

**MicrobEnergy services**  
for the biotechnology and renewables sector



Heating systems  
**Industrial systems** ◀  
Refrigeration systems



INNOVATION  
ENERGY ECONOMY  
LATERAL THINKING FLEXIBILITY SUSTAINABILITY  
BUSINESS MODEL DEVELOPMENT PROTOTYPING  
**INTERLINKING OF SECTORS**  
MARKET MONITORING PILOT PROJECT DIGESTER  
ENERGY MARKET ANALYSIS CERTIFICATION MANAGEMENT  
COMMUNICATION  
STUDIES **NETWORKING**  
ANAEROBIC TECHNOLOGY QUICK AND DIRTY  
RECYCLING **MICROBIOLOGY**  
TECHNOLOGY DEVELOPMENT DYNAMICS  
BIOTECHNOLOGY PROCESS DEVELOPMENT  
SOFTWARE DEVELOPMENT BUSINESS MODEL  
**ENERGY STORE**  
PILOT PLANT OPERATION TECHNOLOGY SCREENING  
LABORATORY TESTS INTERDISCIPLINARY  
**RESEARCH** FOCUSED  
BIOTECHNOLOGY RESEARCH PROCESS TECHNOLOGY  
EFFICIENCY ECO-EFFICIENCY ANALYSIS  
**VIRTUAL POWER STATION**  
DEMONSTRATION PLANTS

## Work with us to perfect your understanding of the processes involved - customised services to perfectly match your requirements

MicrobEnergy GmbH offers products and services in various fields of activity from power-to-gas to biogas, through to establishing and operating biological processes.

Take advantage of our broad range of services relating to the renewables sector, to optimise your own processes and implement new and innovative business models. When it comes to developing the flexibility of your biogas plants or power-to-gas and power storage solutions, we prepare feasibility studies that address energy economy issues.

Our microbiological test laboratory and extensively equipped technology centre are there to help you resolve questions concerning microbiological fermentation and methanation processes. Our doctorate biologists and chemists, specialist process technicians, engineers and experienced medical technicians develop suitable concepts to meet biological and technical challenges.

# Biotechnology centre – for more accurate results



Individual management of test benches in our technology centre



Working under oxygen exclusion in anaerobic chambers

In the MicrobEnergy GmbH technology centre, individual test benches are set up, required processes mapped out and tests subsequently conducted. The focus is on mapping and further developing power-to-gas processes based on biological methanation, as well as the biogas yield of classic biogas plants.

## **Establishment and operation of biological processes**

- Practice-oriented engineering scale
- Setting up and continuous operation of individual test benches
- Fully evaluated and assessed process data
- Database for viability studies and process optimisation
- Explosion protection zone for H<sub>2</sub>, H<sub>2</sub>S and CO
- Simulation of process steps

## **Power-to-gas plants with biological methanation**

- Suitability evaluation of sites for P2G plant construction
- Continuous operation test in the technology centre
- Calculation of site-specific methane production rate
- Cost-benefit analysis of the results

## **Biogas plants**

- Suitability of various substrates for use in biogas plants
- Nutrient and trace element balance, rheology and physical characteristics
- Gas yield prognosis
- Flexibility potential

## Scale-up – for large scale operations

MicrobEnergy GmbH scales up microbiological processes from the laboratory scale to the engineering and pilot plant scale, thereby gaining essential experience for practical operation in the process. In addition to plant operation, relevant process parameters are evaluated and optimised.

### Biotechnological scale-up services

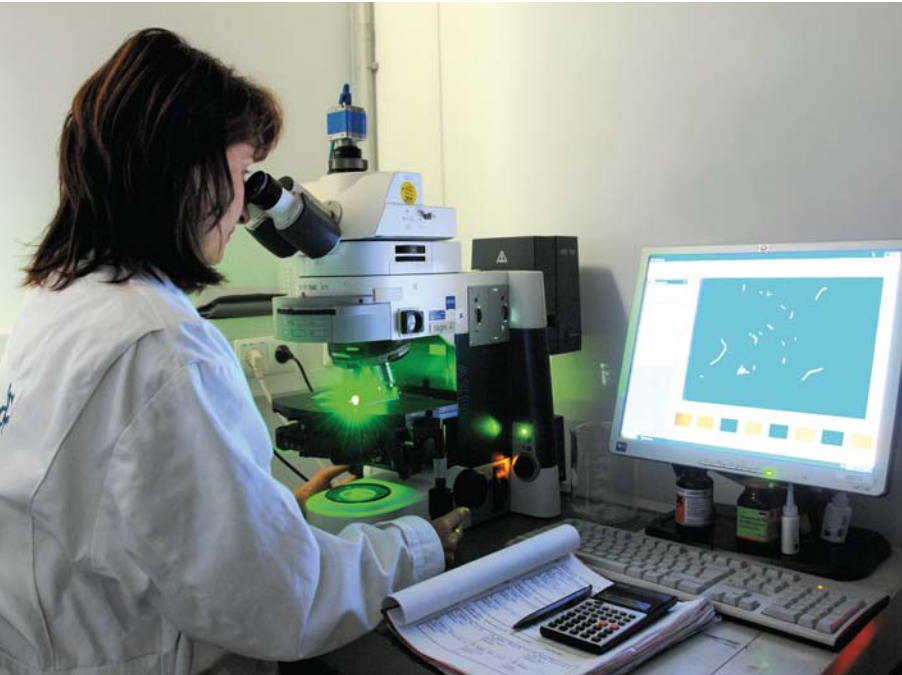
- Design and sizing of test benches
- Customer support during equipment selection
- Programming of plant controllers
- Management and optimisation on an engineering scale
- Implementation and evaluation of tests
- Processor simulation
- Setting up pilot plants



World's first power-to-gas plant with biological methanation in Allendorf (Eder)

Development of the BiON® process (biological methanation) in the technology centre

# Process analysis – for a deeper understanding



Microorganism screening using a fluorescence microscope

MicrobEnergy GmbH's core competence lies in the microbiological and technical optimisation of anaerobic and aerobic synthesis processes. A deeper understanding of processes is gained through the performance of different analytical tests.

## Microscopic examination

- Phase contrast microscopy up to 1000x resolution
- Fluorescence microscopy (methanogenic fluorescence, live/dead staining)
- Standardised cell count determination (counting chamber)

## Isolation and cultivation of microorganisms

- Production of special synthetic culture media (sterile, aerobic and anaerobic)
- Microorganism cultivation and growth optimisation (up to and including risk group 2)
- Anaerobic technology specialists

## Determination and characterisation of microorganisms (DNA level)

- DNA isolation
- PCR at 16S-rDNA level
- Restriction analysis and sequencing
- Determination of the sample's microbiological diversity
- Use of various test materials

## FISH (fluorescence in situ hybridisation)

- Design of DNA probes to detect specific microorganisms
- Adaptation of the detection method for specific substrates

## Gas analysis

- Determination of the composition of gases using gas chromatography
- CH<sub>4</sub>, CO<sub>2</sub>, CO, H<sub>2</sub>, H<sub>2</sub>S, N<sub>2</sub>, O<sub>2</sub>

## Viscosity measurement and determination of the redox potential

- Determination of the rheology and redox potential in the digester
- Expert evaluation of the results by specialists; recommendations for improving microbiological performance

## Substrate distribution in mixed systems

- Calculation of the actual dwell time
- Information on dead zones and mixing problems

## Ensilage of substrates

- Performance and optimisation of the ensiling process (also with different substrate compositions)
- Evaluation of ensilability with regard to quality and speed
- Examination of different ensilage additives
- pH value analysis and gas yield potential calculation

## Inhibition test

- Detection of growth inhibiting factors for microorganisms
- Test bacteria *E.coli*

## Feasibility studies – for greater benefits

Many years of experience in microbiology, particularly in fermentation and conversion processes, but also in the field of patent research and patent monitoring, technology screening, cost-benefit analysis and funding consultancy, enable MicrobEnergy GmbH to assess the technical, economic and legal feasibility of a project.

### Portfolio in detail

- Biological methanation and power-to-gas
- Broad database in the field of power-to-gas and biogas
- Electrolyser processes
- Injection methods
- Storage technologies
- Biotechnology
- Fermentation
- Development of biogas plant flexibility
- Biomass production
- In-situ electrolysis



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