Decision support system for scheduling a work cell in a production line

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This talk concerns a project which is a joint venture between Chalmers University of Technology and Prosolvia Systems AB, Göteborg. The aim of the project is to develop a decision support system for foremen in a production line, primarily intended for use in case of a production disturbance. Such events occur daily in industries, causing considerable economic losses. A system which can help to reduce the damage therefore has a large potential. The decision support system will be a part of [PS-ENGINE], a product developed by Prosolvia.

Plant level scheduling is a well studied problem, both in industry and in the academic society, and lots of commercial tools are available. Scheduling on the work cell level has not received much attention, except in a few special cases. This is probably due to the fact that under normal circumstances it is trivial to construct a plan given the overlying schedule of the factory. But when an unexpected event occurs (a machine or transport failure, a person is being ill or injured, a material delivery is delayed, etc.), it is often the case that the schedule is impossible to hold. In this difficult situation, the foreman has to take a fast decision of what to do, often with incomplete information at hand. Frequently, bad decisions are made.

A decision support system needs to have all relevant information regarding the work cell and its orders stored, and has to be able to model various events such as those described above. When constructing a new schedule for the cell, it has to take special actions (such as ordering overtime) into consideration as well as "normal" ones. Not only is this application previously unstudied, it is also uncertain if any existing methods from related problems can be applied. Integer programming models like job shop scheduling are too simplified, and simulation methods used in more complex situations are far too time consuming.