A Spreadsheet based scheduling system for a small printing company

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Abstract

In this paper we present the design and implementation of a low cost scheduling tool based on Microsoft Excel. This tool was developed for a small printing company in Colombia (South America). The company scheduling problem can be defined as a Flexible Job Shop with highly sequence dependent set up times where makespan is the objective function in a weekly planning horizon. The system architecture includes a product specifications data base, an engine which transforms the product specifications into shop floor operations, a processing times data base and a graphical user interface.

The proposed scheduling tool uses Simulated Annealing (SA) for optimization purposes. An initial schedule is generated by a non-delay schedule generation algorithm combined with the Most Work Remaining dispatching rule. Insertion moves on each machine were used for the generation of neighbors. This scheme was selected after conducting testing on several neighborhood schemes also reviewed in this work. The cooling schedule and the stopping criterion for the implemented SA algorithm are also explained.

The objectives of this work are twofold: The first objective is providing the company with a decision support system aimed to reduce the effort to generate schedules that can be trusted by the plant personnel; the second objective is to improve service levels, machine utilization and production lead times. Extensive testing shows significant reduction in the objective function values (makespan) in comparison with the values generated by the current scheduling methodology.

The company currently uses the scheduling tool for planning its production run over the span of a week. The product specification data base currently accounts for more than five hundred different products that can be scheduled in any run. Actual processing times during the run are registered by the personnel in a computer terminal located at the shop floor. In this way the application can accurately establish the status of any job, generate reports on resource utilizations, evaluate differences between actual and calculated processing times, and finally calculate performance indicators.

The implementation was recently finished and results are being collected in order to measure the actual improvements in resource utilization and customer service levels. Such improvements are expected to be significant.

Keywords: Scheduling; Flexible Job Shop; Simulated Annealing; Decision Support Systems

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