

PhD Thesis in Combinatorial Optimization

Title: Energy-Efficient Production and Maintenance Planning

Laboratory: Ecole des Mines de Saint-Étienne - Department of Manufacturing Sciences & Logistics, UMR CNRS LIMOS 6158, Campus Aix-Marseille-Provence, Gardanne (Bouches-du-Rhône), France.

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Supervisors:

- **Nabil ABSI** – Professor (absi@emse.fr)

- **Elodie SUZANNE** – Associate Professor (elodie.suzanne@emse.fr)

Keywords: Modeling and optimization, production planning, maintenance planning, energy management, sustainable manufacturing

Context : Production planning, a central pillar of operations management, plays a crucial role in optimizing manufacturing processes while efficiently meeting market demand in an economic and sustainable manner. However, the emergence of environmental concerns, the continuous rise in energy costs, and the need to comply with legal obligations regarding greenhouse gas emissions have introduced a major new challenge: integrating energy constraints into industrial strategies. In recent years, energy management in production operations has gained undeniable importance.

Objectives: This PhD aims to integrate energy considerations into production planning while incorporating maintenance management. Although maintenance can be costly and energy-intensive, it remains essential to prevent equipment failures and optimize energy consumption. The primary objective is to develop a combined production and maintenance planning approach based on predictive indicators of equipment conditions. This research will contribute to the expanding field of sustainable manufacturing by proposing a novel planning approach that minimizes both energy consumption and unexpected downtimes.

Another focus will be on designing innovative solution methods to address the challenges posed by this integration. The solutions developed will rely on decomposition techniques, with a particular emphasis on designing efficient exact

methods for the identified subproblems.

Candidate Profile: Candidates must hold a Master's degree or an engineering diploma in Operations Research, Applied Mathematics, Computer Science, or related disciplines. Strong programming skills and a solid understanding of combinatorial optimization are required. The candidate should demonstrate autonomy and a strong sense of initiative.

Application Process: Please send your application via email (in a single file) including:

- A detailed CV,
- Transcripts,
- Recommendation letters (if available),

to Nabil ABSI (absi@emse.fr) and Elodie SUZANNE (elodie.suzanne@emse.fr).

Do not hesitate to contact us for further questions regarding the position.