

# Scheduling Industrial Jobs to Minimise Electricity Consumption Costs

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The InduStore project’s objective is to reveal the flexibility potential of industrial plants. As the electricity prices become more and more volatile and hard to predict, the industrial sites are more willing to adapt their production to the price variations; the evolution of the electricity market also provides opportunities for the plant to increase the revenue in exchange of some services (such as reducing the total consumption). To this end, the plants must be completely modelled to globally optimise the use of energy: the production can be scheduled, while taking into account the various consumption profiles of the machines and guaranteeing the absence of shortage in the processes.

For example, the paper mill’s production should be scheduled according to the price of electricity, in order to minimise the total electricity bill. The paper machines can also be turned off when the grid operator asks for it in order to provide *flexibility services* to the electrical grid operator. This scheduling problem is called “single-machine preemptive job scheduling with transition costs.”

A part of this project is to schedule jobs efficiently on machines within the context of a global plant model. Technically, the machines are modelled with a mathematical optimisation programme (MIP), but the scheduling part is more commonly performed with constraint programming (CP). The actual difficulty is to mix both models in a single solver.

The goal of this master’s thesis is to develop a state-of-the-art solver for these kinds of problems that can find good solutions in a reasonable amount of time. The solver must work within the framework of mathematical programming to be integrated in the global plant model. Approaches can include formulation comparison and improvement, heuristics to find good initial solutions or improve existing ones, development of valid inequalities.