This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691911

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	Change-Pressure disintegrator
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

TECHNOLOGY/EQUIPMENT AVAILABILITY		**technology license sellers** Technology supplier has a prototype functioning in fractional - technical scale. It is possible to test the technology for potential customers. The technology supplier is not a producing company.
What is the core innovation? (Please explain here what is innovative on this technology and which problem does the technology solve.)		The device uses an innovative system of sudden pressure changes that enhances the pre-treatment process.
Vision of the innovation (Please describe here what impact you see for the future)		It can compete in the market with the currently proposed devices.
What are the R&D needs for your technology? (Are there any barriers or challenges which still need to be overcome?)		Device should be tested in semi-technical scale. Prototype should be built and optimized in full technical scale. The limitation for use on small objects is the level of technological complexity.
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:

Substrate introduced into the device is exposed to high temperature and high pressure, and then a sudden decompression. In the final phase of disintegration, the substrate is subjected to a vacuum. This results in the destruction of organic matter. Sudden changes in pressure favor the destruction by causing cavitation. It allows to get a better effect of biomass disintegration at lower cost for heating.

The device has a tank 1 with the heating system 2 and is equipped with an inlet port 3 for the raw substrate and the discharge port 4 for the processed substrate, and the

gas pipe 5. The gas pipe 5 ends with a overpressure electrovalve 6 and a underpressure electrovalve 7. After the underpressure electrovalve the pipe is passed, which is connected to a vacuum tank 8 to the discharge port 9.

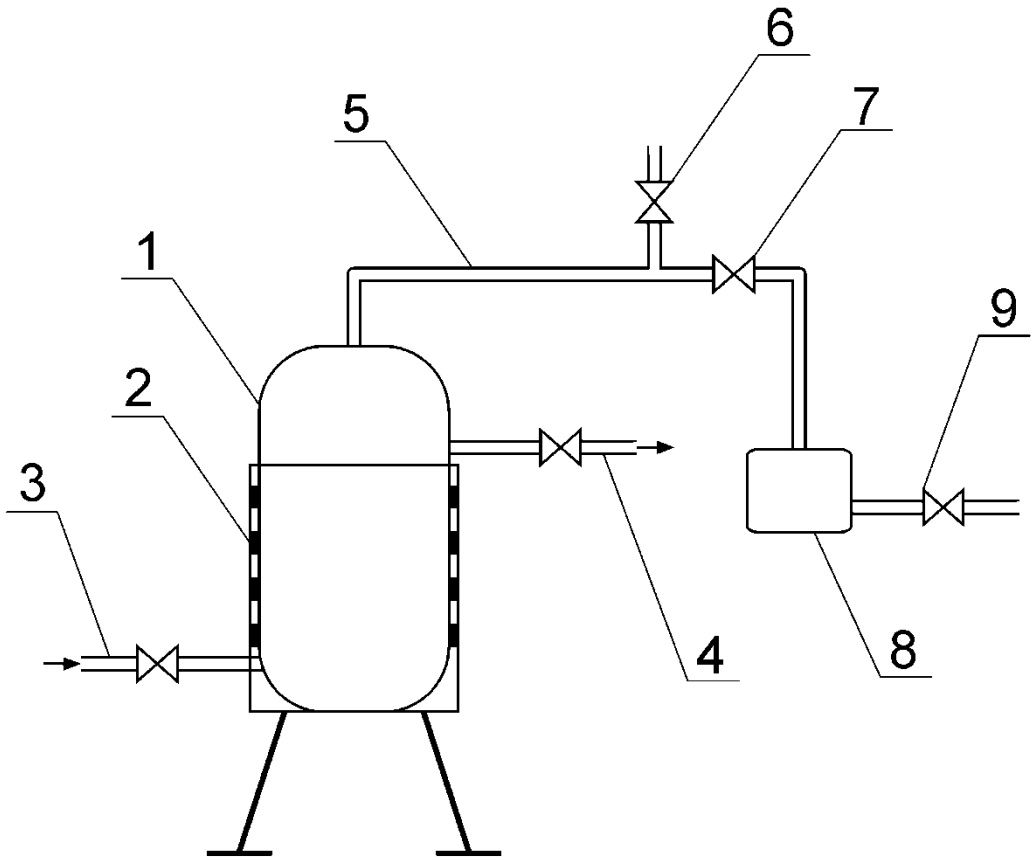

Fig. 1 Scheme of the device

Operation of the device

The substrate is introduced into the inlet port 3 into the tank 1 and heated by the heating system 2. During the heating, temperature rise and increase the pressure in the tank 1. When the desired temperature and pressure are achieved, gases and steam water flow through the pipe 5 and by the overpressured electrovalve 6 to the atmosphere. Switching on and off the electrovalve 6, which runs periodically, until the pressure close to atmospheric pressure is achieved. Then the underpressured electrovalve 7 is turn on, which runs periodically, and gas and steam water flow into the vacuum tank 8. After lowering the vacuum in the vacuum tank 8 and the underpressured electrovalve 7 shuts off and at the same time by the discharge port 9 the processed substrate is discharged.

Fig 2 Change-Pressure disintegrator

Technical Data:

Parameter			**Comments** (e.g. which condition does the entered value correspond to?)
Current technology	Flow rate of technology at current TRL-level (Mg/h)	0,05 Mg/h	
Data basis for following data list	1.: market ready stage of technology (based on test runs of current techn.) **Please only use 2. or 3. if 1. not at all possible.** 2.: market ready stage of technology (based on estimate) 3.: current level (TRL) of technology	1 ☐ (preferably) 2 ☐ 3 ☒	
Technical efficiency	Increase in biogas production through pre-treatment technology (%)	14 %	Depending on the kind of material
Capacity	Flow rate (range) (Mg/h)	0,05 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 0,2 Mg/h	
Data for assessment of economical added value, possible contribution to GHG-reduction and flexibility	Electricity demand (kWhel/Mg Substrate)	1,6 kWhel/Mg Substrate	
	Heat demand (kWhth/Mg Substrate)	1,5 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 35% dm	
	Space requirement (m^2)	1,0 m^2	
	Staff requirement (excluding maintenance) (h/a)	750	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. ☐ < 5.000 €/Mg/h ☐ 5.000 - 10.000 €/Mg/h ☐ 10.000 k€ - 15.000 €/Mg/h x > 15.000 €/Mg/h 16 000	Not determined on an industrial scale
	Maintenance costs (including spare parts, staff) (€/a or €/operating hour)	800	Not determined on an industrial scale
	Production costs (€/Mg)	0,29	Not determined on an industrial scale

	Expected lifetime of unit (years)	4	Not determined on an industrial scale
Flexibility	Types of substrate (solid and liquid)	Disintegrated substrates must be hydrated. In the case of solid substrates the dosing and emptying the tank should be changed. The pressured closure is required. 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	
	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>Adventages:</u> The simplicity of use, no need to add chemicals, a large increase in the amount of biogas. <u>Disadventages:</u> The high energy inputs	
	Special application area of technology	Biogas plants using a substrate of poor quality	