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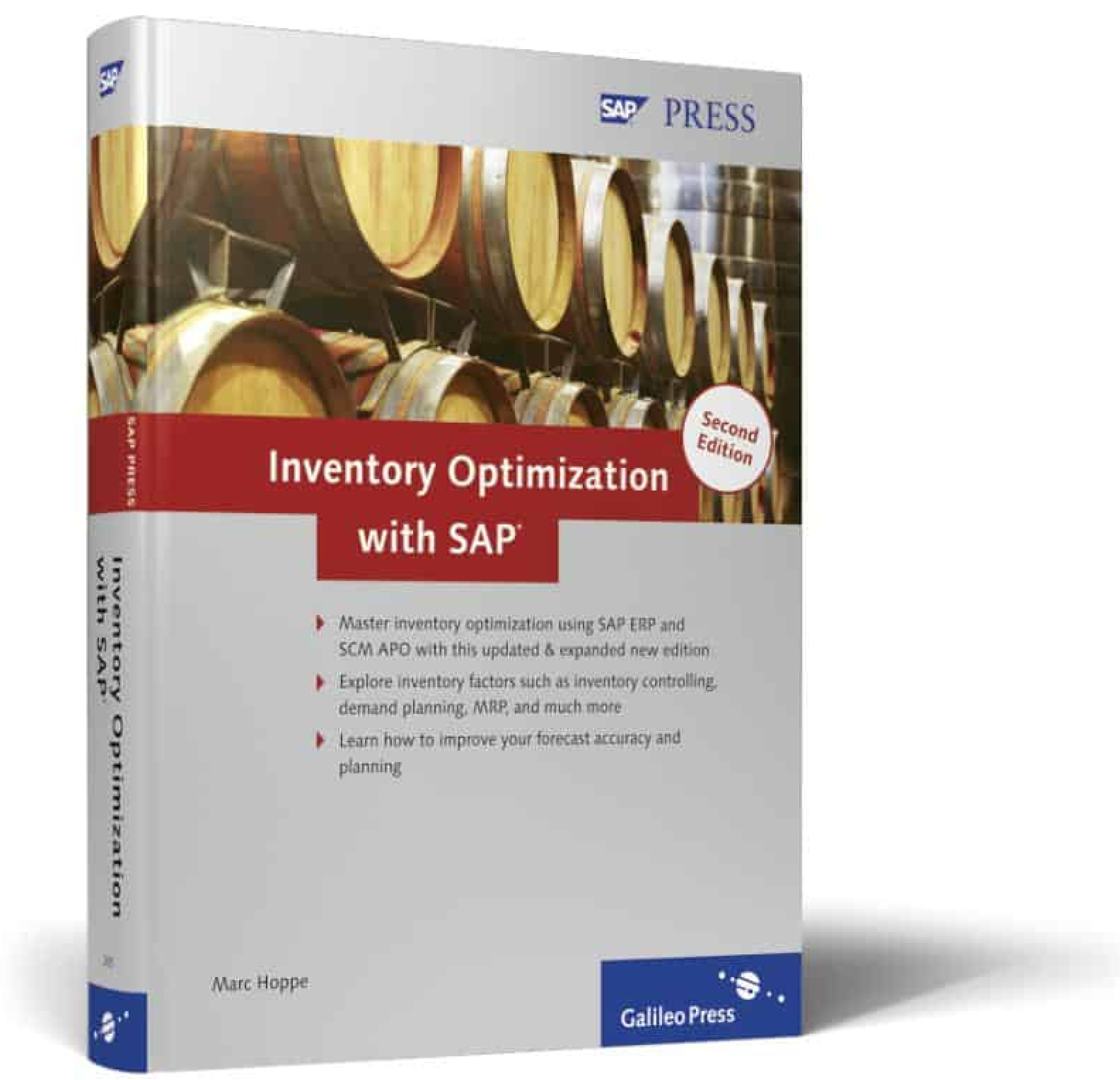
Inventory Optimization with SAP®



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Contents at a Glance

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There's no doubt about it—inventory is important. But too much of it is counterproductive. What is the best way to manage inventories? This chapter provides a brief overview of the five instruments you can use to manage and optimize your inventory: demand planning, material requirements planning (MRP), service level and safety stocks, lot sizes, and production.

2 Factors Influencing Inventory

Today's supply chain networks can cross both organizational and geographical boundaries. This forces companies to control what cannot be controlled. The future of supply chain management (SCM) depends primarily on the ability to quickly react to supply and demand changes and important events in the supply chain on a global basis. The faster a supply chain network can adapt to such events, the higher the added value and the more likely it is to influence the inventory. Inventory optimization is the key to keeping the profitability of a company at a constant level and to increasing the company's competitiveness.

2.1 Five Instruments

Supply chain planning is influenced by a number of factors that cannot be forecast with absolute certainty. For example, when forecasting customer requirements, there is generally uncertainty regarding the quantity and the exact selling date. In addition, disturbances and fluctuations in production cause deviations in the planned replenishment lead time. For this reason, safety stocks are used to secure the supply chain against uncertain influences and the optimization potentials described in Chapter 1, Why Inventory is Necessary.

Colgate Palmolive was able to increase its forecast accuracy up to 98 %, to reduce its inventory by 13 % and to improve its cash flow by 13 % by using SAP Supply Chain Management (SCM). Similarly, a manufacturer of handheld computers, which had implemented a new SCM solution, managed to reduce the planning cycles by 50 %, to increase the inventory turnover from six to ten times, and to reduce the delivery stocks by 32%. In that case, however, an entire range of processes had to be improved, namely the demand and requirement forecasts, inventory management, production planning, and order processing. All these changes were based on the goal of increasing the company's competitiveness and on shortening the delivery times. In the highly competitive handheld market, factors such as price, availability, and on-time delivery have a direct influence on a company's growth and profitability. Also, research carried out by Gartner Group predicted that 90% of today's leading enterprises that have no SCM strategy will lose their preferred vendor status in the future. These examples already indicate the instruments that can influence inventories.

In the following sections, we'll take a closer look at the instruments that enable us to optimize our inventories.

2.1.1 Demand Planning

The first instrument we'll consider is demand planning. Demand planning and forecasting are inevitable elements in logistics and the comprehensive planning process for the entire company. They are used to create rough realistic and consistent production plans based on the potential sales volume and the available budget. Good demand planning leads to reliable characteristics-based forecasting, which, in turn, is the basis for all subsequent processes. The results derived from demand planning determine the production and financial resources. The annual plan and the regular revision of the target plans largely depend on the level of accuracy of sales forecasts and on efficient production planning.

When planning future sales and production, the planner should not only rely on forecasts. He must include his knowledge of future market trends, planned advertising campaigns, and changes to specific product groups in the planning.

If the forecast sales volumes are smaller than the customer demand, the previously produced stocks will be completely reduced; furthermore, there will be a need to resort to the safety stock. If the delta is too big, it can cause stockouts. Customers are lost if they turn permanently to the competition. In addition to a loss of sales, a loss of image for the company and market shares can also result.

If demand planning is higher than the actual customer demand, surplus inventories can result, which may have to be scrapped or written off. This leads to a lower profit margin and reduced profitability.

Ultimately, the accuracy of the forecast determines the volume of the safety stock. If the forecast deviates substantially from the actual demand values, the safety stock is correspondingly high or low. Finally, the planner determines the primary requirements on the basis of the production quantities and forwards the data to material requirements planning. Chapter 4, Demand Planning and Forecasting, provides further detailed information on using demand planning as an instrument for optimizing the inventory.

2.1.2 Material Requirements Planning (MRP)

The second instrument, material requirements planning (MRP), is used to create and manage the production programs for finished and unfinished products. For this purpose, customer orders and forecasts are needed. Moreover, all other components of the entire product structure are planned—down to the lowest level. This is done on the basis of the secondary requirements, which must be identified by MRP.

Frequently, specific finished products, subassemblies, or raw materials must be produced or procured in advance to ensure short delivery times when customer sales orders come in. This advance planning, which at first is not based on any sales order, is based on the planned independent requirements that are offset against incoming customer sales orders at a later stage. This type of planning triggers the procurement of raw materials and the production of subassemblies or final products that will be stored in the warehouse.

MRP monitors inventories and determines the material that will be needed at a specific quantity on a certain date. In addition, MRP automatically generates the procurement proposals necessary for this process. In MRP, a net requirements calculation is automatically carried out in which the available warehouse stock or the planned stock receipts from purchasing or production are compared with the primary requirements. For a material shortage—if the available inventory is smaller than the required quantity—the system automatically generates a procurement proposal. Then, MRP initiates *make-or-buy decisions*. If dates or quantities change, the planned orders must be automatically adjusted in the MRP process. MRP must be able to quickly adjust procurement and production to meet new requirement situations. Choosing the right lot sizes is another task handled by MRP.

MRP is the interface between demand planning in sales and distribution and production planning in production. If demand planning is too high, MRP has to compensate for the discrepancy by selecting the best safety stock level, the correct range calculations, the best delivery rhythm, and optimal lot sizes so that the optimal quantity can be produced at minimum production costs.

This means MRP is an important adjustment screw for optimizing inventory, because it must find the optimum between the different inventory goals of sales and distribution (high service level = high inventories) and production (short lead times = low inventories).

MRP's influence on the operational result of a company can be expressed as a direct, an indirect, and a nonquantifiable success potential:

- The *directly quantifiable potential* results from the portion of material costs in sales or in the prime costs. This cost pool can be influenced by choosing the optimal lot size or the level of the optimal safety stock.
- An *indirectly quantifiable potential* represents, for example, the creation of supplier relationships, the reduction of overall procurement costs, or the inclusion of inventories in the financial report.
- The *non-quantifiable success potential* becomes manifest in the way the company is viewed by its customers on the basis of a high ability to deliver and delivery reliability.

Chapter 5, Material Requirements Planning, provides further details on the MRP strategies and parameters you can use to optimize your inventory.

Service Level and Safety Stocks

A company's decision to provide a comprehensive service level is a strategic one. It must be geared toward other objectives such as cost minimization and capacity utilization. This means compromises must be found and priorities set. To achieve a high service level, you may have to increase your warehouse stocks so that you can satisfy the demand with finished products from your stocks. Moreover, production must be able to start processing an order when it is first released, whereas distribution must be able to deliver on time. However, keeping warehouse stocks generates stockholding costs and therefore counteracts the objective of minimizing cost.

The decision to provide a high service level always requires a definition of subgoals that the company wants to pursue. Reliability can be ensured by creating intermediate storage facilities and final product storage facilities. In addition, buffers that you include in production planning ensure that the capacities can produce the right product at the right time in accordance with the planning. This, however, causes longer wait times and larger storage quantities, which is why you must use the service level value that causes customers to accept higher prices and long-term commitments against the actual costs. Unfortunately, not many companies do that.

If, on the other hand, the company pursues its goal of providing high delivery flexibility and speed, it must organize its business processes in such a way that the planning lead times are as short as possible, especially regarding order acceptance, planning, and production. In that case, the machine utilization buffers are kept small to shorten the order-processing timeframe and to guarantee a fast delivery and shorter turnaround times for the customer. The cost risk is rooted in the downtime costs that, for example, occur when required materials are not delivered on time. Moreover, the company must bear additional costs that can hardly be measured when machine failures or disruptions result in delayed productions and deliveries so that confirmed delivery dates cannot be adhered to.

The costs generated by an increase of the service level must be considered on the basis of profitability aspects. When comparing the costs with the revenues, which have been generated by the service level, the services must far outweigh the costs; otherwise, the business objective of profit maximization and the long-term existence of the company would be at risk. Contrary to the objective of cost optimization, however, the service level orientation enables the company to better respond to market requirements, which, after all, is the basis for a complete success. Depending on the focus of a company, the direction toward a service level increase requires a different orientation and processing of the business processes. In this context, striving for speed and flexibility is as important as concentrating on the readiness to deliver, as well as the delivery time and reliability.

An organization can achieve a 99% readiness to deliver within a maximum of 48 hours only if it permanently maps peak demands in its inventories; however, because those peaks often only occur sporadically, high inventories must be maintained throughout the entire year. Consequently, the company faces increased direct and indirect costs such as high depreciations and accumulated depreciations for short product lifecycles.

What then is the optimal service level that satisfies your customers and compensates for the costs? How can the service level be measured, and which processes support an optimal service level? These and other questions are addressed in great detail in Chapter 6, Service Level and Safety Stocks.

Lot Sizes

One of the primary goals of MRP is the economic supply of external customers and internal customers, that is, production. Here, MRP must optimize the material, order processing, and stockholding costs. Material costs depend on the order quantities and can be determined on the basis of the net landed costs. The order-processing costs depend on the specific operations. They can be described as proportional staff and material costs for procurement, receiving inspection, invoice verification, and data processing. Stockholding costs depend on stockkeeping and can be determined on the basis of the delivered price, the interest rate for stockkeeping, and the inventory cost rate. As a result of the order calculation, you obtain the optimal or cost-effective lot size as a production requirement, which represents the initial value for purchasing and production.

For example, if you want to increase your delivery flexibility, you must produce smaller lots, which, in turn, entails a reduced capacity utilization due to longer machine downtimes that are caused by a higher number of setup processes. At the same time, the setup and unit costs go up, as well as the procurement costs in purchasing. Moreover, smaller lots reduce the costs and procurement costs in purchasing. They also reduce the procurement quantities, which results in smaller discounts and rebates, whereas the cost pool for the procurement process remains unchanged and acts as a cost driver due to the shorter replenishment cycles.

Chapter 7, Lot Sizes, describes how you can influence your inventories by selecting the right lot-sizing procedures.

2.1.3 Production

The logistics of production is a central functional area within the entire supply chain. The largest portion of the entire added value of a manufacturing company is generated within production logistics. All upstream processes, such as procurement, and all the downstream processes, such as distribution, are linked to production. Products are produced and refined within production. The value creation within production logistics is what makes money. The essential goals of production are therefore short product lead times, low inventories, on-time deliveries, and a high degree of machine utilization and customer satisfaction.

Success factors that lead to a high degree of customer satisfaction and thus a long-term relationship with a customer are therefore short delivery times and high delivery reliability. Short delivery times can be achieved by short product lead times, high delivery reliability, low scrap rates, and a high degree of capacity utilization. However, short product lead times and a high degree of capacity utilization are contradictory objectives. The optimization of these goals is the focus of production planning and control. Production planning consists of all the essential planning tasks, such as the creation of master data, work scheduling, and the creation of a production program, as well as capacity leveling. Basically, production planning is composed of all work that occurs prior to the actual production start. The production program determines the type and quantity of items to be produced. This applies to final products, semifinished products, and subassemblies. The program is also used to define the most favorable production lots and procurement quantities. The production dates (planned dates) and the order sequence are defined in capacity scheduling.

Production control monitors and controls the actual production process. The task of production control is to ensure the supply of production with material components and raw materials, as well as the adherence to production dates. Changes on short notice also entail changes to the short-term production program. The changes to the production program lead to changes on the supply side: Orders must be canceled. Suppliers are asked to deliver later or earlier. Suddenly the lot sizes in procurement are no longer optimal. Rush deliveries must be triggered if a production standstill is imminent, because of an insufficient material supply. Not only does this increase the procurement costs, but the costs in production also increase as inefficient machine setup changes become necessary.

Inventory is supposed to avoid such firefighting and to balance those short-term changes. This means that the inventory level must be appropriate so that, on the one hand, stock surpluses are avoided, and on the other hand, process disturbances can be compensated.

To identify optimization potentials in production, the entire production process must be considered as a whole, both from the standpoint of production and costs. The following section summarizes the potential areas for optimization in production:

- **Shortening of product lead times**
  This leads to an increase in machine capacity, a reduction of inventories, shorter

delivery times, and a higher customer satisfaction. Liquidity increases due to the shorter delivery times because customers pay earlier. Because individual orders no longer occupy machines as long as they used to due to the shorter product lead times, a higher number of orders can be processed in production. This leads to increased revenues in a demand-driven market.

- **Improving unit costs**
  A reduction of the unit costs can be achieved by a high degree of machine capacity utilization. A setup optimization and a finite planning lead to a reduction of setup costs and an optimization of the production lots. This increases the capacity utilization. In general, it also increases the variable unit costs; however, it also increases the marginal revenues as the fixed costs remain unchanged.

Chapter 8, Production, describes the influences of production on the inventory in greater detail and introduces options for using the SAP system in this context.

2.2 Controlling by Inventory Monitoring

Because the supply chain is very complex, all aspects of the supply chain that we have described so far only become clear by using the right controlling instruments. However, many companies find the "standard key figures" inappropriate. These figures often cannot be used for the organization or the objectives pursued in SCM, or they are simply not the right means of control.

One of the most common serious mistakes is the isolated use of logistics key figures. For example, if a company measures the professionalism of inventory management based only on the inventory turnover or range, the resulting picture will be blurred. Transport costs must also be considered; otherwise, management will see only the low inventories without noticing that the transport costs have risen, and this negative effect will outweigh the benefits of the positive inventory effects.

You can only take the right action if various key figures are combined intelligently into key figure systems. Therefore, the key figures must be consistently defined and implemented across the entire company. Today, an appropriate key figure system enables a company to proactively identify and counteract problems. The description of a holistic key figure system would exceed the scope of this book; however, Chapter 9, Inventory Controlling, describes the most important key figures and their relevance to real-life production processes.

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