

**A guide to Inventory Reduction      part 1:****INTRODUCTION**

How many firms think their inventory investment is low enough? What is low enough? INVENTORY is the largest single asset on the balance sheet of many manufacturers and distributors. It is usually the most expensive asset to own and maintain as well, with estimates of carrying costs typically running 25-30 cents or more on the dollar annually. Therefore, any useful suggestions to optimize INVENTORY investment and associated expenses would be most valuable.

This paper addresses how to manage INVENTORY investment to optimum levels, which means a reduction or major redistribution of it in most companies. Optimal INVENTORY levels come down as management makes the operation more efficient by improving processes, reducing lead-time, managing supply and demand better.

One can't "attack" INVENTORY effectively, but only its underlying causes, which will be discussed. Most INVENTORY "problems" are merely a reflection of management, design, process or operational problems. Current literature on Just-in-Time and World-Class Manufacturing addresses how inventory reduction is a by-product of doing things right the first time.

**WHAT IS THE SIGNIFICANCE OF INVENTORY?**

Why is INVENTORY "bad"?

INVENTORY is a major capital investment affecting cash flow and profitability. Inventory comprising one-third to one-half of companies' total assets isn't unusual. There are significant expenses associated with possessing it. INVENTORY reductions can do more to improve ROA (Return On Assets) in most companies than most other factors. For instance, a 50% reduction in INVENTORY will typically account for a 10-25% improvement in ROA! Certain industries, such as aerospace and defense, widely believe that INVENTORY is a non-issue, because they receive "progress payments" from customers or because they "write-off" job-end variances and leftover "residual" inventories. The facts are that these companies need to watch inventories even more closely but first they need to be made aware that there are INVENTORIES to watch. Just because the government or other customers finance the cost of money for INVENTORY, doesn't mean that there aren't many other hidden costs, most of which are hiding in burden and serve to make the company less competitive and profitable.

Excess inventories subject the manufacturer to additional liabilities for things such as obsolescence, rework, storage charges, etc. Most of these ultimately end up "written off" and are applied to "overhead", but this eventually raises the overhead rate, which increases costs of doing business, which raises prices, which makes companies less competitive. It really doesn't matter that much (except for tax purposes) whether costs end up as direct, indirect, expensed, burden, or whatever: they all affect profitability, investment and cost of manufacturing.

## Carrying Costs

Let's look at what goes into INVENTORY "cost of ownership", frequently called the "carrying cost" and expressed in terms of percent cost of INVENTORY valuation per year of ownership. For example, a 25% carrying cost would indicate that it costs about \$.25 to own each \$1.00 of INVENTORY each year. These costs consist of:

- Cost of money - The cost of capital to the company or, in some cases the "opportunity cost" or return that could be earned on the money by applying it productively elsewhere. The cost of money has ranged anywhere from 6% to 18% in the last 25 years. Obviously, cost of money has a very significant impact on investment strategy.
- Obsolescence - The risk of INVENTORY never being used, or needing rework to make it usable, needs to be factored into the cost of owning INVENTORY. In theory (and practice), the larger the INVENTORY is, and the longer it is held, the more likely engineering changes, customer preferences and technological changes will render that INVENTORY unusable. In the clothing industry, it is not uncommon to see inventories depreciate as much as 90% when styles change. Certain portions of the electronics industry have problems with INVENTORY becoming obsolete very quickly due to technological changes.
- Shrinkage - A portion of INVENTORY becomes unavailable to the owner due to loss, damage, theft or spoilage. The longer INVENTORY is there and the more there is, the more likely this is to happen. Steps to prevent it only raise carrying costs in other areas, such as security, air conditioning, better control systems, recruiting policies, etc.
- Quality Factors - Allowances for yield, attrition, scrap and rework. This is really more of a function of the process than the amount of INVENTORY invested and is more related to throughput, but is usually expressed as part of the aggregate INVENTORY carrying cost.
- Technological or Price Obsolescence - Prices don't always go up. In fact, in industries such as electronics, prices often plummet due to constantly improving designs, product and process technology improvements. Therefore, it is desirable to minimize inventories in high-risk areas.
- Taxes - There are two dimensions to this: 1) In some areas, a tax is levied on inventories, so the more INVENTORY, the more tax is paid. 2) INVENTORY is regarded as an asset by most accounting and tax rules. Therefore, building large inventories shows "profits" and profits are usually taxed, usually by multiple government entities.
- Insurance - The cost of carrying insurance on INVENTORY needs to be considered, as well as insuring the space, equipment, people and other resources needed to control it.
- Space - Costly storage space sometimes occupies 25-30% of the total facility, when one considers raw material warehouses, stockrooms, work-in-process storage, receiving, shipping, outside warehouses, MRB and residual storage areas. INVENTORY reduction campaigns frequently help companies avoid the need to move to large facilities, or permit them to shut down or cut back existing facilities.
- Manpower - All of this INVENTORY needs people to order, receive inspect, record, move, count, store, retrieve, post it to the ledger, etc. People are the largest or second largest expense (behind material) for most manufacturers.
- Record Keeping Systems - Software, procedures, equipment and paper must be used to stay on top of INVENTORY.
- Material Handling/Storage Equipment - Conveyors, fork lifts, bar code readers, scales, AS/RS, trucks, carts, bins, racks, shelves must all be purchased, leased, maintained and cared for.
- Physical Inventories, Reconciliations - Must be conducted to ensure that inventories are properly accounted for and maintained.
- Transportation - Must be provided to move INVENTORY in and out of the facility, to vendors, within the facility to different workstations and storage areas.
- Energy - Heat, light, humidity control, air conditioning, refrigeration and fuel must be consumed to make all this happen.

## WHAT AFFECTS INVENTORY?

One must "know thine enemy" to successfully deal with it. Now that we've discussed the significance of INVENTORY, let's determine why it exists and what makes it go up or down.

INVENTORY is not always evil. It usually exists for a reason, however a reason is not always true justification. INVENTORY is frequently kept as a buffer and masks other problems.

### Major Reasons for Inventory

- Net Demand - Demand derived directly from customer requirements or internal demand.
- Pipeline - INVENTORY needed to sustain the process over its cumulative lead-time through all operations and holding points. Also included in the pipeline are paperwork operations, such as billing, which could increase inventory if not done timely enough.
- Quality - Yield, attrition, scrap, rework allowances impacting amount of inventory and time inventory is in process.
- Lot Size - Lot size considerations include vendor minimum order quantities, raw material and manufacturing lot sizes due to setup and other nonrecurring, lot-related cost considerations and run time impact considerations.
- Supply Buffer - Extra INVENTORY carried as a hedge against unreliability of vendor or factory schedules, inaccurate records, unpredictable quality or other fluctuations tending to reduce reliability of providing materials on demand. It is usually expressed in terms of "safety stock" (quantity or periods of supply) or "safety lead time" (bringing it in earlier).
- Demand Buffer - Extra INVENTORY planned due to uncertainty of the true requirement need date or quantity, which may vary due to poor forecasts, transportation problems, or various contingencies. It usually takes the form of larger quantities being put into process, or processes started earlier as a hedge against demand fluctuations. It is usually combined into the total buffer as described above. Another form of demand buffer is building "anticipation" inventory for seasonal fluctuations and other forecasted demand surges.
- Hedge - Inventory acquired for speculative purposes with the exception that prices will rise later, justifying the earlier investment risk.

### Other Factors Affecting INVENTORY

The reasons given above are those that apply for a given set of circumstances or basic assumptions about design, processes, etc. The factors below are more basic and can have a more profound long-term effect on INVENTORY:

- Product Design - The number and type of parts, difficulty to manufacture and specifications for materials, reliability designed in and other factors, do more to set basic parameters for INVENTORY than anything else. A product design that minimizes the number of parts, picks easily obtainable materials and components, lends itself to manufacturing with the simplest possible facilities and equipment will minimize INVENTORY costs over the long pull.
- Materials Supply - Specifying quality materials, well suited to the process and application, with easy availability, low prices, reliability of supply and short response time are all big advantages that can facilitate INVENTORY reduction. Having the best sources for key materials or changing existing arrangements can do a lot to help minimize inventories.
- Processes - Good, reliable processes will help reduce INVENTORY, because they will help reduce scrap, rework and attrition, and also provide a more reliable flow of supply, which will help reduce buffer stocks, safety stocks, safety lead time INVENTORY and eliminate much accumulation of INVENTORY on the production floor. Better processes will also serve to reduce many other burden activities, such as inspection, MRB, management intervention, expediting, etc.

Better process design, coupled with improved equipment selection and tooling engineering cannot only minimize the amount of set-up and other nonrecurring or lot-related activities to be performed, but speed up the entire process. Reducing set-up not only cuts labor, but also improves facilities/equipment utilization and decreases the amount of time that INVENTORY needs to be invested. This can result in capital investment avoidance, which helps minimize the asset base and operating expenses, which further improves return on assets/investment.

- Facilities Layout/Design - INVENTORY may be increased significantly if this is not done properly. Widely scattered plants, multi-story buildings with inadequate material flow capabilities and processes distributed over many different departments, all increase the amount of part travel, possibility of loss, delays and need for manpower and extra equipment to support the process. Poor utilization of space will also increase the cost per square foot and the number of square feet required to support the process.

- Service Objectives - The required response time and reliability of service to customers has a big impact on INVENTORY costs. For instance, if **industry standards** allow making to customer specifications from scratch, there may be less need to maintain finished goods inventories. If customers or distributors carry stock, that reduces pressure upon the supplier to maintain inventories and reduce them quickly. Once a competitor attempts to improve service by keeping raw materials, work-in-process or finished goods available, or by making the process quicker and more efficient, it puts pressure on competitors to meet this new standard.

- Outside Processing - Some firms lament the amount of money spent on outside processing charges. This is not a problem unless they are significantly higher than comparable in-house costs. If only a little bit higher, it's better to leave them outside if the vendors are nearby, reliable and provide good service. The reason for this is that these services are hard to manage, are frequently outside the scope of the business and are better left outside when fluctuations in customer demand occur, since this reduces the amount of money needed to support underutilized capacity.

- Planning/Control Systems - Systems employed to manage supply and demand and control the production process have a large effect on INVENTORY. The policies that management sets, the education/training it provides and the ongoing follow-up to ensure that these points are implemented and data integrity maintained, are decisive.

The systems we refer to are:

- Front End
  - Forecasting
  - Production Planning
  - Master Production Scheduling
  - Capacity Requirements Planning
- Engineering
  - Bill-of-materials
  - Change Control
  - Routing/Process
- Material Planning
  - Time Phasing Tools
  - Requirements Calculations/netting
- Shop Floor Control
- Data Integrity
  - Bill-of-material
  - MPS
  - INVENTORY, PO, RM, WIP, QA, FG
  - Process

## Cost

- **Material Costs** - Material cost increases (obviously) raise INVENTORY. Lowest unit cost does not necessarily mean lowest cost of doing **business**, or even lowest cost of material, for that matter. These can be deceptive, because as material costs go up, turns do not decrease, because they are being measured on a new and higher base. In a standard cost system, "variances" may be expensed and not immediately show up in some inventory systems, such as standard cost.

Overhead - Burden rates of 300%, 500% or more are not uncommon. Having a high overhead rate is not "bad", only total costs that are too high are "bad". Your overhead rate is a reflection of cost distribution and accounting techniques as well. However, if overhead is going up without attendant drops in other areas and if other industry competitors are doing better, then it's "bad."

- **Setup and Other Nonrecurring Costs** - In most companies, these are either part of direct labor or buried in overhead. I broke them out separately here because of their differing characteristics. Many manufacturing people feel that the way to reduce the set-up portion of overall run time is to increase lot sizes. Unfortunately, the attendant increase in INVENTORY and other related expenses sometimes negates setup reductions. Another argument is that long runs increase capacity. An interesting idea, but large lot sizes also take up capacity and confuse priorities. The real answer is to reduce setup times.

- **Labor Content** - Reduction of direct labor has been one of the few bright spots in American productivity improvements over the years. It has gone down to a much lower percentage than before. It amuses me that some major manufacturers and government regulatory agencies focus so much attention on reducing direct labor content, which is as low as 3-5% in some industries. The area to look at is labor variances, due to down time, quality problems, material shortages, etc., and in indirect labor. In short, reduce the overhead due to other factors increasing labor.

The preceding sections should give you a better idea of the significance of INVENTORY, and what affects it. If you have been reading carefully, you have already seen opportunities for reduction, since knowing the question is frequently half of the answer. The next installment will address how to reduce inventory.

### **Paul Deis - About the Author:**

George J. Miller, CFPIM, is Founder of PROACTION. Prior to selling the company to Paul Deis, George had worked with dozens of companies in assignments involving productivity, quality and service improvement, business systems, change management, acquisitions, divestitures, expert witness testimony, and others. Prior to founding PROACTION in 1986, he was Vice President of Marketing for Western Data Systems; Director of Planning and Development and Assistant Director—Operations for Purolator Technologies (PTI); Consultant for Booz-Allen & Hamilton, and Manufacturing Systems Manager for Becton-Dickinson.

Paul Deis, CFPIM, is CEO, PROACTION. He brings over 25 years of consulting and senior executive experience to his work, including detailed work with nearly 60 companies. Prior to acquiring PROACTION, Paul's experience includes running a small ERP software company, leading other consulting businesses, prior work with PROACTION, Manager at Deloitte & Touche, VP Manufacturing at Raypak, Inc., where he was very successful with an early Lean management initiative, and dozens of projects in the areas of enterprise software, operations management, crisis resolutions, in a wide variety of industries, business types, and scales. Our website: [PROACTION - Generating Best Practices](#)

The following is a capsule summary of the 3/01/11 meeting of the Tri-City Board of Directors:

- \* The minutes of the February meeting were reviewed and accepted.
- \* The financial reports are not ready for publication. Todd will email those to the board members for review.
- \* We discussed the option of offering an “expedited” version of the CPIM review classes. We have had inquiries from students requesting a shorter timetable for certification attainment.
- \* We are still looking for a volunteer to join the board and help out with our website maintenance and content.
- \* The next scheduled board meeting is May 3<sup>rd</sup>, at Honest Johns on East 2nd St. in Jamestown, at 5:45 PM. Attendance by members is welcome. Please contact Todd Eggleston for arrangements.

	<b>Name</b>	<b>Phone</b>	<b>E-mail Address</b>
<i>President, Treasurer</i>	<i>Todd Eggleston, CPIM</i>	<i>(716) 363-3449</i>	<a href="mailto:Tfe1965@yahoo.com">Tfe1965@yahoo.com</a>
<i>Vice President - website –</i>	<i>- open -</i>		
<i>Membership</i>	<i>Brenda Gray</i>	<i>(716) 456-2318</i>	<a href="mailto:Brenda.L.Gray@cummins.com">Brenda.L.Gray@cummins.com</a>
<i>Secretary</i>	<i>Bill Kuppinger</i>	<i>(716) 763-2214</i>	<a href="mailto:kupp67@gmail.com">kupp67@gmail.com</a>
<i>Education</i>	<i>Beth Woodward, CPIM</i>	<i>(716) 665-7615</i>	<a href="mailto:bwoodward@inscapesolutions.com">bwoodward@inscapesolutions.com</a>
<i>Programs Arrangements</i>	<i>Bill Widell, CPIM</i>	<i>(716) 450-1533</i>	<a href="mailto:wwidell@stny.rr.com">wwidell@stny.rr.com</a>
<i>Newsletter</i>	<i>Bill Kuppinger</i>	<i>(716) 763-2214</i>	<a href="mailto:kupp67@gmail.com">kupp67@gmail.com</a>
<i>Publicity / Marketing</i>	<i>Beth Woodward, CPIM</i>	<i>(716) 665-7615</i>	<a href="mailto:bwoodward@inscapesolutions.com">bwoodward@inscapesolutions.com</a>