ABSTRACT

The research presented in this thesis consists of applications of continuous-time production analysis to production planning and scheduling problems.

Part I of the thesis is concerned with Factory Floor Scheduling and Control. Two models for scheduling multi-item production in a work-station having several identical machines are presented.

The first model assumes that the items have deterministic demand rates. A hybrid heuristic / linear programming approach is used. The heuristic is used to determine a master sequence of changeovers. Afterwards, a mixed integer linear program selects a subsequence of changeovers as well as the amounts to be produced after each of the selected changeovers so as to minimize the sum of the changeover and inventory costs.

The second model assumes that the items have stochastic demand rates. The approach used is an extension of the Dynamic Cycle Lengths Heuristic for multi-item single machine proposed by Leachman and Gascon [1987]. The heuristic dynamically adjusts the lot sizes and the assignment of items to machines so as to minimize the total changeover and inventory costs.

Part II of the thesis is concerned with the Corporate Level Production Planning for High-Volume Process Manufacturing. First, the classical MRP procedure is be modified so as to handle production rates and fractional lead-times (both typical of high-volume process manufacturing). Then, alternative procedures to the classical MRP procedure are developed which result in substantially less work-in-process. Finally, a linear programming formulation for determining capacity feasible Master Production Schedules (MPS) is introduced.