²)	1,0 m ²	



	Staff requirement (excluding maintenance) (h/a)	600	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. <input type="checkbox"/> < 5.000 €/Mg/h <input type="checkbox"/> 5.000 - 10.000 €/Mg/h <input checked="" type="checkbox"/> 10.000 k€ - 15.000 €/Mg/h - 15 000 <input type="checkbox"/> > 15.000 €/Mg/h	Not determined on an industrial scale
	Maintenance costs (including spare parts, staff) (€/a or €/operating hour)	200	Not determined on an industrial scale
	Production costs (€/Mg)	0,25	Not determined on an industrial scale
	Expected lifetime of unit (years)	5	Not determined on an industrial scale
<i>Flexibility</i>	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	<input checked="" type="checkbox"/> Yes, 10% of full capacity <input type="checkbox"/> No	With the part-load device is lower efficiency



	Is self-maintenance of technology possible?	<input checked="" type="checkbox"/> Yes, 100% 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	<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 substrate of poor quality	