new BIOGAS TEST PLANT

UMWELTLEISTUNGEN
Umwelt- und Ingenieurtechnik GmbH Dresden

Do you really know your feedstock for biogas production?

A new standard biogas test plant “BTP2-control” with an internal gas quality measurement system has been launched by Umwelt- and Ingenieurtechnik GmbH (UIT) Dresden. UIT has been providing biogas test plants for decades. For the present it has been constantly enhanced and adjusted to state-of-the-art customer needs.

Figure 1: Biogas Test Plant BTP2-control: Up to 10 bioreactors are configurable in one biogas test plant

The biogas test system is standardized in terms of fermenter sizes, agitator, heating, feeding, discharge, and measurement technologies. Figure 1 shows a set up with 4 fermenters in parallel. Up to 10 fermenters can be integrated into one biogas test plant BTP2-control and equipped with one gas quality analyser. With this test plant, a continuous biogas potential analyses of the feedstock can be achieved and optimized.

Biogas production in view of sustainability criteria addresses careful consideration of multiple factors. These include the continuous evaluation of the feedstock and its compatibility with the biomass in the reactor to avoid process interruption. Various types of feedstocks, critical processing parameters and substrate quality, reflecting a key message**:**

You need to know the Bio-Methane-Potential (BMP) of your feedstock, understand microorganism lifecycle and their activity in the fermentation process.

This article presents a portfolio of laboratory to pilot scale Biogas Test Plants (BTP) provided to optimize the biogas process and to qualify the feedstock.

Qualify the BioGas process

Figure 2: Complex biogas test plant equipped with 6 stations using 1,000 l stainless steel bioreactors – installed at the University of Münster/Germany.

The main objective of the present situation is to address the complexity and challenges related to the economic sustainability of biogas production and utilization. The energetic value and the availability of suitable raw materials as source for biogas production ensuring continuous, stable, and sustainable operation is a challenge that involves many individual aspects of the entire process chain.

The existing situation of biogas production differs from country to country in terms of biogas production and the source of feedstocks.

The yield and composition of biogas varies depending on the morphology of feedstock and calls for R&D.

UIT offers biogas tests plants as single-stage (BTP2 – see Fig. 4), complex multi fermenter biogas tests plants (BTP2-control – see Fig. 1) and biogas plants equipped with multiple larger volume fermenters (see Fig. 2).

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BioGas Test Plant BTP

Existing trends dictate high prices for biogas feedstocks and lead to considerable difficulties in operating biogas plants economically. This has created a large practical interest in controlling the composition of feedstock or using alternative substrates.

The Biogas Test Plant (BTP) as technical solution was developed in a modular design, constructed according to ergonomic aspects for practical use. It can be easily adapted to individual requirements and needs. The customized configurations range from single reactors to multiple reactors as R&D lab instrumentation to containerized solutions for use in large scale biogas plants.

The biogas pilot plant BTP 2 is the basic system for substrate testing and gas potential investigations. Furthermore, this system is ideally suited for product development (enzymes, nutrients) or for process optimization.

This system is characterized by its extensive basic automation system SENSOcontrol with a panel for process control, data acquisition and storage as well as data interpretation in graphs or tables. Optionally, the system can be expanded with pumps for feeding, special control sensors and other elements. The BTP stands for a high degree of flexibility and adaptability to changing needs.

The pumpability of the feedstock is a challenge for the BTP. A special large-volume syringe piston pump was developed to feed the Biogas Test Plant.

Bioreactor sizes

Standard reactor sizes range from 5 to 60 litres. The 15-litre bioreactor has proven to be an excellent size to achieve good transferable research results for many applications. The following table in figure 3 shows the reactor dimensions.

Volume [l]	Diameter [mm]	High [mm]	Total Volume [l]
5	200	250	6.5
15	270	350	17.44
30	325	450	33.3
60	420	550	65.8

Figure 3 – Table of bioreactor dimension

Biogas test plants (BTP) are equipped with gastight/ heated/ stirred/ isolated bioreactors, designed for fermentation processes. Temperature of the bio-reactor can be set up to 60° C. Higher temperatures require a different material of construction.

Figure 4: BTP 2

Feedstock feeding port, discharge and sampling valves are arranged directly accessible. To ensure adequate mixing and degassing of feedstock material, the reactor has a two-stage agitator with an adjustable speed between 5 and 240 rpm.

Integrated control and analysis instruments (temperature, pH, redox potential, conductivity) and gas quality analysers allow fundamental investigations into the process understanding and the kinetics of gas production.

Research work on process optimization and control as well as the development and evaluation of biogas plant concepts with new reactor types can be carried out. These biogas test plants are also used to optimize processes when full scale bioreactors are in operation and various substrate compositions are fed for biogas production.

The biogas gas quality (CH_4, CO_2, H_2S, O_2, H_2) analysed during the fermentation of carbohydrates, fats and proteins is automated, including biogas collection and gas volume measurement. The gas analyzer cannot take the required gas directly from the reactor. Therefore, the biogas is collected in gas bags and analyzed automatically.

With its highly motivated and experienced staff, UIT is ready to solve your task. We look forward to your ideas and inquiries. For more information, please visit our website.

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