

Master's Thesis:
Protein Extraction in an Oscillatory Flow Reactor for a Value-Added Circular Economy in the Food Industry



AEE - Institute for Sustainable Technologies (AEE INTEC)

AEE INTEC was founded in 1988 and has grown into one of Europe's leading institutes in applied research in the fields of renewable energy and resource efficiency. Our research and development projects range from fundamental research to the implementation of demonstration plants and focuses on three target areas: „Buildings“, „Cities & Power Grids“, and „Industrial Systems“ with three technological working groups: “Renewable Energy”, “Thermal Storage”, and “Water- and Process Technologies”.

AEE INTEC currently has a team of approximately 80 employees from eight different countries working at its location in Gleisdorf. With an average of three PhD students, as well as around ten diploma students, interns, and student assistants, the institute also contributes to the education of highly qualified professionals.

In recent years, AEE INTEC has played a key role in advancing sustainable technologies through its involvement in national, European, and international R&D projects. Sponsors of these projects include federal ministries, the European Commission, international organizations such as UNIDO, as well as industrial and commercial enterprises.

The Research Project

The CircularFood project researches the multi-stage material and energy utilization of organic food waste from Austrian food production. The aim is to develop innovative methods for extracting high-quality proteins, producing bio-liquid fertilizers, biological plant substrates, and peat substitutes, to strengthen the circular economy and reduce CO₂ emissions.

Master's Thesis Project

The master's thesis will be an integral part of the above-mentioned research project and focuses on the experimental investigation of protein extraction from selected substrates (such as brewer's spent grain, pumpkin seed press cake, bakery waste) on a laboratory scale. A novel, continuously operable reactor technology, the "*Continuous Oscillatory Flow Bioreactor*" (COFB), will be used for this purpose. This key enabling technology can achieve effective mixing of heterogeneous biomass with low energy input and is therefore of great interest for material valorisation approaches in the circular economy. Future research questions in the project include continuous feed dosing, optimized conditions for gentle extraction with high protein quality and yields, as well as the production of sufficient quantities for product utilization and biogas production with further material utilization. The content of the thesis includes:

- Investigation of suspension and flow behaviour of different biomass types
- Conducting extraction trials in the COFB with variable extraction conditions
- Upscaling of the reactor from DN25 to DN50
- Verification of the laboratory setup (precision, accuracy, reproducibility)
- Optimization of the system and process conditions

- Sampling and sample analysis (basic in-house analytics & external analysis)
- Data collection, evaluation, and interpretation
- Discussion of results in relation to the research hypothesis
- Assessment of the method's suitability and its impact on further valorisation in the project



We expect:

- organized, solution-oriented, and as independent working style as possible
- solid knowledge in one or more of the following fields: environmental engineering, chemistry, physics, process engineering, biotechnology, or related areas
- good command of English
- presence required at the research institute in Gleisdorf
- option for remote work for data analysis possible

We offer:

- paid MSc thesis and a workspace at our institute in Gleisdorf
- public transport ticket for the duration of employment
- integration into an ongoing research project and the research team
- supervision by experienced staff and researchers
- duration: 6-12 months, starting February 2025

Contacts:

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