Silage (fresh) for Biogas

New ideas are necessary for the production of renewable energy sources

Silage of different origins is increasingly used for the production of biogas. The design of biogas plants and their optimisation from a scientific point of view is still a broad field of activity.

Processing of silage

The task consisted of processing fresh silage, as well as corn and grass silage in the same manner. Goal of the process is the determination of the chemical oxygen demand, the CSB value. For this purpose various suppliers offer readymade testing solutions, for example CSB according to Dr. Lange or by Riedel-de Haen the vessel test 37737 „AQUANAL“. Hereby, the mass of oxygen per volume unit which reacts in standardised conditions with the in water suspensions contained oxidisable substances, is measured as a potassium dichromate equivalent in a sulphuric solution via photometry. The CSB value correlates with the results of the fermentation tests of organic substances performed according the guideline VDI 4630.

Fig. 1: Silage

It provides uniform rules and specifications for the practice of fermentation experiments which serve the design and operational optimisation of biogas plants. Those more interested in the basics, should search in the internet for *Martin Kaltschmitt* author of the *Energy made from biomass*.

Comminution with the PULVERISETTE 6 *classic line*

FRITSCH was given the task, to process fresh grass silage containing a higher degree of moisture, in such a manner, so that a homogenous sample would evolve. Chosen was the Planetary Mono Mill PULVERISETTE 6 *classic line* in combination with a 250 ml grinding bowl made of sintered corundum and 30 mm diameter grinding balls. From tests with other tough, elastic materials it is known that the slightly rough surface of sintered corundum has a very positive influence on the comminution.

During the tests a buffer solution was added to the silage. Therewith the solids content was lowered. After four minutes the material was extremely well ground. Temperature readings were also in a normal range and therefore thermal damage was not to be expected.

The established CSB values were clearly different though form the CSB values of the samples prepared with previous methods.

It became therefore clear, that the processing of the samples has a significant influence on the test value of the chemical oxygen needs. Since it depends more on the comparability with the existing data rather than the absolute values, the preparation was matched to the previous mode.

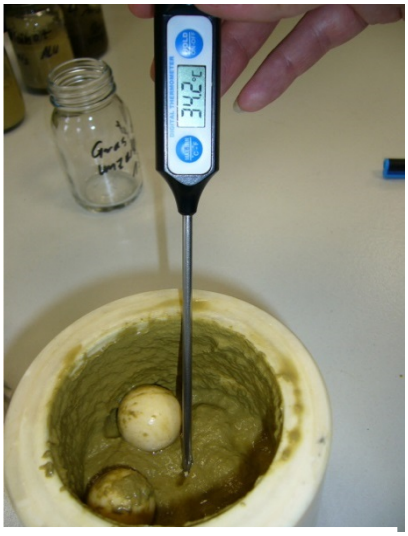

Fig. 2: Temperature of the sample is in normal range

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Utilizing the Knife Mill and Planetary Mill

For this the silage was pre-crushed with the **Knife Mill PULVERISETTE 11** and then finely comminuted in a Planetary Mono Mill PULVERISETTE 6 *classic line*, equipped with a 250 ml steel grinding bowl and 20 mm balls. With this preparation, comparable results in regards to the empirical values and the correlation with the batch tests of the produced methane yields are achieved.

Fig. 3: Dry as well as fresh materials can be comminuted in the Knife Mill PULVERISETTE 11

Fine comminution with the Planetary Mono Mill PULVERISETTE 6 *classic line*

The fine comminution was conducted in the **Planetary Mono Mill PULVERISETTE 6 *classic line***. This procedure is more elaborate and evaluating it visually a not so homogenous final product evolves. But all decisive though is the comparability of the CSB values with other values and the correlation of the in laboratory tests produced amounts of methane.

Abb. 4: The photos illustrate the condition before and after the comminution with the Planetary Mono Mill

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