BioReactor Simulator

A universal simulation platform

bioprocess CONTROL

www.bioprocesscontrol.com

A **cloud based** simulation platform

Simulate continuous processes

The BioReactor Simulator is a universal platform for simulating at laboratory scale anaerobic fermentation processes in a continuous mode of operation. The system is controlled by a web-based software running on an efficient cloud computing solution accessible from any computer or mobile device with an internet connection.

Significantly reduce your labour demands

The BioReactor Simulator significantly reduces the time and labour demands for both operation and data analysis, whilst providing useful information related to the capabilities and loading limits of a process, both of which are essential for the design and operation of biogas plants.

Standardise and compare results

The BioReactor Simulator provides for the standardisation of data intepretation, presentation and reports. This allows for data from different simulation experiments, as well as laboratories around the world, to be easily compared.

Obtain deeper knowledge and experience

The high quality of the data obtained from the BioReactor Simulator allows users to gain deeper knowledge and experience for determining the suitability of a potential feedstock for biogas production, defining the suitable organic loading rate or retention time for a given feedstock, designing suitable feeding schedules and assessing handling or disposal conditions for digested residues.

up to
6
cells

10 ml
measuring resolution

Possible to run experiments with high data generation for prolonged timescales without storage and computational issues

Measuring range: 10 to 4000 ml/h

Secure and reliable data logging and storage

The web-based software of the BioReactor Simulator is based on a cloud computing software solution, with data storage on an external server. This allows one to run experiments with high data generation for prolonged periods of time without storage and/or computational issues. In addition, it provides on-board storage for data caching. Overall, users will be able to run lengthy simulation experiments knowing that data loss and storage under normal conditions is not an issue.

User friendly interface for both experiment setup and follow-up

The BioReactor Simulator is an extremely flexible simulation platform, supporting both manual and automatic feeding, depending upon user needs. Moreover, the system supports multiplexing, allowing for the simultaneous initiation of multiple experiments at different startup times. This unmatched flexibility, in combination with standardised report generation in Microsoft Excel format, provides users with an unmatched simulation platform which will meet and go beyond the requirements of the most demanding biogas labs.

Standardisation of data registration and presentation

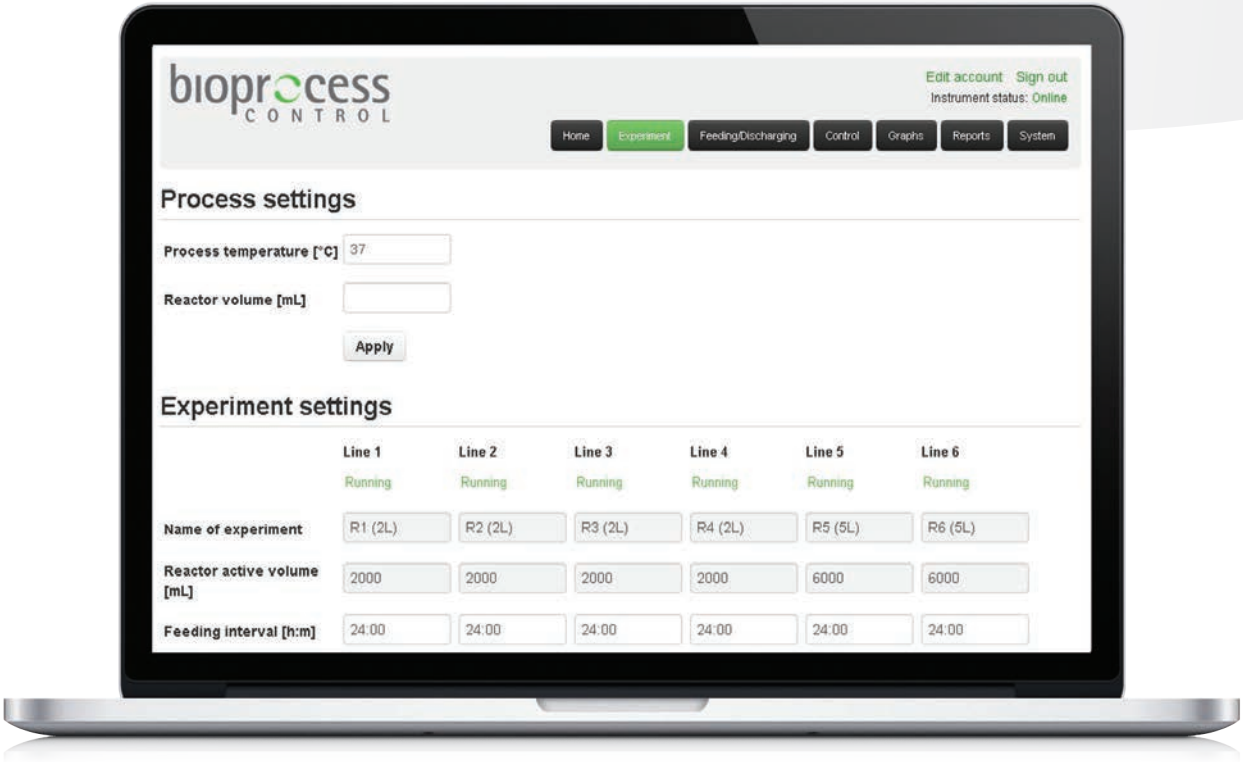
The real-time temperature and pressure compensation feature of the BioReactor Simulator ensures that the impact of measurement conditions can be minimised and data presentation standardised. The temperature and pressure of gas are measured every time a flow cell opens, allowing users to derive exact kinetic information compensated for any variation over time, while considering the vapour content of the gas. The volumes are normalised to dry conditions at 0 °C and 1 atm.

High accessibility for process monitoring and control

The powerful web-based software of the BioReactor Simulator is easily accessible from any location with an internet connection via a verifiable industry-strength encryption. Through the use of standard protocols, it behaves like any other unit on an internal network, secured by a user definable password.

All interactions with the software are conducted through a web browser using any computer. Thus, experiment monitoring can be carried out with any kind of smartphone or tablet device.

Software for BioReactor Simulator



For continuous simulations of biogas production processes

The BioReactor Simulator cloud-based software application has been specially designed for carrying out continuous lab-scale biogas process simulations with a large number of data points over a long period of time. This application, which is easy to understand and navigate, allows users to set-up an experiment, control feeding and discharging, monitor its progress and download results with little effort. Moreover, all data is in a format that allows for easy analysis.

The BioReactor Simulator software application is simply a natural extension of an already universal hardware platform that has been designed for carrying out continuous lab-scale biogas process simulations.

A simple and intuitive experiment setup

The Experiment Settings feature of the BioReactor Simulator software application allows users to define settings of process parameters for all reactors such as organic loading rate (OLR) and hydraulic retention time (HRT). Users can also define the active reactor volume, feeding interval and substrate concentration. The BioReactor Simulator supports both manual and automatic feeding and discharging modes.

A software application specially designed for biogas simulations

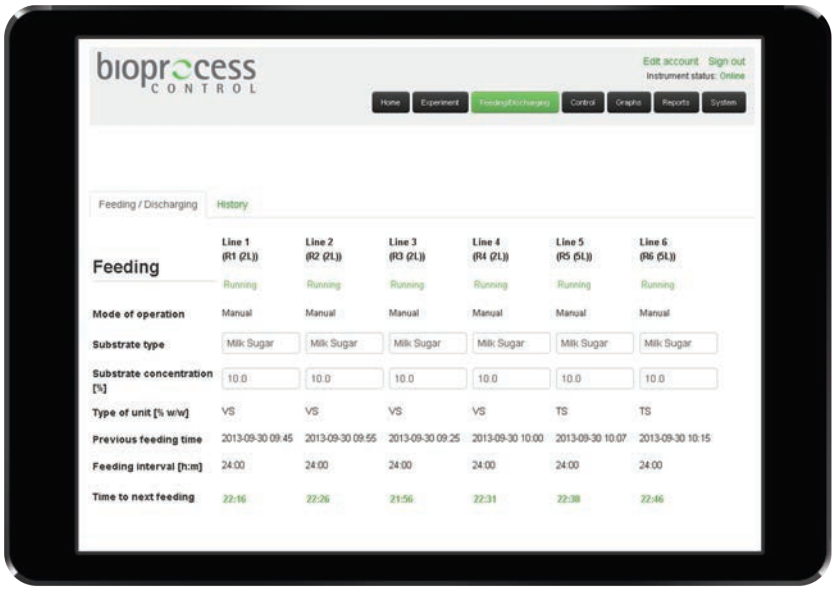
Allowing you to customise feeding and discharging schedules

A complete understanding of feeding and discharging details

The Feeding and Discharging feature of the BioReactor Simulator software application allows users to control all aspects of how and when a reactor should be fed and discharged. In the feeding details section, users can introduce values for feeding time and one of the following parameters: loading amount, OLR or HRT.

Moreover, depending upon which parameter is chosen, the application will automatically calculate the other two parameters, providing users optimal support with regards to how each reactor should be fed with little effort.

The BioReactor Simulator also allows the user, if so pleased, to detail the discharging times and amounts, again providing optimal and total control of both reactor feeding and discharging. Lastly, users can view all feeding and discharging history with regards to time, amount and substrate concentration, with OLR and HRT automatically calculated. All information is logged and included in the report for further data analysis and interpretation.



Always have total control over your experiment at any time and any place

See your experiment in real-time and anywhere

The Graph feature of the BioReactor Simulator software application and remote database server allow users to see their experiment in real-time and anywhere. Users can easily monitor variations in the gas flow rate, and the calculated OLR and HRT, with gas flow rate value normalised to 1 atm, 0 °C and zero moisture content.

Moreover, users can easily zoom in and out in the paragraph for optimal monitoring. Also, specific gas production is calculated and displayed for the period of time passed since the last reset of the calculations. This flexibility and precision allows BioReactor Simulator users to always know the status of an experiment, as well as the data being produced.

Wide user base and application areas

User base

The BioReactor Simulator is currently used by academic scientists, public and private laboratories, energy producers, organic waste handlers, wastewater treatment plants and food producers.

Application areas

The BioReactor Simulator is a universal biogas simulation platform for simulating at laboratory and small pilot scale anaerobic fermentation processes in a continuous mode of operation.

Technical specifications

Flow cell array and DAQ unit

Working principle: liquid displacement and buoyancy

Up to 6 cells running in parallel

Built-in pressure and temperature sensor

Integrated embedded data acquisition

Measurement resolution: 10 ml

Measuring range: 10 to 4000 ml/h

Measuring range for instant gas flow rate: 10 to 120 ml/min

Dimension: 51 x 44 x 18 cm

Housing: plastic

Repeatability: ±1%

Reactor alternatives

Incubation unit with six 2 liter reactors

Maximum number of reactors per system: 6

Reactor material: glass

Reactor volume: 2 liters

Dimension: 53 x 33 x 24 cm

Temperature control: up to 95 °C (203 °F)
(precision of 0.2 °C)

Mixing in the reactor: mechanical agitation (adjustable interval, speed and rotation directions), max. speed 200 rpm

Standalone reactors, configuration and size options
CSTR-5G, CSTR-5S, CSTR-10S

Reactor type: CSTR

Volumes: 5 l, 10 l

Materials: high quality glass and stainless steel (AISI 316)

Mixing: mechanical agitation with manual and automatic remote control (adjustable speed and rotation directions), max. speed 300 rpm

Temperature control through external recirculation water bath (sold separately)

Dimensions: CSTR-5G: H 38 x W 24 cm, CSTR-5S: H 74.5 x W 28.5 cm, CSTR-10S: H 77.5 x W 32.5 cm

Weights: CSTR-5G: 7.8 kg, CSTR-5S: 12.8 kg, CSTR-10S: 16.5 kg

Usage: indoor applications

CSTR-5G **CSTR-5S** **CSTR-10S**

Software features

- A software application specially designed for real-time monitoring and control up to six biogas reactors in laboratory and small pilot scales simultaneously
- Web-based software running on a cloud solution, accessible from any location with an internet connection, via industry-strength encryption
- Supports both manual and automatic feeding
- Possible to run experiments with high data generation for prolonged timescales without storage and computational issues
- Embedded temperature and pressure sensors for real-time gas flow and volume normalisation
- User-friendly guidelines for experiment setup
- Standardised report generation in Microsoft Excel format for easy usage combined with on-line storage
- On-board storage for data caching
- Possibility of multiplexing, allowing for the simultaneous initiation of parallel experiments at different startup times
- User friendly interface for experiment follow-up
- Power supply:12 V DC / 5 A (Flow cell array and DAQ unit), 24 V DC / 2.7 A (mechanical agitation)
- Usage: indoor

Bioprocess Control – **optimising** the production of **biogas**

Bioprocess Control is a technology and market leader in the area of advanced instrumentation and control technologies for research and commercial applications in the biogas industry.

The company was founded in 2006, and brings to market more than 15 years of industry leading research in the area of instrumentation, control and automation of anaerobic digestion processes. Today Bioprocess Control has product exports to more than 35 countries.

Bioprocess Control has a broad product portfolio covering biochemical methane potential (BMP) tests, substrate analysis, process simulation, gas flow measurements as well as a series of bioreactors. AMPTS – the Automatic Methane Potential Test System has quickly become the preferred analytical instrument around the world. It is used by both academic and industrial actors in the biogas industry.

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