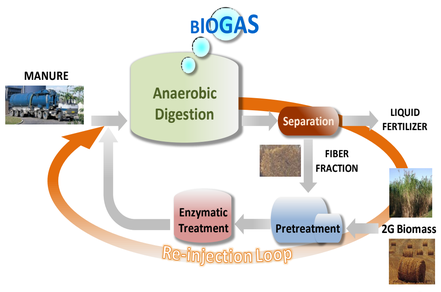

BIOMAN

DANISH TECHNOLOGICAL INSTITUTE

Economically efficient biogas production from manure fibres and straw

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Introduction

Anaerobic digesters operated on low-energy substrates are one of the biotechnological engineering systems that will play an important role in future energy-generation. To ensure a successful and sustainable biogas production continuous supply of substrates and wastes are needed. So far, unexploited resources in biogas generation are cattle slurry, manure, and straw, due to comprehensive pre-treatments. The aim of the recently funded **BIOMAN** project is to develop new treatment concept `the Re-Injection Loop´ for anaerobic digesters operated on recalcitrant low-energy substrates. The Re-Injection Loop concept is applying a range of mechanical and enzymatic treatments on pre-digested and dewatered biomasses, as depicted below. The Re-Injection Loop is developed specifically for substrates with high lignocellulose content, and the outcome will be a low-cost treatment directed at the recalcitrant fraction. This will result in longer retention time for the pre-digested fibres, which after treatment, will comprise of opened fibres assessable for methane-producing bacteria. The goal is to increase the biogas yield from approx. 50% to 70 % , and thereby improve the overall economy of biogas production

The Re-Injection Loop Concept

The Re-Injection Loop concept is applying a range of mechanical and enzymatic treatments on pre-digested and dewatered biomasses, as depicted below. The Re-Injection Loop is developed specifically for substrates with high lignocellulose content, see **Figure 1**.

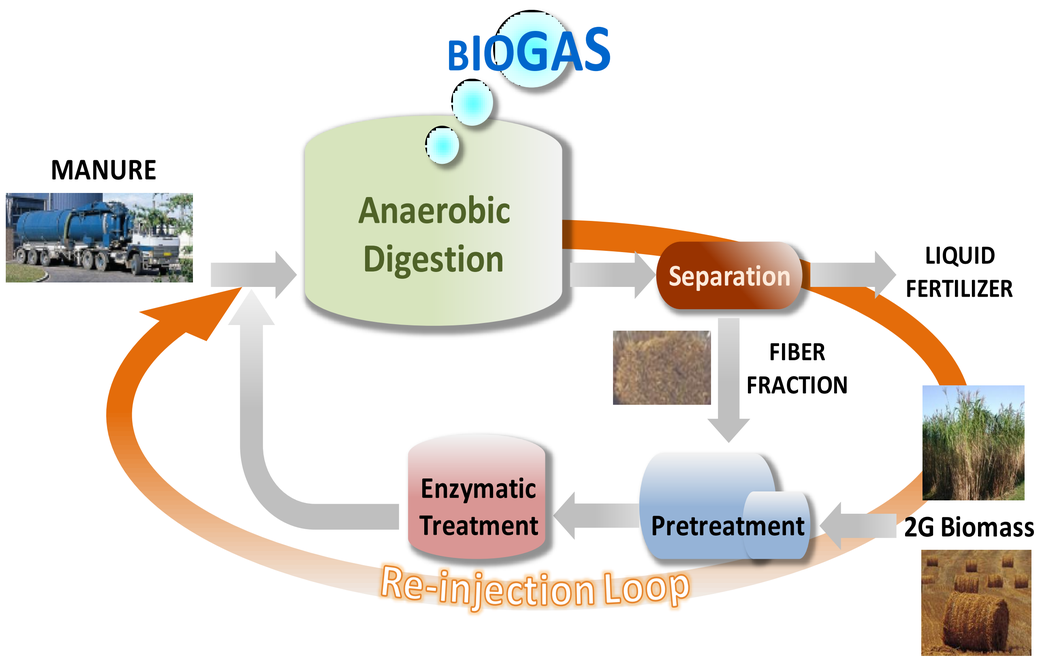

Figure 1: Schematic drawing of the Re-Injection Loop concept.

The BIOMAN consortium

The consortium consists of research institutions and several small- and medium- sized enterprises (SMEs) representing 5 European countries. The three **RTDs** are DTI, AAU-CPH and AINIA. Three of the **SMEs** provide equipment for the physical treatment, such as solid-liquid separation (Bidagan), ultrasound (Hielscher) and material cracking technology (Enprocon). One partner provide suitable enzyme blends (Enzyme Supplies) and the remaining SME deliver full scale facilities for final validation of The Re-Injection Loop (HTN).

Table 1: Overview of work packages in BIOMAN.

WP 1	Description of chemical properties of selected substrates e.g. 2nd generation energy crops and manure.
WP 2	Lab scale investigation of Re-Injection Loop
WP 3	Pilot plants validation of the Re-Injection Loop
WP 4	Development of full scale Re-Injection Loop operation
WP 5	Full scale demonstration of the Re-Injection Loop

Experimental APPROACH

The experimental approach of **BIOMAN**, shown in **Table 1**, is starting with chemical characterisation of selected highly cellulytic substrates of relevance for the European marked. This is followed by thorough examination of the physical and the enzymatic treatment of the substrates both alone and in combination. Results are evaluated using chemical parameters as well as biomethane potentials (BMP). The experimental set-up is depicted in **Figure 2 and 3**. Based on the BMP results of the selected substrates after physical and enzymatic treatment, the Re-Injection Loop concept is set up in semi-continuous pilot scale reactors (approx. 30 L reactors). The remaining work is focussing on the full scale implementation of the Re-Injection Loop, followed by validation and continuous stable operation of the Re-Injection Loop at HTN biogas plant.

Figure 2: Experimental set-up of biomethane potential measurements.

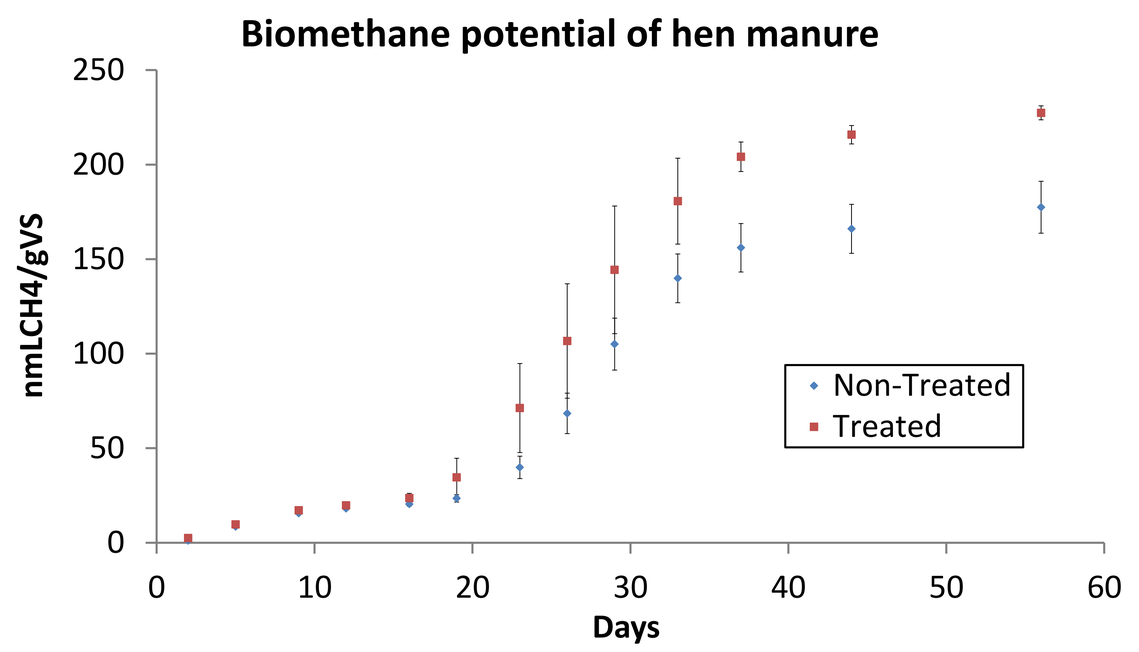

Figure 3: Biomethane potential for evaluation of different pretreatments for the Re-Injection Loop.

Acknowledgement

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