Call for applications for a Master 2 research internship

Master 2 internship: Development of a production model for biogas purifiers

Supervision:
Sylvain TOUCHARD / Mohieddine-El Hadi TERKI-HASSAINE

University: Université Lyon2, INSA Lyon
Research laboratory: DISP laboratory

Required profile:
Second year student in Master of Science in Industrial Engineering or Operations Research

Funding: 600-650€/month

Internship period: From 02/01/2027 to 07/23/2027

Required skills:
Python programming, industrial production management, mathematical optimization methods

Key words: Optimization, assembly line, ergonomic, Biogas

Topic description:

Development of a production optimization model for biogas purifiers, incorporating ergonomic constraints.

Context:

In a world of increasingly volatile fossil fuel prices, renewable and bio-based energy sources have become a significant means of reducing costs and improving environmental impact. Against this backdrop, the biogas industry is experiencing rapid growth, particularly in the manufacturing of raw biogas purification systems. However, these purification units are complex products, and their assembly takes several weeks. Consequently, there is a need to optimize and balance assembly lines—an optimization problem that involves distributing the total workload across multiple workstations (N. Boysen, 2021). The goal is to determine the assembly layout by optimizing the number of stations, cycle time, or other performance criteria (O. Battaïa, 2022).

However, recent studies have begun incorporating new operational constraints to better reflect industrial reality—such as balancing lines with multiple operators per station, known as the Multi-Manned Assembly Line Balancing Problem (MALBP) (Mohieddine-El Hadi TERKI-HASSAINE, 2026). Yet, current research on this type of problem often fails to account for ergonomic constraints (Ilenia Zennaro, 2019; Mohammed-Amine Abdousa, 2025).

Through a collaboration with PRODEVAL—Europe's leading manufacturer of biogas purification units—this internship aims to develop optimization approaches for designing manual assembly lines for these units, while integrating ergonomic constraints for assembly operators.

Objectives:

In this context, the study will focus on the MALBP under ergonomic constraints, applied to a real-world case in the field of biogas purification. The internship will aim to design approaches integrating ergonomic aspects such as task repetitiveness, task difficulty, and physical workload into the configuration of assembly systems. A literature review will help define the various ergonomic assessment techniques considered in the ALBP. Next, a data collection phase (postures, effort levels, etc.) will be conducted in the field. A mathematical optimization model will be proposed to adapt and enrich the existing model with the selected constraints. A resolution approach (exact or approximate method) will be proposed to optimize this problem. A critical analysis comparing the newly proposed results with the results without ergonomic integration will be performed.

In summary the work will cover the following points:

- Literature review on the integration of ergonomics in ALBP balancing problems.
- Data collection in the field.
- Mathematical modeling integrating ergonomic constraints.
- Development of optimization approaches to solve the studied problem.
- Testing and analysis of the results.

Required profile:

Master's (M2) or engineering school student, with knowledge in Operations Research and/or Industrial Engineering.

Strong programming skills in at least one language (Python / C+++, etc.) and in using mathematical programming solvers (Gurobi, CPLEX, etc.).

Solid knowledge of MILP.

Bibliographic references for this topic:

Abdous, Mohammed-Amine, Xavier Delorme, Daria Battini, et Fabio Sgarbossa. «Scenario-based optimization and simulation framework for human-centered Assembly Line Balancing.» *International Journal of Production Economics*, 2025.

agenda, Big size highly customised product manufacturing systems: a literature review and future research. «Ilenia Zennaro, Serena Finco, Daria Battini, Alessandro Persona.» *International Journal of Production Research*, 2019: 5362-5385.

Battaïa, Olga , et Alexandre Dolgui. «Hybridizations in line balancing problems: A comprehensive review on new trends and formulations.» *International Journal of Production Economics*, 2022.

Boysen, Nils, Philipp Schulze, et Armin Scholl. «Assembly line balancing: What happened in the last fifteen years?» *European Journal of Operational Research*, 2022: 797–814.

Joshi, Mangesh, et Vishwas Deshpande. «A systematic review of comparative studies on ergonomic assessment techniques.» *International Journal of Industrial Ergonomics* 74 (2019): 102865.

Terki-Hassaine, Mohieddine-El Hadi, Taha Arbaoui, Sylvain Touchard, et Tao Wang. «Solving Multi-Manned Assembly Line Balancing under Resource and.» *2026 12th International Conference on Control, Decision and*, 2026: 770-775.

Zennaro, Ilenia, Serena Finco, Daria Battini, et Alessandro Persona. «Big size highly customised product manufacturing systems: a literature review and future research agenda.» *International Journal of Production Research*, 2019: 5362-5385.

Submit your application by November 20, 2026, by DISP - Candidature pour ... - Grist. Attach a file composed of a CV, a cover letter, and academic transcripts of the last two years.