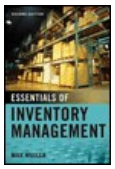


Essentials of Inventory Management, Second Edition

by Max Muller

Chapter 6: Why Inventory Systems Fail and How to Fix Them

Overview

The objective of this chapter is to provide you with an understanding of the nature of inventory accuracy and the working tools to “fix” your inventory system. If all items are moving through a properly operating system, then it doesn’t matter what the characteristics of an SKU are—expensive item, inexpensive item, fast mover, slow mover, long lead time, critical—the shelf count of the item (actual balance on-hand stock levels) and record count (how many your records say are supposed to be here) will match.

The traditional method of determining if actual balance on-hand stock levels match book/record levels is to take an annual physical inventory. As a method of correcting inventory accuracy problems, this costly and time-consuming effort is riddled with deficiencies. Why? Consider the following:

- Accuracy is often defined in dollars rather than in actual physical units. As discussed in Chapter 1, the dollar value of product does not reflect exactly what items are in-house. For example, imagine you sent out a thousand cases of peaches to a customer rather than the thousand cases of pears actually requested. An annual inventory would reflect an overall dollar value roughly equal to whatever it would have been even if the correct item had been shipped. Therefore, our shelf count is off a thousand over for one SKU and a thousand under for another with no discrepancy in accuracy—if accuracy is measured in dollars.
- Misidentification of product. As discussed in Chapter 3, product within a facility is misidentified for a variety of reasons. During annual inventories, misidentification often occurs because inexperienced counters assisting with the effort do not recognize items, misunderstand package descriptions, and so on.
- Misidentification of units of measure. Incorrect quantities are often written down during annual inventories because counters simply do not understand an SKU’s pack size, pack size descriptions, or abbreviations on packaging.
- Discrepancies “adjusted away.” Perhaps the greatest problem with using the annual inventory as a method for establishing accuracy is that it provides no method for backtracking through physical and paper transactions to determine why an item’s shelf count and its record count do not agree—a 12-month time period is simply too long of an audit trail. Consequently, if the reason for a discrepancy cannot be immediately found during the inventory, an adjustment is made with the underlying cause of the error never being corrected.

At the end of an annual inventory, after all of the adjustments have been made and after the lights have been turned off, you have an inventory shelf and record count that agree. At least they agree until the next morning when the same system that spawned the discrepancies found during the effort reasserts itself and a new group of errors is born.

Albert Einstein, the famous physicist, once said, “A problem stated is a problem half-solved.” Modern business writers like Peter Drucker have expressed a similar view, “A problem analyzed is a problem half-solved.” The sentiment expressed in these sayings, that reviewing the nature of inventory problems is a key step in solving them, provides you with a good starting point in resolving your own inventory-related issues.

Inventory System Failure: A Case Example

The following events in this inventory system failure case example have been numbered for ease of reference. The events described in the case example characterize common misunderstandings between different operating units within an organization, as well as timing and sequencing disconnects in inventory movement and information capture that cause inventory systems to fail. The case example is followed by a discussion and explanation of each of the events described.

1. Big Hammer, Inc., manufactures and distributes widgets. Manufacturing occurs at its Los Angeles, CA, plant. It distributes from two separate locations. One of these locations is in Kansas City, MO, and has been part of Big Hammer for many years. The other location is in New York, NY, and is the surviving portion of Paulex Co., a distribution company just purchased by Big Hammer.
2. Marc, Big Hammer’s president, has just reviewed operating reports from all three locations and is upset. It seems that the inventory accuracy level at all three locations is off. The end result is delayed production, too much inventory, and poor customer service. In addition, various department heads in all three locations clash with one another. To straighten everything out, he hires the consulting firm of Alana, Eric, and Shawn.
3. Alana goes to KC. Eric goes to NY. Shawn goes to LA.

4. The trio immediately discovers that NY is using a different software system than LA and KC. In addition, the LA/KC software was designed for distribution, not manufacturing. However, some modifications have been made to the LA/KC software to help with manufacturing applications.

5. The NY system allocates inventory on a real-time basis. In other words, as a pick ticket is generated for an item, the quantity in question is allocated to a specific order and is not available for any other customer—its paper life ceases.

6. The LA/KC system is a batch system. Items are relieved from stock at the time the system is updated. This usually occurs once per day when billing is done. A modification to the system backflushes[1] some items out of stock during the manufacturing cycle.

7. Eric wanders around the NY location and observes the following:

   7A. Salespeople, customer service personnel, clerical staff, and others freely roam through all stockrooms. Eric notices that some nonstockroom personnel fill their own orders, grab samples for customers, and put things back into the facility that they have previously removed.

   7B. Eric observes that some of these individuals document their actions immediately, while others document nothing, and others turn in necessary paperwork—later.

   7C. Eric observes Sally, a salesperson, peering intently at her computer screen. He hears her utter an oath and declare out loud, “I just saw a whole bunch of SKU #1234 out there a little while ago.” She then creates a manual invoice within the software system, prints it, walks out into the stockroom, fills the order she has just created, delivers it to customer Acme Widgets of the World, and later drops the signed delivery copy on the desk of her accounts receivables clerk.

   7D. Eric observes an angry exchange between the warehouse manager and the accounting manager of the NY location. They were arguing over a negative stock balance for SKU #1234.

   7E. Eric also observes Sally angrily telling the warehouse manager that one of her customers, Widgets, Gidgets, Gadgets and Such, was shorted 10 widgets on an order it received “just a little while ago.”

8. Alana has also observed some interesting things in KC.

   8A. Alana has observed two different order fillers attempting to fill orders for the same item—from the same empty shelf.

   8B. At 5 PM one evening, Alana was standing behind Carmen, the company’s billing clerk. Carmen’s inbox contained several inches of delivery slips ready for processing. Carmen got up and began to make preparations to go home. Alana asked her what she was doing. Carmen replied, “It’s 5 PM, I’m going home.”

   Alana said, “But you still have a lot of work in your inbox.”

   “So what? I’ll work on it tomorrow,” Carmen indignantly responded.

   “But you’ll mess up the warehouse if you don’t get those slips processed tonight,” Alana stated.

   Angrily, Carmen stated, “I work in accounting. I don’t work in the warehouse.”

   Alana asked, “How long would it take you to do those?”

   Carmen glanced at her inbox and replied, “About 30 minutes.”

   “Please stay and get them done,” Alana cajoled.

   “I can’t even if I wanted to,” Carmen said. “I’m not allowed any overtime.”

   Bill, one of Carmen’s coworkers, chimes in and says, “Why can’t you get your work done during the day?”

   Furious, Carmen turns on Bill and says, “Hey, you sort and distribute the mail every morning, run photocopies of all incoming checks while fighting with people over our one copy machine, and prepare and go out to make the daily deposit like I do; and then let’s see if you can get your stuff done.”

   8C. Hanging around the warehouse, Alana observed that receiving was done on a manual basis, and there wasn’t

always a copy of a PO in the warehouse to support incoming loads.

Alana noticed on several occasions that when receiving staff members did not have all appropriate paperwork for an item, they would simply put it away or move it off to the side. Then later, or the next day, they would hunt down all of the appropriate documentation and turn everything in to the data entry people for entry into the system.

Like Eric, Alana also observed nonstockroom individuals filling their own orders.

8D. Alana also observed a curious exchange between Franklin, the accounting manager, and Carmen, the billing clerk.

While attempting to create an invoice for an item, Carmen's computer screen flashed an error message indicating that she was trying to bill for something that had a zero stock balance in the system. The software would not let her bill for an item it did not reflect as being available for the subject sale.

Carmen called Franklin over. She showed him the signed delivery slip indicating that the item had, in fact, been delivered.

Franklin stated, "Those people in the warehouse can't get anything right." He then proceeded to manually override the system and entered the SKU (SKU #4567) and quantity in question (10). Franklin then directed Carmen to try again. The invoice was created without any further problems.

Mid-morning of the next day, the stock records began to show that there were 10 of SKU #4567 in the facility. A telemarketing salesperson sold 10 SKU #4567s that afternoon. A pick ticket was generated for the order. The order filler could not find any of SKU #4567 in the warehouse. A stock adjustment form is processed to take these 10 items out of stock.

8E. Alana overhears a telephone conversation between Carmen and a customer. The customer wants to return five SKU #9876s and wants to ensure that it is not charged for them. Carmen notes the information, prepares a pickup slip, and issues a credit to the customer's account.

Later that day, a salesperson sells five SKU #9876's. A pick ticket was generated for the order. The order filler could not find any of SKU #9876s in the warehouse. A stock adjustment form is processed to take these five items out of stock.

9. Meanwhile, Shawn has been talking to Ichiro, the inventory control clerk in LA. Ichiro is frustrated. He works hard at his job but can't seem to track work in process.[2] Consequently, he is never sure how much of any particular item the company has available for production purposes.

10. Shawn observes a worker disassembling a subassembly. He asks the worker what he is doing. The worker replies that there is a rush order for which they lack all of the raw materials, so they are disassembling some less important assemblies to cannibalize the required parts.

    Shawn asks if the products being disassembled are from other orders. The worker replies that they are. Shawn asks about any paperwork that was generated to support whatever it is the worker is doing. The worker replies that he doesn't know.

Set out below is a discussion and explanation of each of the events described above. For ease of reference, each event is restated and then followed by its debrief.

[1]***Backflushing*** refers to a software technique where raw materials and other components going into a particular subassembly or final product are relieved from stock when that subassembly/product is completed. If there were a seat and a leg assembly that goes into making up a stool, then upon completion of the stool these items would be deleted from inventory. Until the backflush occurs the respective parts, subassemblies, and so on remain in the record count. Contrast this to having each item relieved from stock as it is removed from the shelf for production purposes. Backflushing reduces the time and effort involved in tracking individual inventory transactions.

[2]***Work in process*** is used to describe raw materials, parts, and subassemblies as they are being used to produce the next higher level component or finished item in a bill of materials (the recipe of materials going into an assembly of some type).

Discussion of Example Case

Event #1. *Big Hammer, Inc., manufactures and distributes widgets. Manufacturing occurs at its Los Angeles, CA, plant. It distributes from two separate locations. One of these locations is in Kansas City, MO, and has been part of Big Hammer for many years. The other location is in New York, NY, and is the surviving portion of Paulex Co., a distribution company just purchased by Big Hammer.*

Any organization that has several locations must clearly answer the "who, what, when, where, why, and how" questions: Who is doing what? When are they doing it? Where are they doing it? Why are they doing it? and How are they doing it? If these questions are not answered, materials and information will not flow smoothly between and among the organization's separate departments.

Event #2. *Marc, Big Hammer's president, has just reviewed operating reports from all three locations and is upset. It seems that the inventory accuracy level at all three locations is off. The end result is delayed production, too much inventory, and poor customer service. In addition, various department heads in all three locations clash with one another. To straighten everything out, he hires the consulting firm of Alana, Eric, and Shawn.*

Although consultants are helpful in most instances, by applying the concepts contained within this chapter, you should be able to resolve many system problems your organization may be currently experiencing.

Event #3. *Alana goes to KC. Eric goes to NY. Shawn goes to LA.*

Event #4. *The trio immediately discovers that NY is using a different software system than LA and KC. In addition, the LA/KC software was designed for distribution, not manufacturing. However, some modifications have been made to the LA/KC software to help with manufacturing applications.*

Trying to integrate different software systems is always difficult. Once again, any organization hoping to achieve that result must clearly lay out the timing and sequencing of the information flow within the system.

In addition, the demand patterns for items in a distribution world and those in a manufacturing environment are radically different. Purchasing patterns for finished goods and spare parts in a distribution are based on past usage patterns. Purchasing patterns for the raw materials and subassemblies used in manufacturing are based on the master production schedule. Different concepts and formulae are used for each type of inventory and, therefore, software designed for one or the other or specifically written for a combination environment should be used whenever possible.

Event #5. *The NY system allocates inventory on a real-time basis. In other words, as a pick ticket is generated for an item, the quantity in question is allocated to a specific order and is not available for any other customer—its paper life ceases.*

The central problem often encountered in real-time systems is that there is often a time lapse between the creation of a pick ticket and the actual removal of the product from the shelves.

Since the items on the pick ticket were immediately allocated[3] to that order, with their paper life ceasing, those SKUs will actually be sitting on the shelves but won't appear in the then current record count.

Somewhere in the software files is the information: total items on hand, items allocated, and items actually available for sale or use. The problem is that not everyone in the organization has access to this information! If (a) staff members are allowed to fill their own orders and (b) do not understand how it is possible to check the then current stock records and see a lower number of items than are actually sitting in plain view, then (c) they will stop believing in the record count, will only believe their eyes, and will raid product allocated for other orders.

Event #6. *The LA/KC system is a batch system. Items are relieved from stock at the time the system is updated. This usually occurs once per day when billing is done. A modification to the system backflushes*[1] *some items out of stock during the manufacturing cycle.*

The most significant issue created by batch software systems is that items are physically gone from the shelves/building but still appear in the record count until the system is updated. The longer the length of time between updates, the more out of balance the shelf count and the record count are. Backflushing works well if the backflush occurs at each level of the bill of materials. See the discussion of Event #9.

Event #7. *Eric wanders around the NY location and observes what follows in Event #8.*

Event #8. *Salespeople, customer service personnel, clerical staff, and others freely roam through all stockrooms. Eric*

notices that some nonstockroom personnel fill their own orders, grab samples for customers, and put things back into the facility that they have previously removed.

Any organization hoping to always have its shelf count match its record count simply must stop all unauthorized personnel from touching anything in a stockroom or warehouse. In addition, authorized personnel must have a paper- or computer-based document before placing anything into or removing anything from storage areas. These points cannot be overstated. They are imperative to inventory accuracy.

Event #9. *Eric observes that some of these individuals document their actions immediately, while others document nothing, and others turn in necessary paperwork—later.*

Documentation created after something has been placed into or removed from a facility creates all sorts of problems. For example:

a. If an item is physically removed without a document deleting it from inventory, then salespeople, production schedulers, and others will believe that the item is still available for sale or use. They will then generate pick tickets for its selection. Order fillers will then waste their time looking for items that do not exist. The order fillers will generate adjustment forms leading to the items being deleted from inventory. Eventually, when the original documentation goes through the system, it causes these same items to be deleted from inventory—again. Your shelf count and record count are now almost hopelessly out of balance.

b. If an item is placed into the stockroom without accompanying paperwork, then the subject SKU is unavailable for sale or use—since no one knows it's there.

Event #10. *Eric observes Sally, a salesperson, peering intently at her computer screen. He hears her utter an oath and declare out loud, "I just saw a whole bunch of SKU #1234 out there a little while ago." She then creates a manual invoice within the software system, prints it, walks out into the stockroom, fills the order she has just created, delivers it to customer Acme Widgets of the World, and later drops the signed delivery copy on the desk of her accounts receivables clerk.*

Event #10 is an example of someone in a real-time software scenario who does not understand how it is possible to have a stock record (in the computer or on hard paper copy) that reflects a stock balance lower than the actual number of items on the shelves. Recall that the discrepancy is due to the time period between the creation of a pick ticket with its allocation of product to an order and the physical removal of the SKUs from the stockroom.

Event #11. *Eric observes an angry exchange between the warehouse manager and the accounting manager of the NY location. They were arguing over a negative stock balance for SKU #1234.*

Since this is a real-time system, when Sally created a manual pick ticket she caused the system to allocate and delete the subject SKU. If the stock balance was zero when Sally did this, her actions have caused the balance to go into a negative.

As discussed in Event #7 of this section, Sally's actions have also created the potential for a much different problem in an entirely different department of the organization. By forcing a manual invoice through the system and dropping off a delivery slip for billing, Sally has created the potential for a billing clerk to try to create an invoice for product that the system has never received into itself. Many accounting programs will not let an invoice be created for product that has never been received.

Event #12. *Eric also observes Sally angrily telling the warehouse manager that one of her customers, Widgets, Gidgets, Gadgets and Such, was shorted 10 widgets on an order it received "just a little while ago."*

In Event #7C it should be obvious that the product Sally took had already been allocated to a different customer (Customer #1) than the one she was taking care of at that time (Customer #2). Sally's actions caused her to raid Customer #1's order, causing a stockout for one of her own customers—Customer #1.

Event #13. *Alana has also observed some interesting things in KC.*

Event #14. *Alana has observed two different order fillers attempting to fill orders for the same item—from the same empty shelf.*

It is common in batch systems that are only updated once per day and in which there is no way to easily check (without going to look) the availability of an item for multiple orders to be written against the same "phantom" items. This also creates the danger of multiple adjustments adding to the overall confusion.

Event #15. *At 5 PM one evening, Alana was standing behind Carmen, the company's billing clerk. Carmen's inbox contained several inches of delivery slips ready for processing. Carmen got up and began to make preparations to go home. Alana asked her what she was doing. Carmen replied, "It's 5 PM, I'm going home."*

Alana said, "But you still have a lot of work in your inbox."

"So what? I'll work on it tomorrow," Carmen indignantly responded.

"But you'll mess up the warehouse if you don't get those slips processed tonight," Alana stated.

Angrily, Carmen stated, "I work in accounting. I don't work in the warehouse."

Alana asked, "How long would it take you to do those?"

Carmen glanced at her inbox and replied, "About 30 minutes."

"Please stay and get them done," Alana cajoled.

"I can't even if I wanted to," Carmen said. "I'm not allowed any overtime."

Bill, one of Carmen's coworkers, chimes in and says, "Why can't you get your work done during the day?"

Furious, Carmen turns on Bill and says, "Hey, you sort and distribute the mail every morning, run photocopies of all incoming checks while fighting with people over our one copy machine, and prepare and go out to make the daily deposit like I do; and then let's see if you can get your stuff done."

A number of issues are raised by the Event #15 scenario, including:

a. The morning following an incident like the one described will find everyone who deals with inventory—sales, accounting, production scheduling, customer service, and purchasing—making decisions on information they believe is as current as of the night before when the system was updated. The reality is that the information is no more current than the last time Carmen made it to the bottom of the inbox. If she hasn't made it to the bottom of her basket in several days, then the records and operations are really suffering.

The problem is compounded by the fact that roughly 20 percent of our inventory will represent 80 percent of our most important items. Therefore, not only does our shelf count not match our record count, but they don't match regarding some of our most important items.

b. Another problem revealed by the incident is that the organization does not recognize the importance of getting all receiving and shipping into and out of the building on both a real-life and paper-life basis every day. This is indicated by those duties assigned to Carmen that cause her not to complete her inventory-related tasks on a daily basis. Although these duties are important, they should be performed by someone whose actions do not have the ripple effect that Carmen's actions have throughout the entire organization.

Event #16. *Hanging around the warehouse, Alana observed that receiving was done on a manual basis, and there wasn't always a copy of a PO in the warehouse to support incoming loads.*

Alana noticed on several occasions that when the receiving staff members did not have all appropriate paperwork for an item, they would simply put it away or move it off to the side. Then later, or the next day, they would hunt down all of the appropriate documentation and turn everything in to the data entry people for entry into the system.

Like Eric, Alana also observed nonstockroom individuals filling their own orders.

Virtually every organization has a purchase order system. And, in virtually every organization, anyone with the authority to buy something is repeatedly told to have a PO for everything. In spite of those facts, in many organizations product comes in daily without any supporting documentation. This causes confusion, inefficient receiving operations, and separates an item's real life from its paper life. (See also Chapter 1.) There should be either a hard copy or a record of the PO in the computer system available to receiving for all items that arrive at the stockroom.

When an item's real life becomes separated from its paper life, people begin to ship or use product that has not been received; to put away product that has not been received so that no one knows it is available for sale or use creates an environment where inventory clerks and accounting personnel are making adjustment after adjustment to the record count.

Event #17. *Alana also observed a curious exchange between Franklin, the accounting manager, and Carmen, the billing clerk.*

While attempting to create an invoice for an item, Carmen's computer screen flashed an error message indicating that she was trying to bill for something that had a zero stock balance in the system. The software would not let her bill for an item it did not reflect as being available for the subject sale.

Carmen called Franklin over. She showed him the signed delivery slip indicating that the item had, in fact, been delivered.

Franklin stated, "Those people in the warehouse can't get anything right." He then proceeded to manually override the system and entered the SKU (SKU #4567) and quantity in question (10). Franklin then directed Carmen to try again. The invoice was created without any further problems.

Mid-morning of the next day, the stock records began to show that there were 10 of SKU #4567 in the facility. A telemarketing salesperson sold 10 SKU #4567s that afternoon. A pick ticket was generated for the order. The order filler could not find any of SKU #4567 in the warehouse. A stock adjustment form is processed to take these 10 items out of stock.

From Event #16, it appears here that someone delivered an item that had not yet gone through the paperwork receiving cycle. Then when Carmen tried to bill for it, the software would not let her.

Instead of researching what had actually happened, Franklin overrode the system and put in a quantity of 10. Carmen's billing then deleted the 10 items.

When the receiving paperwork finally made it through the system it created a quantity of 10 items that were no longer in the building. These 10 phantom items were then sold—maybe more than once.

When the 10 items could not be found, additional paperwork had to be initiated to delete the SKUs from the system.

All of the above issues are caused, in part, by a lack of understanding on the part of various staff members of how the timing and sequencing of the system works.

Event #18. *Alana overhears a telephone conversation between Carmen and a customer. The customer wants to return five SKU #9876s and wants to ensure that it is not charged for them. Carmen notes the information, prepares a pickup slip, and issues a credit to the customer's account.*

Later that day, a salesperson sells five SKU #9876's. A pick ticket was generated for the order. The order filler could not find any of SKU #9876s in the warehouse. A stock adjustment form is processed to take these five items out of stock.

Although application software systems vary widely in how items are accounted for, many systems place an item back into stock (in the database) when a credit is issued against that item. By issuing a credit, Carmen caused the software system to place the five SKUs back into stock—even though they had not yet been returned to the building.

Again, a lack of understanding regarding timing and sequencing of software and events causes terrible dysfunctions to stockroom operations.

Event #19. *Meanwhile, Shawn has been talking to Ichiro, the inventory control clerk in LA. Ichiro is frustrated. He works hard at his job but can't seem to track work in process.*[2] *Consequently, he is never sure how much of any particular item the company has available for production purposes.*

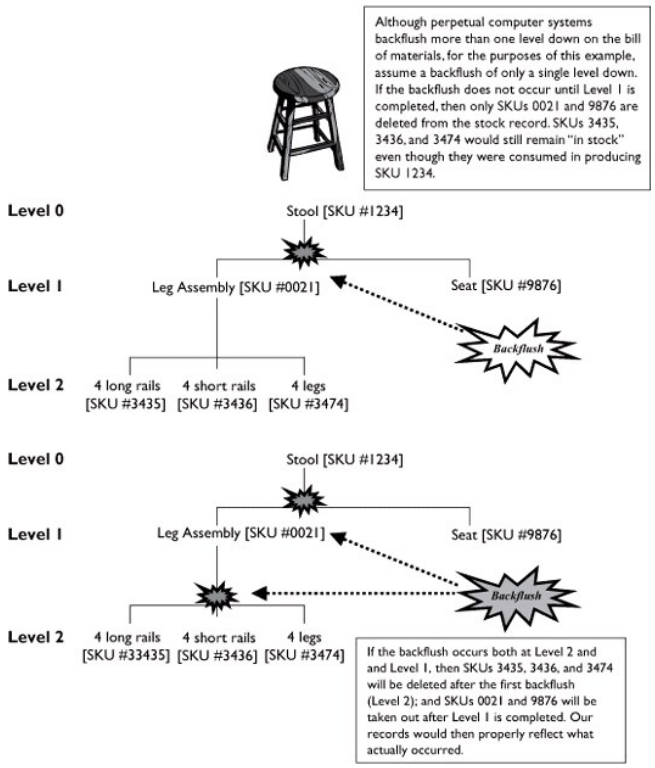
As indicated in Event #4, a key problem Ichiro faces is that the company is using two separate methods of relieving items from stock. One method is batch, while the other is a backflush of some items. Recall that backflushing refers to a software technique where raw materials and other components going into a particular subassembly or final product are relieved from stock when that subassembly/product is completed.

As indicated in the discussion of Event #6, if a batch system is not updated with some degree of frequency, it is difficult to understand what is available without actually looking. This problem can be overcome through software modules that advise the stockkeeper of those SKUs that have gone into completed orders. This report shows a running total for each SKU that has been drawn down that day. Once the system is updated, then a new report begins.

The key issue regarding backflushing is whether the backflush occurs at every level of the bill of materials. See Exhibit 6–

1. (A similar example is also used in Exhibit 5–4.) If the backflush only goes down one level, but no backflush occurred at that next lower level, then all materials below that level will still appear to be in stock. In reality they have been used up.

Exhibit 6-1: Backflushing



Event #20. *Shawn observes a worker disassembling a subassembly. He asks the worker what he is doing. The worker replies that there is a rush order for which they lack all of the raw materials, so they are disassembling some less important assemblies to cannibalize the required parts.*

Shawn asks if the products being disassembled are from other orders. The worker replies that they are. Shawn asks about any paperwork that was generated to support whatever it is the worker is doing. The worker replies that he doesn't know.

[3]***Allocation*** refers to an item being tied to a specific order. "Relieving" an item refers to it actually being removed from stock in terms of both its paper life and its real life.

Metrics

> ***"You can't control what you don't measure."***
> - Peter Drucker

Before doing *anything* toward establishing methods to discover, analyze, and fix any discrepancies between actual on-hand stock levels and database record levels, you should take a snapshot of where you are *now*. There are two sets of numbers you should develop that relate to (a) *inventory record accuracy (IRA)* and (b) *fill rate*.

IRA is a reflection of how well your shelf count and record count match. In other words, do your stock records accurately reflect what is actually in the stockroom?

Fill rate is a reflection of how effective your inventory is. Did you have what you needed when you needed it?

Inventory Record Accuracy

An excellent way to establish a benchmark of how accurate your inventory records are "right now" is to take a test count.

Test Counting

A quick, accurate method of establishing your current IRA is to perform a test count:

- Select 100 SKUs that represent a cross-section of all items. In other words, select all sorts of items—fast movers, slow movers, expensive items, inexpensive items, and those with both long and short lead times to acquire.
- Count all 100 in all locations where they are located. Measure accuracy by considering actual units on the floor—not dollar value.
- Divide the number of accurate counts by the total number of counts. Accurate counts mean where the record count and the shelf count exactly match.
- Quotient is your inventory record accuracy. See Exhibit 6–2.

Exhibit 6-2: Test Counting to Establish Inventory Record Accuracy

$$\frac{\text{Accurate Counts}}{\text{Total Counts}} = \text{Inventory Record Accuracy} \quad \frac{87}{100} = .87 = 87\% \text{ IRA}$$

Tolerances

How accurate does accuracy have to be? You may think, at first, that accurate means that 100 percent of the time your stock records match your shelf counts. Consider, however, your feelings about counting a large container of nails.

In counting a large container of nails, would you actually count each nail individually? It is more probable that you will (a) weigh out one pound of nails, (b) count the number of nails in a pound, (c) weigh all of the nails, and (d) then compute the total number of nails by comparing the number of nails in a pound to the number of pounds of nails in the container. Will your computation capture the exact number of nails in the container? Probably not. Do you really care? Probably not. Why? Because of the nature of the SKU in question, in this case nails, is low cost, easy to acquire, and hard to count individually (if there is a large quantity of them). Therefore, you would probably be willing to accept some percentage of tolerance in your numbers. If you were within ±5 percent of a perfect match between the record count and the shelf count, would you be satisfied? Probably so. Would you be equally satisfied applying the same approach to a large container of diamonds? Of course not.

Many organizations allow a variance or tolerance in considering IRA. That is, they allow a plus-minus percentage of accuracy they find acceptable. These tolerances can be set using dollars, actual units, or some combination of the two. Most accountants use dollars. Stockkeepers should use actual units: It's either here or it isn't.

Few organizations accept a tolerance of greater than ±5 percent on any item. In other words, a 95 percent tolerance should be the lowest variance from a 100 percent accuracy level you will accept for any item no matter what its characteristics.

If you will accept tolerances, they must be set for each item or category of item with great care. Consider the following factors:

- Dollar value: The higher the dollar value, the more accuracy you will demand.
- Usage rate: Usage rate can actually be argued in two ways:
  - The Higher-the-Usage-Rate-the-Lower-the-Tolerance-Level Argument: If you are using a large quantity of an item, you will want to always know how much is available so there is never a stockout.
  - The Lower-the-Usage-Rate-Lower-the-Tolerance-Level Argument: If an item is not moving very quickly, then why should there be any discrepancy between shelf and record count? A low variance percentage for a slow-moving item will alert everyone to a problem quickly, as opposed to waiting for a crisis. This argument assumes that if there are stockouts on higher-moving products, then the situation will alert everyone anyway.
- Lead time: The longer the lead time, the lower the tolerance level. A long lead time requires more working reserve and safety stock. See also Chapter 5.

- Level on bill of materials: The higher something is on the bill of materials, the more overall value it has. Therefore, the higher on the bill of materials an SKU is, the lower the tolerance.
- Criticality: Some items are critical for reasons other than dollar value, usage rate, or lead time. A safety equipment company may only sell a few biohazard cleanup suits per year, but when they are needed they are needed immediately.
- Combination of the above

In the following scenario, you'll find an example of considering tolerances.

Melvin, President of Megawatts, Inc., doesn't believe in allowing any tolerances in his inventory levels. His friend, Sarah, President of Bright Lights Co., does.

A cross-section of 100 items was counted in each of these companies' facilities.

The actual stock count on 87 SKUs in each facility matched the respective companies' stock records.

Bright Lights allowed a variance of ±2 percent on 5 of the 13 items that were not 100 percent accurate. The count of these 5 fell within their respective tolerances.

$$\text{Megawatts: } \frac{87}{100} = 87\% \text{ accuracy}$$

$$\text{Bright Lights: } \frac{92}{100} = 92\% \text{ accuracy}$$

Melvin argues that Sarah's higher IRA level is artificial and doesn't really reflect accuracy.

Sarah's approach does reflect an acceptable level of accuracy if the tolerances were carefully set. As in the container of nails example, if we (1) weighed a large container of nails and determined there were 14,003 nails, (2) entered that total into our records, (3) reweighed the nails and determined there were 14,010 nails, would we change our records? Probably not. The second total would fall within an acceptable tolerance.

Once you have set tolerances, you should not make adjustments to your records when a discrepancy between shelf and record counts falls within the variance allowed. If an item does fall outside of the tolerance range, you would hunt down the reason for the discrepancy and adjust the record if necessary. See Exhibit 6–3.

Exhibit 6-3: Tolerances and Adjustments

Assume that a count was made of 10 SKUs, with the results being as follows:

SKU	RECORD COUNT	ACTUAL COUNT	% DEVIATION	% TOLERANCE	HIT/MISS
1	1,200	1,128	–6%	2%	M
2	2,217	2,106	–5%	5%	H
3	317	304	–4%	5%	H
4	8,947	8,679	–3%	2%	M
5	100	98	–2%	5%	H
6	567	561	–1%	2%	H
7	100	100	0%	0%	H
8	1,367	1,381	+1%	0%	M
9	1,432	1,461	+2%	2%	H
10	185	191	+3%	5%	H

SKUs 1, 4, and 8 fell outside of their tolerances. For example, if the count for SKU 1 would have fallen within the range of

1,176 to 1,224, ±2 percent of the record count, then it would have been a hit. It was not. Therefore, you would research why the discrepancies exist and adjust your records if necessary.

All of the other SKUs fell within their tolerances. However, only SKU 7 was exactly correct. You would still not make any adjustments to any SKUs where there was a hit. The variance percentages you set should allow you a comfortable range in which you can tolerate some up or down differences. Often pluses and minuses cancel one another out over time.

Fill Rates

Although matching shelf count to record count is one way of measuring inventory, it does not indicate if you have the items you need when you need them. Simple fill rate calculations achieve that objective. The fill rate looks at the qualitative nature of your inventory efforts.

Fill Rate Formulae

Simple Fill Rate:

$$\text{Fill Rate} = \frac{\text{Items Shipped on a Given Day}}{\text{Items Ordered for Shipment on a Given Day}} \quad \frac{\text{417 Items Shipped}}{\text{447 Items Ordered}} = 0.93 = 93\% \text{ Fill Rate}$$

The above indicates that you had 93 percent of the items you needed on the day they were required.

The fill rate can reflect the availability of a single item or a grouping of items.

Stockouts Per Year:

$$\text{Stockout \%} = \frac{\text{Number of Days Where all Orders Were Not Shipped Complete}}{\text{Total Number of Shipping Days During the Year}} \quad \frac{34}{200^{4}} = 0.17 = 17\%$$

This indicates that you were unable to send all orders out complete 17 percent of the time. Stated more positively, you were able to send orders out complete 83 percent of the time.

Tools with Which to Uncover System Dysfunctions

To solve problems you need to engage in:

- Fact finding—what is happening now?
- Problem finding—what is wrong with what is going on?
- Solution finding—how can we fix what is wrong?

So far this chapter has focused on (a) beginning to analyze inventory problems in an intellectual, intuitive, “gut feel” manner, and (b) developing some measurements with which to understand your current level of inventory accuracy and availability. This is part of fact finding.

Another way of determining what is actually happening at your facility is to create a number of charts.

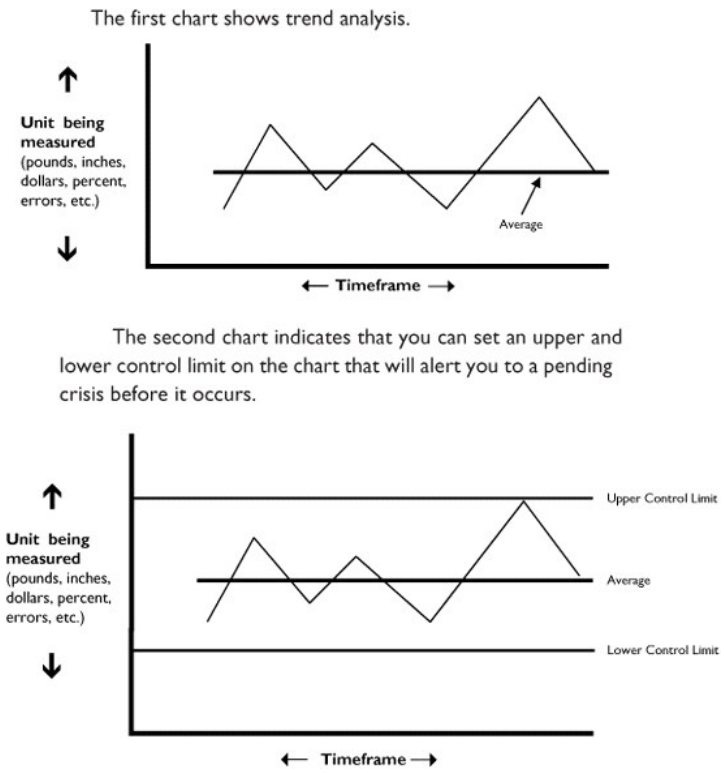
Charts, by their very nature, allow you to analyze things. However, you need to guard against “paralysis by analysis.” If everything is equally important, then nothing is important. In other words, you should only chart things that are really important to controlling inventory items, trends, operational undertakings, and so on.

Run Charts

Run charts allow you to measure a variable that changes over time.

A run chart is an *x*–*y* axis chart with the unit of measure appearing on the vertical *y*-axis, and the timeframe running along the horizontal *x*-axis. The unit of measure can be anything you wish to track such as stockouts, errors, labor hours, pieces, pounds, or gallons. The timeframe can also be whatever you desire it to be such as seconds, minutes, hours, days, weeks, months, or years. See Exhibit 6–4.

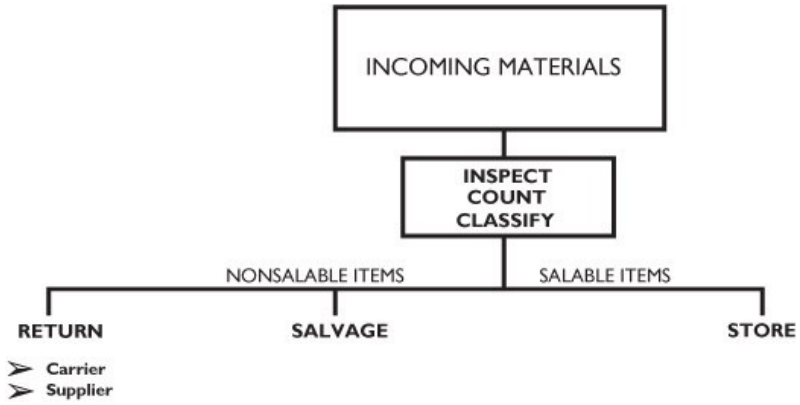
Exhibit 6-4: Run Charts



Flow Charts

Flow charts allow you to analyze the sequence of a set of events. A flow chart does not necessarily show the interdependence of events or which events are going on at the same time as others.

Flow charts are easier to understand than written procedures.



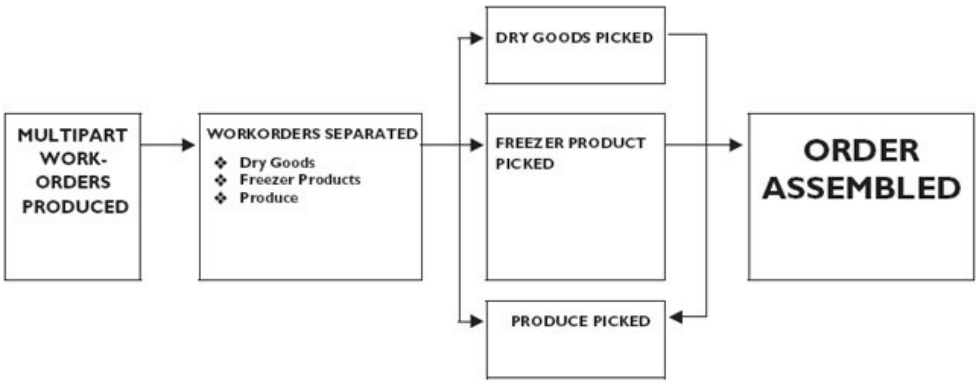
Caution:

- You do not have to use traditional flow chart symbols. Be consistent, however, with the symbols you do use or you will confuse yourself and others. Provide a key to symbols.

- Have version control. If flow charts are not revised as procedures change, they are worthless.

Logic Charts

Logic charts are flow charts that show the interrelationships of events.



Variance Reports

Variance reports compare an expectation with what actually occurred.

Variance reports can be based on any factor necessary for tracking an expectation. Some factors are dollars, labor, consumption rates, lines/pieces per hour, or trucks per day.

VARIANCE REPORT				
			VARIANCE	
DESCRIPTION	PROJECTED	ACTUAL	AMOUNT	PERCENT
TOTAL				

Cycle Counting

After becoming familiar with your system through utilization of the techniques described in this chapter, you should be ready to systematically approach “fixing” whatever might be causing discrepancies between your shelf and record counts.

The most systematic method of solving inventory problems and enjoying a consistently high IRA is cycle counting. Cycle counting is simply counting a statistically significant cross-section of your inventory frequently.

This continuous counting leads to the discovery of discrepancies soon after they arise. By catching an error quickly, you can backtrack through both the paperwork and the stock movement of the item(s) to determine why that SKU’s paper life became separated from its real life. Once the cause of the error is identified, it can be eliminated.

Since this is a continuous process, as one cause of error after another is eliminated the system begins to operate more and more smoothly. Eventually all items move through a series of procedures that work.

Cycle counting is different than an annual inventory in several ways.

Annual Inventories

In a nutshell, the objective of an annual physical inventory is to satisfy an accounting need.

Objectives:

- The objective of the annual physical inventory is to produce a financial valuation of the inventory on a given day.

- Every item must be counted as part of the annual inventory.

The 12-month-long audit trail of the annual physical is too long for any serious effort made at uncovering why an error occurred or even when—did it happen yesterday, last month, 10 months ago?

Cycle Counting

In a nutshell, the objective of cycle counting is to identify and correct system failures that result in inaccurate inventory records.

Objectives:

- Discover discrepancies soon after they occur
- Identify causes of errors
- Correct conditions causing errors
- Continuous process improvement
- Minimum of 95 percent accuracy on ALL items
- Correct statement of inventory assets

Eliminate annual inventory. Most accounting firms will allow an organization to stop taking annual physical inventories once the company has established a mature cycle counting program. Generally, a company will cycle-count for at least 12 months. Then, an annual physical inventory is taken and the numbers from the annual are compared with the cycle count figures. If they match, then in the future the accounting firm will merely test-count once per year for valuation purposes.

Not every item in the building has to be counted as part of a cycle count, only a statistically significant cross-section of all items.

Cycle Count Methodologies

There are a number of cycle count methodologies.

- Control Group
- Location Audit
- Random Selection
- Diminishing Population
- Product Categories
- A-B-C Categorization

A key point to remember is that no matter what cycle count methodology you eventually choose to follow, when you first begin and your inventory record accuracy is low, you will not count a large number of items per day. This is because it will take time to recount, review paperwork, talk to people, and do all of the other things necessary to determine why an item's record count and shelf count do not match. Why count 50 items a day if you can only count and reconcile 10 of them? As your record accuracy increases, and more and more items match their record counts, you can comfortably count more items each day.

Any cycle count methodology will assist you in achieving high levels of IRA. However, not every method works in every company setting. For example:

Assumptions:

- You wish to cycle-count each item four times per year
- Cycle-count 200 days per year (4 days/wk × 50 wks = 200 count days)[4] 10,000 SKUs

- Three cycle counters working 7 hours per day
- Company A has 10,000 items that are unitized and in single locations within the stockroom
- It takes Company A an average of 2 minutes to count an item

Company B has 10,000 items that are not unitized, would have to be counted in “onesy-twosy,” and each item is found in multiple locations throughout the facility

It takes Company B an average of 5 minutes to count an item

Company A	Company B
10,000 SKUs x 4 counts/yr = 40,000 counts	10,000 SKUs x 4 counts/yr = 40,000 counts
40,000 counts ÷ 200 days = 200 counts/day	40,000 counts ÷ 200 days = 200 counts/day
200 counts/day x 2 minutes = 400 minutes	200 counts/day x 5 minutes = 1,000 minutes
400 minutes ÷ 60 minutes = 7 hours/day	1,000 minutes ÷ 60 minutes = 17 hours/day
7 hours/day ÷ 3 counters = 2.33 hours/day each	17 hours/day ÷ 3 counters = 6 hours/day each

Treating all items equally and counting them four times per year *may* work for Company A, but it seems an unreasonable burden for Company B.

You should select a method that fits your own organization’s resources and inventory types.

Control Group Cycle Counting Method

No matter which method you eventually decide to use, always start with a small-scale counting test run. By using a control group approach you will be able to:

- Immediately identify significant system problems, such as unrestricted access to the stockroom, major timing problems related to when product is moved, and when records of the move are updated.
- Develop an understanding of the who, what, when, where, why, and how of the way your system actually works.
- When you first begin cycle counting you will probably make adjustments only to find that you made a mistake. It is much simpler to correct errors related to only a few SKUs rather than hundreds of them.

Control Group Procedure

Set out below is a step-by-step procedure for using a control group to teach yourself basic cycle counting techniques.

- Select 100 items as a control group. IMPORTANT: The SKUs selected must be a true cross-section of the entire population of items they represent, such as some expensive items, some inexpensive, some fast movers, some slow, or some with a long lead time, etc.
- Count only 10 items per day. Use a Control Group Count Tracking Sheet. See Exhibit 6–5.
- Count for 100 days.
- Stats: 10 × 100 = 1,000 counts
- “Cycle” is 10 days
- Each item counted 10 times during test

Exhibit 6-5: Control Group Count Tracking Sheet

	SKU #	DESCRIPTION	1	2	3	4	5	6	7	8	9	10
1	BD79	Widget	✓	✓								

2	QD455	Gidget	✓	✓
3	XD110	Gadget	✓	✓
4	PD418	Thig-a-ma-jig	✓	✓
5	AC123	Doohickey	✓	✓
6	ZG23	Receiver	✓	✓
97	HG786	Receiver Mount	✓	
98	LK951	Miniplexer	✓	
99	LK236	Multiplexer	✓	
100	DK47	Radome	✓	

Because you have tracked the same items over and over again, at the conclusion of your control group cycle count you should be able to eliminate major systems problems and have a good understanding of how your overall inventory system is working.

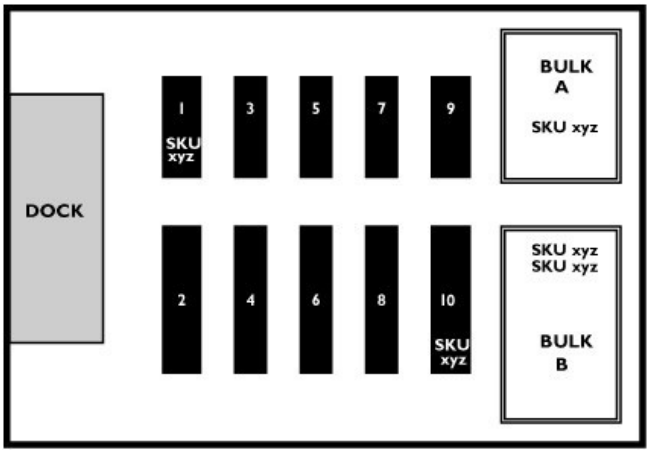
The control group approach should only be used as a starting point and not as an ongoing cycle count method. The reason for this is that the control group is not statistically large enough to actually represent your entire inventory.

Now you are ready to select a cycle count method that best suits your own organization's needs.

Location Audit Cycle Counting Method

In this approach, you divide the stockroom(s) up in some logical method—rooms, racks, bins, and so on. See Exhibit 6–6. Then on each counting day you count the SKUs found in those areas.

Exhibit 6-6: Example of Dividing Stock into Geographic Areas for a Location Audit Cycle Count



All items are treated equally. In other words, selection of those items included on that day's count is based solely on the item being located in the area counted. No other characteristics, such as cost, usage rate, and so on, are considered.

The length of the cycle depends on how many areas are to be counted. For example, if you were counting by rack, one rack per day, and there were 45 racks, then the entire cycle would be 45 days. You would then start over again.

The location audit approach has two significant benefits:

1. This approach does not require detailed recordkeeping of whether or not you have counted a specific item or the exact number of times you have counted it. It is administratively simple to follow.

2. This approach serves as a double audit because you are checking the quantity of an item at the same time that you are checking to make sure it is in the right location in your facility. Product that has been misplaced can be "discovered" sooner than the annual inventory through the use of this method.

Two separate approaches are possible regarding how much of any selected SKU gets counted:

1. Only count the SKU in the location being cycle-counted that day.

   Example: Count only the quantity of SKU xyz in Rack 1. See Exhibit 6–6. Item xyz located in Rack 10 and in both bulk storage areas are ignored.

   This first approach requires a higher level of sophistication within your own inventory control system. Your system must allow you to identify not only how much of an item you have, but also each location it is located in and how much of it is in each location. See also Chapter 3, Physical Location and Control of Inventory.

   This first approach forces you to keep your shelf count and record count accurate on an ongoing basis.

2. Count the selected SKU in all locations where it may be located throughout the facility.

   Example: Quantities of SKU xyz counted in Racks 1 and 10 and in both bulk areas.

   With either locational audit approach, the warehouse will be counted wall to wall during the cycle. However, this does not mean that all items in the stockroom during that cycle will actually be counted.

   Not all items in the stockroom during the cycle will be counted because items will arrive into and leave from areas already counted or to be counted during the cycle. In other words, SKUs will be coming in behind you and moving away from in front of you as you go through the count. Does it matter if every item in the stockroom is counted during a location audit cycle? It does not matter that all items are not counted during any particular cycle because of the large number of items that are counted during that cycle. Remember that in cycle counting, you are interested in looking at the system, not individual SKUs within the system. Whether or not a SKU's shelf and record counts match is merely a way of determining if the system is actually working. Therefore, as long as you count a statistically significant number of the total items in the stockroom, you will accomplish the cycle count objective.

Random Selection Cycle Counting Method

This is probably the easiest form of cycle counting. The items selected for counting are totally random. However, the SKUs selected must be a true cross-section of the entire population of items they represent: some expensive items, some inexpensive, some fast movers, some slow movers, some with a long lead time.

The cycle is generally one year with a statistically significant number of SKUs being counted during that timeframe. For example,

- 10,000 total SKUs
- 200 counting days
- Therefore, 50 items/day counted (10,000 ÷ 200 = 50)
- 10,000 total counts during the year—a statistically significant number!

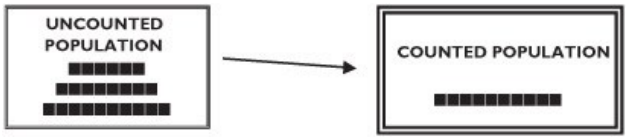
All items are treated equally. Product characteristics like dollar value and usage rate are ignored.

Diminishing Population Cycle Counting Method

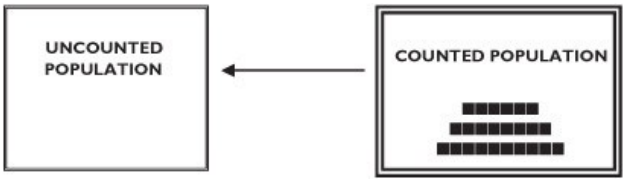
This is a versatile approach. It can be used as a stand-alone procedure or used as part of the product category approach or the A-B-C approach, which are both explained later in this chapter.

The basic concept is to:

1. Count each item in a defined population before counting any item over again.



2. Then you begin the count all over again.



The diminishing population technique ensures all items in the population are counted at least once per cycle.

The number of times the total population is counted during a year depends on the size of the total number of items there are and how many days you are willing to count. See Exhibit 6–7.

Exhibit 6-7: Diminishing Population Cycle Counting

EXAMPLE:

- 900 total SKUs
- 200 counting days in cycle
- 900 ÷ 200 = 4.5 > 5 items/day
- 1,000 total counts/yr

EXAMPLE:

- 900 total SKUs
- 100 counting days in cycle
- 2 cycles per year
- 900 ÷ 100 = 9 items/day
- 1,800 total counts/yr

EXAMPLE:

- 900 total SKUs
- 50 counting days in cycle
- 4 cycles per year
- 900 ÷ 50 = 18 items/day
- 3,600 total counts/yr

The larger the number of items counted per day the more cycles can be completed during the year.

Product Categories Cycle Counting Method

To this point in our cycle count discussion, we have ignored an item's characteristics. In the product categories approach, the organization decides on what categories it wishes to place SKUs into based on some characteristics, such as by manufacturer or by type of use (the "criteria").

Items matching the criteria are counted either on the basis of:

a. a single even (e.g., only items whose balance-on-hand equals zero), or

b. using the diminishing population technique for each separate category: all of the widgets this week, all of the gadgets next week, all of the gidgets the week after, and so on.

The number of items to be counted can vary or be set by the number of items in the group divided by the number of days in the cycle. See Exhibit 6–7.

Cycle can be a single day or a defined number of times per year.

Single Criteria

You should be careful of using single event characteristics in defining categories. For example:

Criteria: Only cycle-count items on that day's purchase orders.

Benefits:

1. Ensures that correct quantity is being ordered.
2. Allows for count when stock level is at a low point. Makes it easier to count.

Problems:

a. Only the fastest moving items receive attention. Expensive but slower use items might be ignored until there is a crisis.

b. A true cross-section of all types of SKUs won't be represented until a large part of the year will have past and when POs for most items will have been written and released.

c. Ignores completely items that are not ordered during a given year such as where the quantity on hand exceeds your use for that entire year.

Criteria: Only cycle-count items at zero or negative balance

Benefits:

1. Negative balances should always trigger a count.

2. Items at zero should be easy to verify.

Problems:

a. Neither of these is statistically significant and both fail to represent a cross-section of all items.

Using the Diminishing Population Technique with Product Categories

- Define the criteria by which each SKU will be placed into a category.
- Decide sequence in which categories will be counted: all manufacturer X's products this week, all of manufacturer Y's products next week.
- Divide the number of SKUs in the category by the number of days to determine how many must be counted per day. See Exhibit 6–7.
- Move to the next category.

The product categories method of cycle counting involves a great deal of administration but provides you with more detailed information and audit trails as to what you have actually done during a cycle count.

A-B-C Analysis Cycle Counting Method

The most sophisticated method of cycle counting, and the one preferred by most accountants, is to break your inventory up into A-B-C classifications. Items are not treated equally. Based on classification, the A items will be counted more frequently than the B items, and the B items will be counted more frequently than the C items.

The A-B-C method may not be appropriate to your particular business. This approach is based on the items in a particular category actually being part of the active inventory throughout an entire 12-month cycle count period. In other words, if you wish to count the A Category items 12 times per year, they must actually be part of the inventory throughout that year.

If your business is highly seasonal or by its nature features an ever-changing product or item base, then the A-B-C method is not appropriate.

An example of a business where the A-B-C method is probably not appropriate would be a "job shop" manufacturer. Job shops produce an item pursuant to a specific order. Therefore, although the organization will certainly use a number of standard items it always has on hand for that job, many of the things it uses will be obtained for that order alone. These specific items will be purchased, used, and not replaced. They will not be around long enough to be part of an A-B-C count cycle. A method that analyzes items "in the house" at a given point in time would be more appropriate in a job shop environment.

The classifications in the A-B-C method are based on "Pareto's Law"—the 80–20 Rule. See Chapter 3 for a discussion of Pareto's Law and of how to determine which SKUs go into which categories using a single criterion for establishing *value*.

For cycle counting purposes, classifications are determined by "value." Value could be based on money, usage rate, acquisition lead times, the critical nature of an item, or a combination of two or more factors.

Because Chapter 3 deals with item placement, usage rate was used as the value criterion.

There are a number of problems with using a single criterion to establish your A-B-C categories for cycle counting purposes, including:

- The criterion used may not be reflective of the entire inventory. For example, if you use dollar value alone, a number of high-dollar items that are infrequently sold or used would become A Category items, while low-dollar items that are used or sold in large quantities would become C Category items.
- Different departments in your organization have different and sometimes conflicting interests. For example, individuals charged with balance sheet responsibilities will be concerned with dollar value, while stockkeepers and production managers will be more interested in quantities and usage rates. Purchasing agents will have the additional concerns of acquisition lead times and the criticality ("Just gotta have it when we need it") of various items. By using a single criterion you will almost certainly alienate someone.

Because of the problems associated with using a single criterion to establish A-B-C categories for cycle counting purposes, this author strongly recommends that you use at least two criteria. The technique for blending two (or more) criteria into a single blended value for your analysis is explained below.

Step-By-Step Implementation of the A-B-C Cycle Count Method

You can create a single value from two or more criteria by multiplying the values of one criterion by the values of another criterion. Then you use the blended value for your analysis. Here's how you do it:

- Perform Pareto analysis of SKUs utilizing desired criteria. See Chapter 3 and Exhibit 6–8.
- Assign SKUs into A-B-C categories. See Exhibit 6–9.
- Decide count frequency of each category. See the section, "Determining A-B-C Count Frequency," below.
- Multiply respective number of SKUs per category by desired frequency to establish total counts. Cycle is assumed to be one year. See Exhibit 6–10.
- Divide total counts by the number of count days (for example, 200 days per year) to determine number of items to be counted each day. See Exhibit 6–10.
- Ask yourself, Is this a reasonable number of daily items? If "Yes," proceed. If "No," then change the frequencies and recalculate until a reasonable daily total is established.
- Determine how many items from each category will be counted each day. See Exhibit 6–10.
    - Divide the number of annual counts within each category by the total (annual) number of counts. This establishes the percentage of counts represented by the respective categories when compared to the total counts.
    - Multiply the A, B, and C percent of total by the number of items to be counted daily. This establishes the quantity of each category to be counted each day.
- Count each category the desired number of times using the diminishing population technique.

Exhibit 6-8: Pareto's Analysis Using Two Criteria

1	Column A =	Total number of SKUs (discrete items)
2	Column B =	Item's specific identification number
3	Column C =	Item's description
4	Column D =	Item's unit cost
5	Column E =	Item's annual usage
6	Column F =	Derived from multiplying Column D by Column E. Column F represents the SKU's "blended" usage/cost value

		AFTER STEP 6 — Sort Columns B, C, D, E, and F in descending order, using Column F as the primary sort field. [NOTE: Columns B, C, D, E, and F constitute the sort range. F is the field used to sort the range.] THEN:
7	Column G =	Derived by adding every row of Column F to the sum of all rows above it. This cumulative value column allows for the calculation of a blended percentage value of all items for selected groupings (A-B-C) of items.
8	Column H =	Derived from dividing each row of Column G by the sum (last value in column) of Column G. Column G represents the blended percentage value of all items for selected groupings (A-B-C) of items.
9	Column I =	Percentage of all SKUs represented by a grouping of items. Derived by dividing each row of Column A by the last number of Column A.

A	B	C	D	E	F	G	H	I
Line No.	Part No.	Description	Unit Cost +	Annual Usage +	Annual Usage Value	Cumulative Usage Value	% Total Value	% Total Items
1	AB103	Item LM	21.60	3,022	65,275.20	65,275.20	3.6%	0.3%
2	ZL8100	Item A	328.00	178	58,384.00	123,659.20	6.9%	0.7%
3	VN-L1079	Item ZK	24.99	1,976	49,380.24	173,039.44	9.7%	1.0%
4	VN-A1267	Item Q	79.99	587	46,954.13	219,993.57	12.3%	1.3%
5	VN-L0572	Item W	8.49	4,899	41,592.51	261,586.08	14.6%	1.7%
6	BCA65100	Item R	2,000.00	19	38,000.00	299,586.08	16.7%	2.0%
7	XL479	Item T	74.00	444	32,856.00	332,442.08	18.6%	2.3%
8	ONV 180	Item PT	36.95	889	32,848.55	365,290.63	20.4%	2.7%
9	VN-A0606	ItemVC	17.95	1,666	29,904.70	395,195.33	22.1%	3.0%
10	NV-65525	Item XR	36.40	788	28,683.20	423,878.53	23.7%	3.3%
11	VN-A0604	Item XT	17.49	1,530	26,759.70	450,638.23	25.2%	3.7%
12	AB65771	Item M	42.85	614	26,309.90	476,948.13	26.6%	4.0%
13	SRP-1442	Item S	34.00	765	26,010.00	502,958.13	28.1%	4.3%
14	MND55303	Item QP	25.97	986	25,606.42	528,564.55	29.5%	4.7%
15	ZL427	Item LS	48.00	533	25,584.00	554,148.55	31.0%	5.0%
16	PF5000	Item LC	29.95	843	25,247.85	579,396.40	32.4%	5.3%
17	SRP123	Item IT	12.00	1,888	25,000.00	604,396.40	33.8%	5.7%
75	VN-A1217	Item KL	1.29	5,788	7,466.52	1,424,352.99	79.6%	25.0%
76	LKR-2313	Item KJ	39.75	185	7,353.75	1,431,706.74	80.0%	25.3%
77	VN-N0592	Item GW	34.99	199	6,963.01	1,438,669.75	80.4%	25.7%
78	NF-92251	Item CV	36.40	189	6,879.60	1,445,549.35	80.8%	26.0%
79	VN-F1128	Item BV	126.99	54	6,857.46	1,452,406.81	81.1%	26.3%
80	HWT-3	Item BMM	19.95	325	6,483.75	1,458,890.56	81.5%	26.7%
81	VN-F6405	Item LM	7.49	861	6,448.89	1,465,339.45	81.9%	27.0%
82	L1100-CL	Item SM	1,240.00	5	6,200.00	1,471,539.45	82.2%	27.3%
97	VN9920	Item JB	41.80	98	4,096.40	1,546,606.04	86.4%	32.3%
98	BTL2117	Item CM	5.85	698	4,083.30	1,550,689.34	86.6%	32.7%
99	VN-S3000	Item DB	99.00	41	4,059.00	1,554,748.34	86.9%	33.0%
100	VN-N1433	Item MM	74.99	52	3,899.48	1,558,647.82	87.1%	33.3%
101	VN-A0515	Item NL	17.49	220	3,847.80	1,562,495.62	87.3%	33.7%
102	BTL506202	Item IH	754.00	5	3,770.00	1,566,265.62	87.5%	34.0%
292	VN-F1053	Item KB	1.69	20	33.80	1,789,820.09	100.0%	97.3%
293	VN-B0720	Item RC	3.49	7	24.43	1,789,844.52	100.0%	97.7%
294	MNY764	Item SC	6.72	3	20.16	1,789,864.68	100.0%	98.0%

295	VN-N2606	Item MH	3.99	4	15.96	1,789,880.64	100.0%	98.3%
296	BG321	Item AMH	12.08	1	12.08	1,789,892.72	100.0%	98.7%
297	VN-F1042	Item JB	1.89	5	9.45	1,789,902.17	100.0%	99.0%
298	LFJ-81012	Item BB	13.46	-	-	1,789,902.17	100.0%	99.3%
299	S109	Item AB	8.39	-	-	1,789,902.17	100.0%	99.7%
300	SD20	Item RM	66.65	-	-	1,789,902.17	100.0%	100.0%

Exhibit 6-9: Assigning SKUs into A-B-C Categories

A	B	C	H
Line No.	Part No.	Description	% Total Value
1	AB103	Item LM	3.6%
2	ZL8100	Item A	6.9%
3	VN-L1079	Item ZK	9.7%
4	VN-A1267	Item Q	12.3%
5	VN-L0572	Item W	14.6%
6	BCA65100	Item R	16.7%
7	XL479	Item T	18.6%
8	ONV 180	Item PT	20.4%
9	VN-A0606	Item VC	22.1%
10	NV-65525	Item XR	23.7%
11	VN-A0604	Item XT	25.2%
12	AB65771	Item M	26.6%
13	SRP-1442	Item S	28.1%
14	MND55303	Item QP	29.5%
15	ZL427	Item LS	31.0%
16	PF5000	Item LC	32.4%
17	SRP123	Item IT	33.8%

Category A
Generally made up of those items constituting approximately 75% of the total value of all items.

A	B	C	H
Line No.	Part No.	Description	% Total Value
75	VN-A1217	Item KL	79.6%
76	LKR-2313	Item KJ	80.0%
77	VN-N0592	Item GW	80.4%
78	NF-92251	Item CV	80.8%
79	VN-F1128	Item BV	81.1%
80	HWT-3	Item BMM	81.5%
81	VN-F6405	Item LM	81.9%
82	L1100-CL	Item SM	82.2%
97	VN9920	Item JB	86.4%
98	BTL2117	Item CM	86.6%
99	VN-S3000	Item DB	86.9%
100	VN-N1433	Item MM	87.1%
101	VN-A0515	Item NL	87.3%
102	BTL506202	Item IH	87.5%
292	VN-F1053	Item KB	100.0%
293	VN-B0720	Item RC	100.0%
294	MNY764	Item SC	100.0%
295	VN-N2606	Item MH	100.0%
296	BG321	Item AMH	100.0%
297	VN-F1042	Item JB	100.0%
298	LFJ-81012	Item BB	100.0%
299	S109	Item AB	100.0%
300	SD20	Item RM	100.0%

Category B
Generally made up of those items constituting from approximately 76% to 80% of the total value of all

Category C
Generally made up of those items constituting from approximately 81% to 100% of the total value of all items.

Exhibit 6-10: Determining How Many Items from Each Category Will Be Counted Each Day

Number of counts per year taken from Exhibit 6–8.

Category	Annual Counts		Total Annual Counts		Percent of All Counts
A	3,300	÷	8,800	=	.375 > 38%
B	2,100	÷	8,800	=	.238 > 24%
C	3,400	÷	8,800	=	.386 > 39%

Category	Total Daily Counts		Percent of All Counts		Number of SKUs to Be Counted Daily
A	3,300	×	38%	=	16.72 > 17 A SKUs per day
B	2,100	×	24%	=	10.56 > 11 B SKUs per day
C	3,400	×	39%	=	17 C SKUs per day

Count each category the desired number oftimes using the diminishing population technique.

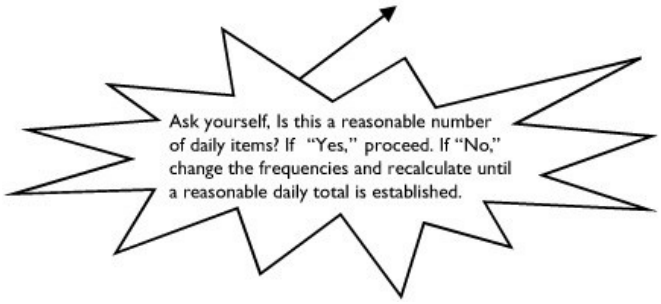
Determining A-B-C Count Frequency

Determine count frequency by:

- Deciding count frequency of each category. You can count the respective categories the number of times you desire. There is no rule-of-thumb. You may want to count “A” items 12 times per year, “B” items 4 times per year, and “C” items 2 times per year. See Exhibit 6–8.
- Multiplying the respective number of SKUs per category by the desired frequency to establish total counts. Cycle is assumed to be one year. See Exhibit 6–11.
- Dividing the total counts by the number of count days (for example, 200 days per year) to determine the number of items to be counted each day.

Exhibit 6-11: Determining Count Frequency and Number of Items to Count Per Day

	Items	Frequency	Counts
A	275	x 12	3,300
B	525	x 4	2,100
C	1,700	x 2	3,400
	Total Counts for the Year		8,800
	Count Days		÷ 200
	Items to Count per Day		44



Determining How Many Items from Each Category Will Be Counted Each Day

It's now time to compute how many items from each category must be counted each counting day to achieve the number of counts for each respective category you desire.

- Divide the number of annual counts within each category by the total (annual) number of counts. This establishes the percentage of counts represented by the respective categories when compared to the total counts. See Exhibit 6–10.

Multiply the A, B, and C percent of total by the number of items to be counted daily. This establishes the quantity of each category to be counted each day. See Exhibit 6–10.

When to Count

The ideal time during the day to cycle-count would be when there is no movement of paper or product. You may, therefore, want to count:

- At end of business day
- Prior to start of day
- Over the weekend
- During slowest shift

Another alternative is to creating a cycle counting cut off during a regular business day by using time-of-day.

To use this approach you would:

1. Create a list of items to be cycle-counted the next day.
2. Distribute the list to Shipping, Receiving, the stock put-away workers, order fillers, and data entry clerks.
3. Have Receiving, Shipping, the stock put-away workers, order fillers, and data entry clerks all note the time of day they interacted and actually dealt with any of the items on your list.
4. You now have the ability to audit back into any timeframe during the day. For example:
    - You cycle-count widgets at 1:00 PM using a stock status report generated by data entry at 11:30 AM.
    - You find that there are 10 less widgets on the shelves than the stock status shows.
    - You review all of the paperwork from these different departments.
    - The receiving paperwork shows that 10 widgets were received at 10:30 AM.
    - There is no paperwork from the stock put-away workers indicating that the widgets were ever moved into stock.
    - The missing widgets are sitting out in the dock area. Your record count matches what you have in-house.

Who Should Count

If there are four hours of counting involved in cycle-counting all items on any given day, should you have a single person count for four hours and then begin any necessary reconciliations—or does it make more sense to have four people count for one hour each and then let the inventory control clerk have the rest of the day to correct any problems? It makes sense to spread the raw counting portion of the cycle count among a group of people. This will allow the inventory control clerk to devote more hours of each day to actually fixing the system as opposed to spending each day counting boxes.

[4]It is a rule of thumb that cycle counting should be done 4 days per week, 50 weeks per year, 200 days per year.

Recap

The objective of this chapter was to provide you with insights as to why many inventory control systems fail.

Often failure is due to individuals in different departments simply not understanding the unintended consequences of their own actions.

A review of who is supposed to write something down, what they are supposed to write down, who they are to give the information to, what that person is supposed to do with the information, and the sequencing and overall timing of these events often reveals that respective departments are using different units of measure to define inventory. Some use dollars, while others use actual physical units. In addition, seemingly simple issues like the timing of when an item is entered into the computer system or who is allowed to actually see various items of information can cause severe misunderstandings and inventory inaccuracies.

In analyzing “what is going on,” metrics should be used, with the old management phrase, “You can’t control what you don’t measure,” being a constant guiding principle.

By documenting the who, what, when, where, why, and how of how the system is actually working you can demonstrate to yourself and others where changes might be necessary.

Review Questions

1. Cycle counting is: ?

a. counting a statistically significant cross-section of your inventory frequently.

b. counting everything in your facility at least twice per calendar or fiscal year.

c. determining a fair valuation of your inventory value at least once per fiscal year.

d. counting all of the bicycle parts in your facility.

2. Flow charts allow you to: ?

a. analyze the sequential sequence of a set of events.

b. determine trends.

c. compare a projected value against an actual one.

d. create a report that identifies the number of items per level and number of tiers of product on a flow-through rack.

3. Run charts allow you to: ?

a. analyze the sequential sequence of a set of events.

b. determine trends.

c. compare a projected value against an actual one.

d. create a report that identifies the number of items per level and number of tiers of product on a flow-through rack.

4. True or False ?

The diminishing population method of cycle counting involves counting items when that SKU’s stock level reaches zero.

a. True

b. False

5. Fill rates indicate: ?

a. how much of a particular SKU you have in stock at the end of a calendar month.

b. the quantitative nature of your inventory.

c. if you had what you needed when you needed it.

d. the ratio of accurate shelf counts to record counts.

Answers

1. (a)
2. (a)
3. (b)
4. (b)
5. (c)