Chapter 10
Order Scheduling and Operating Strategies

Before the execution of external orders it is necessary to decide, when, where and in which sequence they should be started. These are the tasks of order scheduling:

- In order to execute external orders within required times at lowest costs they have to be accumulated, sequenced, divided or bundled into internal orders which are allocated to the available performance stations and resources.

Traditionally, order scheduling has been the task of people, the schedulers. Nowadays, scheduling is supported and performed to an increasing extent by computer. Schedulers, as well as programs, apply scheduling strategies which result from experience or have been systematically developed. Some strategies are documented as rules and working instructions; others are programmed as algorithms. Many strategies only exist in the mind of the scheduler.

The qualification of schedulers, the added value they generate, but also the damage caused by unqualified schedulers and unsuitable procedures are hardly known. In many, even big companies, only a few people schedule orders and resources. When experienced schedulers retire, often problems arise, as their know-how has not been transferred to the successors.

In order to support and improve scheduling, suitable strategies must be developed, selected, documented and programmed. Good scheduling programs perform mathematical forecasts and schedule standard orders without people. Relieved from routine tasks, schedulers can focus on special orders, exceptional situations and difficult tasks.

In this chapter, operating strategies for the optimal utilization of single and integrated performance and production stations are investigated. They can be distinguished in time, processing, allocation, production, sequencing and dispatch strategies. These general operating strategies are applicable to all kinds of production, performance and logistic systems, such as the storage, commissioning and transport systems described in Chaps. 13 to 19.

Time strategies have already been presented in Chap. 8. Sourcing, inventory and replenishment strategies will be developed in Chap. 11. The combination of operating strategies with time and replenishment strategies results in scheduling strategies for integrated production and performance networks with competing order
chains (see e.g. Fig. 8.1). Applications of the general scheduling strategies presented in this chapter are order scheduling and production planning of workshops, bottling and packaging stations, assembly lines and production chains (see Chap. 20). Other applications are administrative stations, such as call centers, offices and order centers.

The qualitative effects of a strategy with respect to certain objectives, such as utilization, delivery times, stock levels or performance costs, are in most cases relatively easy to assess. Quantifying the strategy effect and determining the optimum of a strategy variable are more difficult. In many cases these are still unsolved problems. The strategy effects on the total costs for a longer planning period can be calculated only for relative simple systems under very limited conditions (Gudehus 2003/2007; Inderfurth 1994).

Order scheduling strategies are closely related with production strategies such as make-to-stock and make-to-order. In order to demonstrate the connection between order scheduling and production planning, an algorithm which is used to calculate the order buffer, the stock of finished goods and the lead times for different operating strategies, order flows and limit performances will be presented here. The model calculations quantify the effects of different operating strategies.

The relatively simple example of a single production station coupled with a single storage station turns out to be already quite complex. Delivery, production and supply networks are of far higher complexity. They become manageable by the decoupling principle and the subsidiary principle of section 2.4. These principles and the scheduling strategies are applied to the dynamic scheduling of instationary order flows in the last section of this chapter.

The scheduling strategies, the decision rules for make-or-buy, the opportunity of make-to-order or make-to-stock and the general procedures of production planning outlined in Chap. 20 are the key of production planning and scheduling (PPS), of enterprise resource planning (ERP) and of advanced planning systems (APS) (Frazelle 2001; Gudehus 2003/2007; van Hook 2004; Meyr 2004; Park and Narayan 1997; Scheer 1998; Scheutwinkel 1999; Schönsleben 1998; Stadtler and Kilger 2007; SAP 1994, 2004).

10.1 Performance and Production Structures

The successive actions and part-processes within a single performance or production station are (see Fig.1.6):

order entry
buffering of orders
preparation for execution
start of performance
order execution and production
buffering or storing of results
dispatch of the results

Buffering or storekeeping of the finished goods is only possible, if the order results are storable.