ENVIRONMENTAL TECHNOLOGY VERIFICATION

ETV Verification Statement

TECHNOLOGY TYPE: Mechanical treatment of biomass

APPLICATION: Mechanical pretreatment and separation of organic waste from households and industry to obtain a pulp for biogasification

PRODUCT NAME: **ECOGI**

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ENVIRONMENTAL TECHNOLOGY VERIFICATION

DANETV, the Danish Centre for Verification of Climate and Environmental Technologies, performs independent test of environmental technologies and monitoring equipment

The test and verification of ECOGI was conducted by the Danish Technological Institute, DTI Test Center and DTI Verification Subbody under DANETV.

The verifications and tests were planned and conducted in accordance with the guidelines for the ETV scheme currently being established by the European Union.

This verification statement summarizes the results from the ETV test of the ECOGI process where organic waste collected from households and industry is pretreated to produce a pulp for anaerobic fermentation at biogas plants.

DANETV was established by four independent Danish research and technology organizations and supported by the Danish Agency for Science, Technology and Innovation under the Danish Ministry of Science, Technology and Innovation to provide environmental technology verification for vendors of innovative energy technologies. Information and DANETV documents are available at www.etv-denmark.com.

TECHNOLOGY AND PRODUCT DESCRIPTION

The product verified is a pulper/separator which extracts organic waste from mixtures of organic waste and metals,plastic,glas collected from households and industry. The purpose of the pretreatment is to produce a pulp suitable for biogasification and a reject which is the materials which cannot be gasified such as metal cans, plastic packaging, textiles, larger pieces of glass, ceramics etc. In the treatment a major part of larger particles of organic waste is disintegrated into particles less than 6 mm which can be pumped in the product pulp.

The principle is shown in Figure 1 with the pulping step, reject separation, washing and dewatering of solid fraction. Only these components are used in the test for measuring recovery and purity of the biopulp. In normal operation a screw press is used for concentrating the pulp. The water from the screw press is collected in a collection tank together with water from the washing process and utilized for pulping of the next batch.

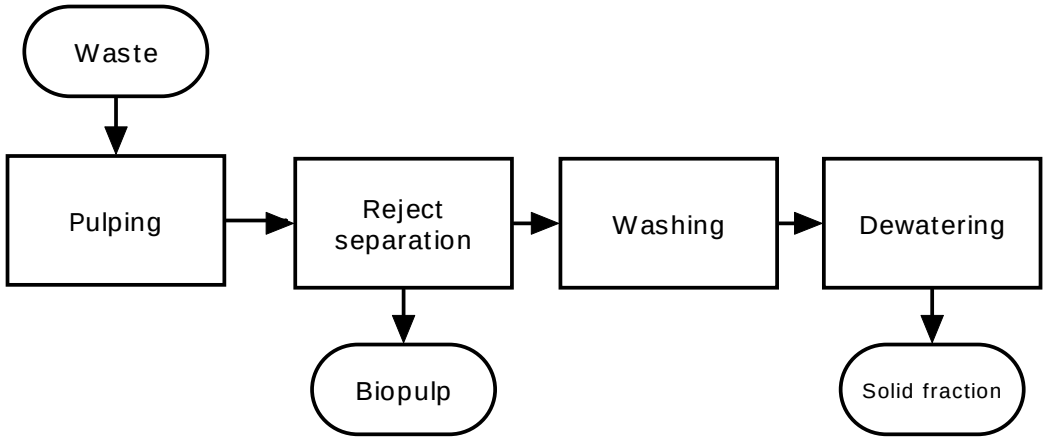

Figure 1 ECOGI process

VERIFICATION AND TEST DESCRIPTION

The intended application of the ECOGI process is defined in terms of the matrix, the target and the effects of the system.

The matrix is the type of material that the product is intended for.
The targets are the measurable properties that are affected by the deflaker.
The effects describe how the targets are affected by the deflaker

Matrix	Biomass for anaerobic digestion
Targets	• Organic pulp amount, residue amount produced per ton waste • Dry matter and volatile solids of fractions • Weight % foreign matter (plastics, glas, metal, textile) in organic pulp • Energy consumption of process • Water consumption of process
Effects	• Recovery of organic matter in pulp • Purity of organic matter in pulp • Energy consumption per ton waste • Water consumption per ton waste
Exclusions	ETV verifications are based on an evaluation of technology performance under specific, predetermined operational conditions and parameters and the appropriate quality assurance procedures. DTI makes no expressed or implied warranties as to the performance of the technology and do not certify that the technology will always operate as verified. The end user is solely responsible for complying with any applicable regulatory requirements.

TEST DESIGN

The detailed test design is given in the test report.

The test design is based on 3 repeated test runs of the ECOGI for each of two different kinds of waste in order to evaluate the customer claims concerning the following issues (effects):

- Recovery of organic matter for biogas production[1] in pulp
- Purity of organic matter for biogas production in pulp

Other measured effects with no claims:

- Energy consumption per ton waste
- Water consumption per ton waste

The two types of waste are:

1. Organic fraction from household waste Vejle Kommune (waste sorting system).
2. Food waste from supermarket 25 %, 25% dairy waste and 50% of (1)

VERIFICATION RESULTS

This section summarizes, in brief the results of the test and verification as described in the test report and the verification report respectively.

Target and measured values of tested parameters.

For the following types of waste the performance parameters in the table below was obtained:
A: Organic fraction from household waste Vejle Kommune waste sorting system.
B: Food waste from supermarket 25 %, 25% dairy waste and 50% of (A)

Parameters	Target	Measured value	Method/comment
Overall performance			
Capacity		5-6 ton organic waste /h	Based on test.
Chemicals		None	
Pure Water		approx. 1 ton water/ton wet waste	Based on test.
Energy			
Electricity consumption		20-30 kwh/ton	based on consumption in the tests
Treatment effects			
Purity of pulps (nondegradable particles plastic, glas, metal of 2-6 mm) % in a pulp with TS 15%	95%	Test with A >99.86 % in pulp with 15% TS Test with B >99.96 % in pulp with 15% TS	
Recovery % VS	90%	Test with A: 94.8 % with standard deviation of 0.7 % Test with B: 95.9 % with standard deviation of 0.6 %	

[1] Organic matter is defined as material which can be converted into biogas within a normal period of operation approx. 25-30 days of mesophilic operation and 18-21 days of thermophilic operation . Wood pieces of size >5*5*5 mm are not included as they are not considered digestible within a normal operation period in a biogas plant.

Conclusion on performance

On basis of the results of various tests, it has been concluded that the tested pretreatment system – The ECOGI process generally performs as claimed for the two tested organic waste mixtures :

1. Organic fraction from household waste Vejle Kommune (waste sorting system).
2. Food waste from supermarket 25 %, 25% dairy waste and 50% of (1)

- The purity is much higher than the claim with a purity of more than 99.8 % compared to the claim of 95% . The impurities are nondegradable particles of plastic, glas, and metal of 2-6 mm) in a pulp with TS 15%

- The recovery is significantly higher than the claim with a recovery of more than 94.8% compared to the claim of 90%.

- The power consumption in the tests was less than 30 kwh/ton treated waste in the tests

QUALITY ASSURANCE

The test and verification have been performed according to the DANETV Quality Manual. As part of the quality assurance internal and external technical experts provided review of the planning, conducting and reporting of the test and verification.

Original signed by Lars Ditlev Mørck Ottosen ,
Verification responsible

6/5 2013

Original signed by Michael Poulsen
Management Representative

6/5 2013

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