



Technology Description (TD) for Substrate Pre-Treatment Technologies

Contact Information:

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Technology Description:

NAME OF TECHNOLOGY	Hydrodynamic 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	Construction of device is adapted to



technology and which problem does the technology solve.)	disintegration of high density and low hydration substrates, including lignocellulosic biomass substrates.	
Vision of the innovation (Please describe here what impact you see for the future)	Implementation to biogas plants based on biomass, including lignocellulosic biomass	
What are the R&D needs for your technology? (Are there any barriers or challenges which still need to be overcome?)	Limitation is decline popularity of biogas plants based on biomass. It needs to be tested and optimize the in technical scale.	
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		
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>	Biogas plant operators

Description of the technology/equipment:

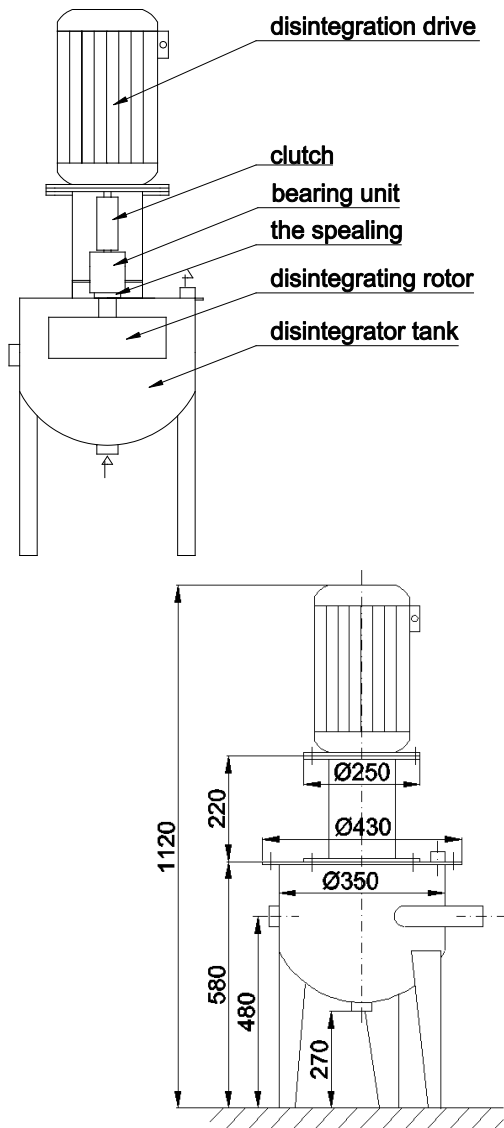
Hydrodynamic disintegrator

Hydrodynamic disintegrator, used in studies, consists of multifunctional rotor, which was made according to Patent PL 214335 B1, rotating inside the tank with a capacity of 25 L, driven by an electric motor with a power of 2 kW and a rotational speed of $n = 2800/\text{min}$. The rotor is mounted on a shaft of bearing unit inserted through the cover and the sealant to the interior of the tank, coupled with the engine by the rubber-metal clutch. The inlet port is located at the bottom of the tank and the outlet at the lid of the tank. The inlet and outlet are equipped with a



2" valves and connected by bypass with 2" valve to enable flowing of liquid and omitting the tank. Disintegrator tank also has additional ½" connectors, equipped with a temperature meter, manometer and valve for sampling.

After filling of the tank and running the disintegrator, substrate is pumped repeatedly through the rotor due to centrifugal force. Liquid is drawn into the tank, by the inlet port located in the axis of the rotor, and is processed flowing through the chambers located closest to the outer edge, and then is expelled outside the rotor. Flowing inside the rotor, through other channels and chambers, liquid is subjected to the alternating high and low pressure, which at the appropriate spin speed creates conditions for the formation and disappearance of cavitation bubbles, which is destructive to the structure of biological material (substrate). After a set time the motor stops the disintegrator and substrate is replaced. After disintegration, the substrate is removed from the tank during filling, as a result of displacement by new inflowing liquid.



Rys. 1 Hydrodynamic disintegrator - scheme

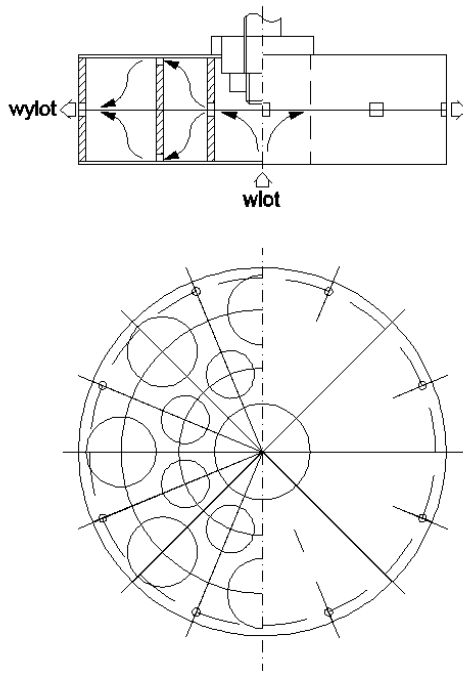


Fig. 2 The cavitation head



Fig. 3. Hydrodynamic disintegrator - photo



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)	0,025 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 (%)	15 %	Depending on the kind of material
<i>Capacity</i>	Flow rate (range) (Mg/h)	0,025 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 0,5 Mg/h	
<i>Data for assessment of economical added value, possible contribution to GHG-reduction and flexibility</i>	Electricity demand (kWhel/Mg Substrate)	1,2 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)	700	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 checked="" type="checkbox"/> 5.000 - 10.000 €/Mg/h - 7 500 €/Mg/h <input type="checkbox"/> 10.000 k€ - 15.000 €/Mg/h <input type="checkbox"/> > 15.000 €/Mg/h	Not determined on an industrial scale
	Maintenance costs (including spare parts, staff) (€/a or €/operating hour)	600	Not determined on an industrial scale
	Production costs (€/Mg)	0,18	Not determined on an industrial scale
	Expected lifetime of unit (years)	4	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, 50% of full capacity	With the part-load device is lower efficiency



		<input type="checkbox"/> No	
	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	