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## BIOCHEMICAL CONVERSION DEPARTMENT

The research activities of the Biochemical Conversion Department focus on the technologies for the production of energy carriers based on biomass by anaerobic degradation. There are several aspects for the optimisation of a biochemical conversion process. Technical, biological and chemical as well as logistical, legal, ecological and economic issues have to be considered. The key objectives remain the increase of efficiency of the overall process along with reduced costs.

## REFERENCE PROJECTS (SELECTION)

- BIOGAS2030 – Options for existing biogas plants until 2030 from economic and energy perspectives, UBA, FKZ: 37EV 16 111 (ongoing)
- BMP III – Biogas Monitoring Programme III: Factors for an efficient Operation of Biogas Plants, BMEL/FNR, FKZ: 22403515 (ongoing)
- DEMETER – Demonstrating more efficient enzyme production to increase biogas yields, EU/ Horizon2020, GA 720714 (ongoing)
- GAZELLE – Integrated Control of Biogas Plants for Flexibilisation and Energetic Optimisation, SAB, FKZ: 100267056 (ongoing)
- SubEval – Substrate Evaluation concerning gas yield – from Laboratory to Industrial-scale Plant, BMEL/FNR, FKZ: 22034614 (ongoing)

With support from



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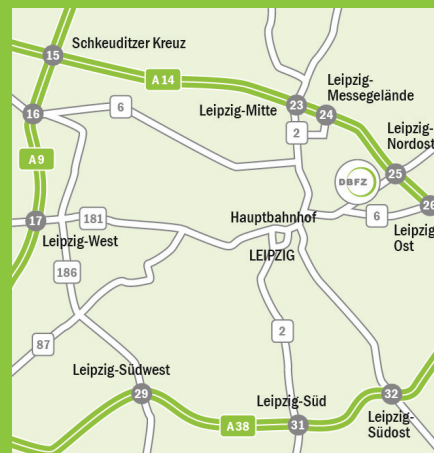


### GETTING HERE:

**By Train:** Arrive at Leipzig Central Station; then take tram 3/3E (towards Taucha/Sommerfeld) to Bautzner Straße; cross the road, pass the car park on the right, straight ahead to the entrance of number 116, turn left after approx. 100 m, and the DBFZ entrance is another 60 m on the left.

**By Car:** Via the A14 motorway; take the exit Leipzig Nord-Ost, Taucha; towards Leipzig; head towards city centre; pass the bft petrol station and the DBFZ is on the left (see 'By Train').

**By Tram:** Tram 3/3E (towards Taucha/Sommerfeld); get off at Bautzner Straße station (see 'By Train').



Pictures/Grafic: DBFZ, Jan Gutzeit, Stefanie Bader (Map)



## RESEARCH FOCUS AREA

Anaerobic processes



*„Biogas plants must become more flexible in terms of their substrates and energy delivery. Only then will they be able to continue making a major contribution to the safeguarding of energy supplies in future.“*

(Dr. agr. Peter Kornatz, Head of the research focus area)

## BACKGROUND

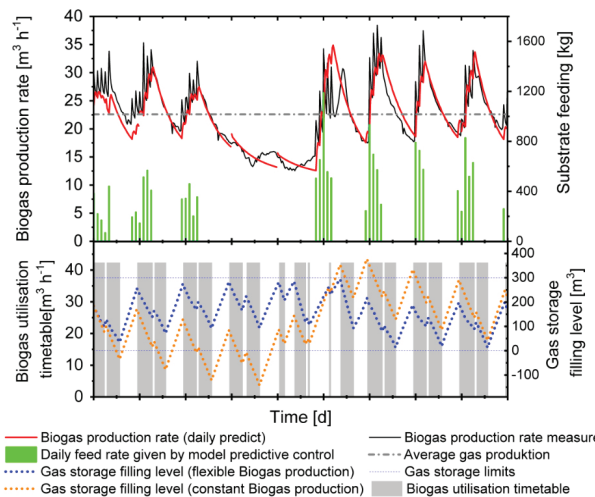
Biogas production technology is in widespread use throughout Germany, with around 8,700 plants in operation. A broad variety of existing concepts and components offer solutions for nearly any framework conditions. Future plants will have to adapt flexibly to changing substrate qualities. In order to maximise utilisation of the provided energy, its provision will need to be aligned with external demand - for both power and heat. Therefore, improved process monitoring and control tools are required to avoid process instabilities, losses and emissions while meeting new requirements through flexible process control. Emission reduction is another key factor for the future of the technology. Methods for analysis on existing plants need to be developed and representative results are required to evaluate the sector.

## TOPICS OF THE RESEARCH FOCUS AREA

- Substrate and process flexibilisation
- Process monitoring and control
- Emission monitoring and reduction
- Efficiency and cost reduction
- Combined material and energetic biomass utilisation

## ANAEROBIC PROCESSES

The research focus area „Anaerobic Processes“ primarily develops and optimises efficient and flexible processes for biogas production to meet the requirements of future energy systems. The connection to material production processes may add value to the overall process. For such applications the research focus area aims to develop tools for process monitoring and control, concepts for flexible, low-emission plants and operational strategies, methods of assessing and optimising efficiency. The particular use of challenging substrates and the maximisation of their conversion degree is also part of the research.



### Process control for biogas plant flexibilisation aims at:

- Proactive process control according to specific gas utilization schedules
- Stable process biology
- Reduction of gas storage demand up to 68 %

## TECHNICAL EQUIPMENT

The DBFZ's research biogas plant extends the available application-oriented research equipment to enhance process understanding and to improve the efficiency of biogas production. The dimensioning of the fermenters allows conducting experiments on demonstration scale, and thus ensures good transferability of results into practice. In addition to the research biogas plant the department operates extensive (continuous and discontinuous) pilot plants with reaction volumes between 0.25 and 500 litres.

The biogas laboratory is designed and equipped to simulate large-scale technical processes on a laboratory to demonstration scale, completed by the corresponding analytics. Processes can be optimised directly and basic understanding of the individual sub-processes can be developed further.

Additionally, the department is equipped with measuring instruments for the identification and quantification of methane emissions. The portfolio includes an imaging system capable of visualising methane losses in real time, methane laser, as well as various handheld instruments with which point sources of methane can be detected and methods for emission quantification.

## CONTRACT RESEARCH/SERVICES

In the research focus area the following services are provided:

- Feasibility studies, market analyses
- Mass and energy balances for process evaluation
- Process optimisation on basis of discontinuous and continuous fermentation tests (5–500 l)
- Substrate and digestate analysis
- Microbiologic analysis (in cooperation with UFZ)
- Upscaling-trials at the research biogas plant
- Tests of sensors and technical components in biogas process
- Emission quantification and leakage detection