June 22 2009

DBMEXECUTIVE

ISSUE 2.02

DBMExecutive is a bi-monthly newsletter created by DBM Systems Inc. a supply chain consulting group located in Cambridge, Ontario, Canada. To get your own copy please visit us at www.dbmsys.com.

The Inventory Diet
Take the Fat out of your Supply Chain

by Duncan McLeod

Obesity kills. Second only to tobacco as an underlying cause of death, there were 400,000 instances in the United States alone in the year 2000.

Actually, obesity itself doesn't kill, but it does increase the risk of the major killers like heart disease, cancer, stroke, and diabetes.

Add to that the restrictions it puts on life-style and it is difficult to defend obesity in any form. Individuals understand this. Companies understand this. Supply Chain managers really understand this because to them, excess inventory in the supply chain is obesity.

It's deadly!

At its worst it can put a company on life support through Chapter 11, or even kill it by locking up vital cash. Obesity hides inefficiencies, causes expensive write offs, incurs carrying costs, and prevents us from performing at the top of our game.

I doubt you will argue with the push to reduce inventory, especially in these tough economic times.

But how to do it effectively? It is very similar to losing weight. If the calories out are greater than the calories in then you will lose weight. If the inventory out is greater than the inventory in you will reduce inventory.

The math is pretty simple. It's the how that causes all the trouble.

Get rid of the fat—not the muscle

Not all weight is excess weight.

If you reduce too much, you start losing essential fats, and then muscle mass, and that could cause potentially fatal health risks. What you need to lose is the excess fat, not the rest.

Getting in shape is about getting to the right body fat percentage. Think about it. If you took your weight to zero, you wouldn't be here. The objective of weight loss is to have the right balance: the right fat/muscle percentage to be healthy.

The same thinking applies to inventory. Too much is bad, but not enough can be worse.

I have seen both. Companies that struggle with high-cost expediting because of inventory short-comings, and those who carry inventory excess.

We need inventory to operate the supply chain just like we need muscle and some fat to be healthy.

The supply chain will not function with zero inventory. Face it, if you make 12-year-old Scotch you need to have 12 years of work in process inventory. Every one of the 12 years that it takes to age the Scotch represents a year of inventory. Take a year out of inventory and you miss sales for a year, or rebrand the product to be 11-year-old Scotch. For some supply chains 0.083 inventory turns is good!

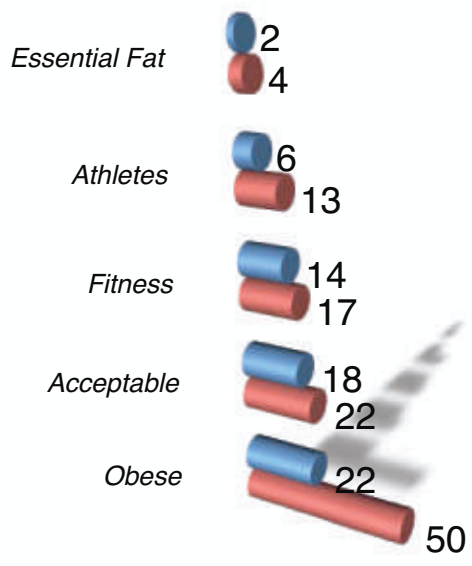
What % should my body fat be?

The body fat percentage is the percentage of individual body mass made up by fat.

The rest is muscle, bones, organs etc., but in my analogy I will simplify this to just muscle or fat. The key word is individual.

It is not read from a chart—everyone has their own calculated body fat percentage.

The following chart represents an example of male body fat targets by percentage. The blue represents the low percentage, and the red high.



Athletes target body fat percentages between 6% and 13%, depending on their sport. This is the ratio that allows them to perform at their peak. Maintaining this ratio requires training and diet control.

Anything above 22% is considered obese and anything below 2-4% is dangerously lean. Both are bad.

While 14% to 22% may be acceptable for us as individuals, our companies must compete as athletes. We need continuous training and management support to make sure that our inventory is in the athlete range.

How does weight compare to inventory?

I need to stay with this analogy to stress a point.

If we compare inventory to total body weight, then some inventory is muscle and some of it is fat.

For peak manufacturing performance we have specific requirements for lot size inventory, safety stock, work in process inventory, transportation inventory, and investment inventory—these are all muscle inventory. The rest is fat.

The trick is finding out how much is muscle, and how much is excess fat.

Just as the type of sport changes that targeted fat ratio, the design of your supply chain changes the amount of muscle inventory you need.

Move from a local supplier to an offshore supplier, and you need more muscle inventory. Change from 3-year-old Scotch to 12-year-old Scotch and you will need 9 more years of muscle WIP.

> "We need inventory to operate the supply chain, like we need muscle and fat to be healthy."

How much muscle inventory do I need?

First, we need to determine why we have inventory and then categorize it as muscle or fat. The following chart summarizes the 5 basic types of inventory.

Requirement	Muscle	Fat
Lot Size Inventory	X	X
Saftey Stock Inventory	X	X
Work in Process Inventory	X	X
Investment Inventory	X	X
Sludge		X

In most cases, inventory can be both muscle and fat. To understand why, let's describe each requirement in sequence.

Lot Size Inventory

Receipt quantities are usually larger than issue quantities.

If you have one piece flow throughout your supply chain, then you do not need to read this section.

Lot sizes are designed to optimize the cost/performance of the supply chain. Set-up, shipping, and administrative costs are weighed against carrying costs to determine the best quantity to make or buy.

With some basic math, and a lot of common sense, it is possible to calculate optimal lot sizes. The alternative method of "Had a hunch and made a bunch" works, but usually results in fat.

On average, half of your lot size inventory will be in stock at any time. This inventory is muscle. To reduce it you have to change the rules: reduce set-up times or increase carrying costs.

If you reduce this inventory without changing these rules you are taking muscle away from your supply chain. The result may be lower inventory levels, but the overall cost of running the supply chain will be higher. You can't increase the number of set-ups without reducing the cost of a set-up first.

In my experience, lot sizes are not balanced. The total lot size inventory may be acceptable, but many lots are too small and many more are too large.

The lots that are too small increase the cost of operations reducing muscle, and the lots that are too large add fat to the inventory.

The total weight may be fine, but the muscle mass is too low.

Safety Stock Inventory

Safety stock is used to buffer the nodes of the supply chain from supply and demand variations.

In-bound safety stock is used to buffer against supplier reliability, and out-bound safety stock is used to buffer against demand planning or forecast variability.

Like lot size inventory, a little math and some common sense is used to calculate safety stock levels.

The basic rule: the higher the variability, the higher the safety stock required to maintain a given level of service.

Lead-time adds another variable: the longer the replenishment lead-time, the more safety stock required.

Duncan McLeod, MBA, CFPIM, CSCP, PMP, is the President and CEO of DBM Systems Inc. in Cambridge, Ontario, Canada, where his consulting and research focus on management strategy in fast-paced industries. Duncan can be reached at dbmexecutive@dbmsys.com.

June 22, 2009

DBMEXECUTIVE ISSUE 2.02

DBMExecutive is a bi-monthly newsletter created by DBM Systems Inc. a supply chain consulting group located in Cambridge, Ontario, Canada. To get your own copy please visit us at www.dbmsys.com.

The Inventory Diet Continued...

by Duncan McLeod

The alternative method to "keep two weeks of everything" might work, but the result will be pockets of fat and some weak muscles.

On average, the total safety stock will be in stock at all times. This is muscle. To change this inventory you need to change the rules: improve the predictability of demand, reduce the lead-time or lower the service level targets.

In my experience, safety stock policies are a major cause of supply chain fat. Improved demand management, and a better application of safety stock rules can help get this requirement under control.

Work in Process Inventory

Work in process, or WIP, inventory can be broken into the following muscle sub-sets:

Material being physically transformed - Material is in WIP for the time it is being physically transformed. The 12-year-old Scotch example may be an exception, but it does take time to physically change the material and this time equates to inventory. This is pure muscle. In many cases it is not possible or practical to reduce this time. (There are exceptions such as where new technologies reduce curing time etc.)

Material waiting to be transformed (in queue) - This is an area where lean initiatives have made great strides. Flattening bills of material, reducing set-up times, and implementing pull systems have all helped to drive down queue-based WIP. There is still a certain amount of queue required for efficient operations. This planned queue inventory is muscle; the rest of the queue is fat.

Material in transit - In the old days we called this "move time". With our new disintegrated global supply chain we need to think of it as transit time. All the material on all those container ships is somebody's inventory. It may not change title until it hits your dock, but it is inventory in your supply chain and as such it carries some cost. The amount of "in-transit" inventory bears a direct relationship to the supply chain design. If the transit time from the vendor to the customer is four weeks, then there must be four weeks of inventory in the transit pipeline. This is muscle; the only way to reduce this inventory is to reduce the transit time.

Investment Inventory

This is inventory we have decided to add based on strategic decisions.

Building inventory early to level load the plant in a seasonal market, building a "strike bank", buying ahead of a price increase or locking up a scarce commodity are all examples of investment inventory.

Investment inventory decisions should be a result of the S&OP process and they should be documented.

It is important to know why you invested in certain inventories. It is also important to understand the assumptions so you can get rid of this inventory after it has met its purpose.

Investment inventory is discretionary muscle. If the call in the S&OP meeting was wrong, then this investment inventory may turn to sludge. But that's why we have an S&OP process – put the call where it belongs.

Sludge

Sludge is all the excess fat you don't need. Once you have identified the muscle inventory it takes to run your supply chain, the rest is sludge. Sludge is bad fat. Get rid of it. It adds no value and consumes resources. It is waste, and one of the most costly investments your company retains.

Sludge kills.

You may have isolated Excess and Obsolete, E&O, as an inventory category, but that is only part of the sludge.

E&O inventory is typically based on rules: no movement in last 6 months, no requirements for next 6 months, obsoleted by ECN etc. This is the really bad sludge. The stuff that sinks to the bottom. The goo.

You need to address your sludge before it reaches E&O.

Most sludge can be converted to cash if quickly acted upon. However, once it becomes excess and/or obsolete inventory, the options for disposal are limited.

In many cases E&O leaves the balance sheet as a write off rather than a transformation to cash—think liposuction, and you'll see my point.

Putting it all Together

There are some basic steps to get rid of the excess fat.

First, calculate how much muscle inventory you need to run your supply chain. The maximum inventory for any item would be the sum of its lot size, safety stock, work-in-process, in-transit and investment inventory. Any amount above this would be excess or fat.

- Start with the data in your ERP systems. Most systems will have lot size and safety stock rules. Use these as a starting point to calculate target lot size and safety stock – that's what your system is doing.
- Investment inventory should be tied directly to the decisions in your last S&OP cycle.
- The target value for WIP depends on your process.
  - If you are using a back flushing system, then your WIP will show as component inventory until the next level of the bill of material is received. In this case, start by taking the manufacturing lead-time of the parent and multiplying it by usage per day to determine the target WIP level for an item.
  - If you issue material to WIP without back-flushing the target, WIP for an item is zero. If you use this approach, the item leaves stock when you issue it to WIP. It then reappears in stock when the parent is completed. The on-hand balance for the item should have zero WIP components. The target level of WIP must be tracked as an aggregate, not at the component level. (WIP is managed on open manufacturing orders in this scenario)
- The target value for in-transit would be the transit time multiplied by the usage per time period. If you do not own the in-transit material, then don't worry about this part of the calculation right now. I will discuss it in a future article because it does have a cost. If the vendor is bearing the cost, then this cost is probably buried in the price. Again, this is a topic for another article.

The following chart is an example of what your data might look like. I have set the investment, WIP and in-transit to zero for simplicity.

	Item Number			
	BY100	RY100	RB100	Total
Lot Size	100	100	100	300
Safety Stock	50	50	50	150
Investment Inventory	0	0	0	0
Target WIP Inventory	0	0	0	0
Target In-transit Inventory	0	0	0	0
Maximum Target Inventory	150	150	150	450
Minimum Target Inventory	50	50	50	150
Average Target Inventory	100	100	100	300
Actual Inventory	170	100	30	300
Sludge	20	0	0	20
Over Leaned	0	0	20	20

In the chart:

- The lot size inventory and safety stock were pulled directly from the ERP system.
- The maximum target inventory is the sum of the lot size, safety stock, investment, WIP and in-transit inventories. This is the target level just after a new lot is received.
- The minimum target inventory is the sum of safety stock, investment, WIP and in-transit. No lot size. This is the target level just before a new lot is received.
- The average target inventory is the sum of one-half the lot size, the safety stock, the investment inventory, WIP and in-transit. On average, one half of one lot should be in stock.
- There are 20 units of sludge in the BY100, which is bad.
- There are 20 units of over lean in the RB100, which is also bad.

Chances are you will find the majority of the sludge in a small number of items. The 80/20 rule or even the 90/10 rule usually applies. Sort your report from the most to least sludge. Then do some root cause work to find out how the sludge got there in the first place, and put plans in place to stop it from reoccurring. At the same time get rid of the existing sludge because it is pure fat.

Take a stab at it and let me know how you make out.

In future articles, I will address some of the logic behind setting lot sizes and safety stock levels. Optimizing these rules is the next step in developing a lean supply chain. Remember "Lean" means optimal inventory, not zero inventory.

Duncan McLeod, MBA, CFPIM, CSCP, PMP, is the President and CEO of DBM Systems Inc. in Cambridge, Ontario, Canada, where his consulting and research focus on management strategy in fast-paced industries. Duncan can be reached at dbmexecutive@dbmsys.com.