



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N 656760

BioEnergyTrain

BET Professional Education Formats

**Pilot Plant Research Lab
on Organic-waste Exploitation**

:metabolon

18.10.2017 - 20.10.2017

**Technology
Arts Sciences
TH Köln**





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Pilot Plant Course / Research Lab

Course Outline

:metabolon – European teaching & research center of TH Köln

General information BET-Project

- Aim of the Pilot Plant Course is to gain hands-on experiences with key technologies
- Student placements
- Individual students or small groups (up to 12 students)
- Work at the pilot plant installations of industry partners, providing them with hands-on experience in the operation of real-world installations
- Research plans will be developed between academic instructors, students and experts from industry
- Evaluation of student performance will be made jointly by academic instructors and industrial supervisors
- BET: practical casework, ECTS points (depending on your Examination Office)

1. General Information

Date: 18. – 20. October 2017

Location: :metabolon site, Leppe Waste Disposal Centre, Lindlar-Remshagen

Expenses for the Course

Costs and organisation of arrival, departure and lodging in Lindlar is in the responsibility of the participants. Board will be organised for the participants and will cost approx. 10 EUR per meal.

Course material will be provided on site.

Application procedure:

Fill in and submit your online application on eseia ETP website.

[Register now!](#)

Application Deadline: 25 September 2017



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2 Research Focus

- The research focuses on sustainable resource efficiency, material conversion and site-related environmental technologies and techniques
- Unused regenerative energy sources are exploited by the development of a regional material stream management
- Supply, processing and conversion are examined
- Utilisation and subsequent treatment of intermediate products and end products are optimized

3 Course Programme

Day 1

- Presentation & Site viewing landfill Leppe / :metabolon
- Presentation of the Research Centre :metabolon
- Safety briefing for laboratory use and pilot plant application
- Introduction to pilot-scale plants:
 - Biogas Plant, Pellet and wood chip furnace, Leachate and Process Water Pilot Plant
- Preparation of experiments

Day 2 and 3

- Experiments at the pilot-scale plants:
 - Biogas, Leachate/Process Water Pilot Plant, Wood chip furnace
- Testing and laboratory analysis
- Evaluation and report



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4 Pilot scale plants and Experiments

Biogas pilot plant

- Two-street pilot-scale plant with two digesters and one final storage tank with 1 m³ each
- Equipped with online instrumentation for pH, ORP, TS and gas analysis for CH₄, CO₂, H₂, and H₂S
- Fully automated for 24/7 operation
- Currently fed with manure, maize and organic Municipal Solid Waste

In the pilot plant course the students ...

- will be introduced to standard measurements and methods;
- will analyse digester and substrate samples for different parameters;
- will determine the parameters COD, NH₄-N, DS, etc.;
- will evaluate their measurements and see if they can
 - identify the differences between samples from fermenter and secondary fermenter and
 - identify the link between parameters and substrate feeding.





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Leachate and Process water Pilot Plant

- The pilot scale plant (3,0 m³) for leachate treatment is used to reduce the amount of carbon compounds and nitrogen in the water leaking out of the landfill.
- The plant is designed in two lanes with three reactors for nitrification and denitrification in order to make it possible to compare different process strategies. Otherwise it is difficult to recognize adaptive processes and critical changes in the biocenosis.

In the pilot plant course the students...

- will get used to the pilot plant and learn about the different process steps;
- will get information about the data acquisition system, the storage of the data and the processing/visualization of the data;
- will acquire analytical data and will change the process if necessary and
- will monitor the plant with analytical tools like oxygen uptake rate (OUR) or ionic chromatography (IC).





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Pellet and wood chip furnace

- Industrial furnace for heating with renewable fuels with 350kw
- The furnace is operated with pellets and wood chips as well as self-made pellets from bulking material, residues and digestate of oMSW and scrap wood
- Equipped with sensors and online instrumentation for flame image analysis and innovative throughput measurement system for improved mass balance study

In the pilot plant course the students have the objective to find alternatives for the use of conventional wood pellets and wood chips.

Experiments carried out by the students:

- Testing of different (solid) fuels,
- Using mixed pellets of different composition, e.g. miscanthus, straw, HTC coal,
- Determination of calorific value by bomb calorimeter,
- Recording and analysis of measured data,
- Identifying the differences during combustion.

