Dear APICS: How should one calculate “days supply” of inventory, and is this a better measure than “inventory turnover?”

REPLY: The generic motive for measures such as days supply or inventory turnover is to know how much inventory is on hand and to be able to assess the appropriateness of that amount. At a minimum, such information is useful to finance—to reflect part of its current asset picture—and to operations—to indicate the ability to cover production requirements and/or customer orders.

Finance, naturally, is most interested in dollar-based measures of inventory. One example is end-of-year total dollar investment in inventory, which is useful for creating required financial statements. In today’s lean production environment, however, the finance department also may want to determine the inventory asset’s level of productivity. Inventory turnover (= Cost of Goods Sold/Average Annual Inventory Investment) is one indicator of how well inventory is being used by a business. How many dollars of sales, at cost, are being supported by each dollar of inventory? Higher ratios are considered better, though this can be overdone in any given situation.

Benchmarking can help companies judge the most appropriate turnover levels to target for their circumstances, and so can inventory value engineering (Sirianni, 1982). Ahrens (1997) explains how to distribute responsibility for improving the productivity of inventory to various units that affect the ratio’s numerator or denominator.

Purely dollar-based measures of inventory are not particularly useful to operations. A customer pays a bill in dollars but buys specific items. From an operational perspective, items must be planned and controlled to match supply and demand. One measure of inventory at the item level is number of units on hand. This yields unambiguous quantity information item-by-item, which is useful for planning and control purposes. But it does not reveal whether the amount on hand is an appropriate amount. For that, you need a yardstick of some sort.

Traditionally, an appropriate amount was established by using independent demand inventory methods, such as Order Point/Order Quantity systems or Period Review/Order-up-To systems. But these methods failed to anticipate future demand and didn’t coordinate the availability of related items needed for joint use, for example, assembly.
Dependent demand planning methods, such as MRP, addressed both of these shortcomings by coordinating the planning of quantity and timing for related items and by driving that planning from known and projected requirements. With realistic lead times and realistic forecasts, the resulting inventories should have been "optimal" for the circumstances. Lack of realism in these areas, however, undermined the operation of MRP systems, yielding less-than-desired service and more-than-desired inventory.

Days supply is an example of a time-supply measure of inventory. A common use of time-supply measures in inventory planning systems is to reduce the risk of excess and obsolete inventory by placing an upper limit on the time-supply of an item that can be stocked. One rule-of-thumb is "no more than a one-year supply of C-items."

Days supply could be calculated by inverting the inventory turnover figure and adjusting for units of measure. For example, a turnover of five (times per year) would be equivalent to a time-supply of \( \frac{1}{5} \) year or \( \frac{1}{5} \times 365 = 73 \) days supply. However, the turnover ratio is based on the cost of sales for the past year and on the average annual inventory investment in dollars. Aggregate dollars and a historical view aren't very useful to operations, which needs to match supply and demand of specific items in the future.

Days supply should be calculated at the item level, based on inventory currently on hand in units vs. known requirements and forecast demand in units per day for a specified period (see graphic above). Some people may prefer to include On Order quantities in the numerator, too, which is certainly OK. Just be consistent within your company and be careful about comparing days supply figures across companies. They may not be computed the same way.

Because time-supply and turnover are inversely related, the above result could be inverted to project an inventory turnover figure for the future, which would be based on units not dollars. Generally, smaller days supply figures are considered indicative of a leaner, more productive use of inventory, but this can be carried too far. Fragile systems have "crashed" for lack of supply, e.g., auto industry strikes at supplying plants shut down assembly plants rather quickly if there is not much buffer.

Another measure, which combines dollars and time, is inventory dollar days. Sorrell and Srikant (1997) have written an article on how to use this measure to better manage inventory. 

References
Ahrens, Roger, "How to Use Inventory Turns to Stimulate Productivity Improvements," CPIM Inventory Management Reprints. APICS, Revised 1997, pp. 1-1 through 1-6.
