Chapter 5

Site Inventory Management

Concept and Implementation

5.1 Introduction

This chapter contains a collection of activities establishment for site inventory management improvement that encompasses the principles, concepts, and techniques guideline for implementation in order to attain the objective proposed in chapter one. These activities provide an overview of site management process, focusing on what sites actually do to improve site inventory management. These activities cover the complete cycle of inventory management as consist of

Stock record

Receiving

Issuing

Documentation of inventory control

Making payment

Physical inventory and reporting

5.2 Stock records

Stock records, whether manual or computer-based, are the heart of the inventory management. Resulting from rapid technological development of computer systems, manual control systems are now being largely superseded. However, whatever system is used, specific inputs of data are required at specific stages in the procurement cycle. Stock records are used for number of reasons. Materials must be identifiable, together with their locations. All transactions must be recorded. These include receiving, allocations, issues and transfers. Inventory control is entirely dependent on stock records for initiating stock replenishment. Management and statutory commitments require costing evaluations.

Stock records normally show each transaction in full details. They enable the stock controller to tell what stock is on hand at any time by looking at the record without needing to check physical stock in the stores, and they enable past demand to be tracked more closely so that large buffer stocks are less necessary. But transactions must be posted promptly and correctly to the records if they are to provide the accurate up-to-date information which the stock controller need, and regular stock counts are still needed to correct the inevitable errors in the records.

However efficiently stock is controlled, discrepancies will occur between actual and recorded levels. These must be investigated to determine how they have arisen so that corrective action can be taken to prevent recurrence. Stock must be valued correctly. Recorded quantities must be correct, shortfalls being identified promptly and stock replenished to support operational requirements.

To meet the needs of legislation and management, stocktaking must be carefully planned and efficiently executed. A high degree of care and attention to detail is demanded. Control of the operation is normally assigned to a senior member of the materials management or supplies management team. An important objective is to prevent malpractice or fraud.

The manual perpetual inventory record system

When things go right, manual perpetual inventory records can, in fact, be an efficient way for site to assure that they have the materials they need. Unfortunately, this method of keeping inventory records, simple as it may seem, is vulnerable to a long list of possible problems. For instance :

1. Material handlers can accidentally move the wrong material.
2. The right material can be moved, but it can be moved to the wrong place and is lost.
3. The quantity of materials moved can be wrong.
4. If the quantity of materials moved is right, it can be records incorrectly, or either the material identity or the new location of the materials can be recorded incorrectly.
5. The numbers can be copied incorrectly.
6. The arithmetic can be done incorrectly.
7. The results can be recorded incorrectly.

Add these are only the most obvious of the things that can and often do go wrong. Material handlers also forget to create transactions. Transactions are lost. Clerks accidentally make double postings or forget to post transactions. Or, for instance, suppose a withdrawal is made and then the remaining inventory is recounted. If the recount is posted before the withdrawal, the end result will be a recordkeeping error.

Still more complex problems can occur in a manually posted inventory system. Even this is only a sample of the complex problems that can occur. But it makes the point. Manual inventory systems are vulnerable to error and, in general, are unreliable.

Inventory record accuracy

The usefulness of inventory record is directly related to its accuracy. Based on the inventory record, stores determines net requirements for an item, releases orders based on material availability, and performs inventory analysis. If the records are not accurate, there will be shortages of material, disrupted schedules, late deliveries, low productivity, and excess inventory (of the wrong things)

Accurate inventory records enable site to :

- Operate an effective materials management system

  If inventory records are inaccurate, gross-to-net calculations will be in error.

- Maintain satisfactory site service

  If records show the item is in inventory when it is not, any order promising it will be in error.

- Operate effectively and efficiently

  Planners can plan, confident that the materials will be available.

- Analyze inventory

  Any analysis of inventory is only as good as the data it is based on.

Inaccurate inventory records will result in :

- Shortage and disrupted schedules
- Excess inventory (of the wrong things)
- Low productivity
- Poor delivery performance
- Excessive expediting, since people will always be reacting to a bad situation rather than planning for the future

The effects of inaccurate inventory data

Impact on systems that use inventory data

An inventory error that understates inventory will cause reorders to be placed too soon. The result is excess inventory, shortages of storage space, and unnecessary costs and investment. When inventory errors overstate the quantity on hand, the result is often delayed reorders, shortages, expediting, and late deliveries to customers.

Impact on the business

- Poor customer service is one of the ultimate results of the shortages that occur when inventories are wrong. Either shipment promises are missed or lead times are overstated.

- Unnecessary inventory investment results from incorrect project and purchase plans made by the material planners when inventories are understated. (i.e. when the system records show that there is less material in stock than there really is). And, whether records are under-or overstated, project planners quickly learn that inaccuracies exist. Their response is usually to increase the size of safety stocks. Increased safety stocks, of course, translate directly into unnecessary inventory.

- Reduced project efficiency is the third adverse effect. Inventory inaccuracies cause emergency orders that are less efficient to place with

vendor and less efficient to manufacture. Overtime, extra material handling etc. will be happened

Causes of inventory record errors

Poor inventory record accuracy can be caused by many things, but they all result from poor record-keeping systems and poorly trained personnel. Some examples of causes of inventory record error are :

- Unauthorized withdrawal of material
- Unsecured stockroom
- Poorly trained personnel
- Inaccurate transaction recording. Errors can occur because of inaccurate piece counts, unrecorded transactions, delay in recording transactions, inaccurate material location, and incorrectly identified parts.
- Poor transaction recording systems. Most systems today are computer based and can provide the means to record transactions properly. Errors, when they occur, are usually the fault of human input to the system. The documentation reporting system should be designed to reduce the likelihood of human error.
- Lack of audit capability. Some program of verifying the inventory counts and locations is necessary.

These problems can be reduced or eliminated by applying the efficient site systems (presented in each topics in this thesis) and applying the computer program as a tool for implementing (presented in next section).

5.3 Receiving

Efficient receiving of materials into stores is the foundation on which all subsequent transactions depend. It is normal practice in most organizations for stores to be notified in advance by purchasing of materials on order. This is done by sending the ***receiving section*** a copy order Material Requisition, (MR). Action then proceeds as follows.

Raising of Materials-Received Report

Delivered materials are identified and a materials-received report is raised. There are exceptions when verbal orders have been placed by phone in emergencies and received materials cannot be identified as no order copy has been supplied at that moment. ***Purchasing*** should always notify stores of the impending receiving of such items, giving them the MR (Material Requisition) or allocated purchase order number, and item description or references.

Receivings from suppliers are almost always verified against a copy of a purchase order or MR. Controls often exist to prevent the receivings of material earlier than specified or in quantities exceeding those ordered. Net receiving information is sent back to Purchasing where it is used to close out orders and authorize payment of invoices.

Receiving should inform Purchasing of partial shipments as well as quantities that exceed the overshipment tolerance. The purchaser then can follow up on items still due and decide whether or not the excess quantity should be returned to the supplier.

Acceptance of materials

Acceptance normally includes checking identification with description / references on the order. A quantity check is then done and any discrepancies noted. There would also be a surface examination for obvious damage or deterioration. Where inwards materials inspection is applicable, i.e. for quality certification or for vendor rating assessment, materials are passed to stores inspection for detailed examination. Where items do not meet specification or are damaged or have deteriorated in transit, the supplier and/or the carrier must be notified promptly (and certainly within the prescribed period). Items would then be returned or collection arranged. Some materials are not readily classified ***acceptable*** or ***not acceptable***, and these are transferred into quarantine pending examination and a decision being made.

Items that do not meet inspection requirement may be sent to a material review area. Representatives of quality control, engineering, purchasing and sometimes the supplier then will decide on the disposition of the rejected items. Some may be reworked, others may be accepted as a usable variation, and others will be returned to the supplier.

Transfer to storage or to users

Following receiving and subsequent acceptance, materials are normally transferred to designated storage locations. In case of urgent need, users would be notified and arrangements made for dispatch or collection of the items.

5.3.1 Scheduled receiving

Scheduled receiving is orders placed on a vendor and represent a commitment to buy. The scheduled receivings row shows the quantities ordered and when they are expected to be completed and available.

The basic responsibilities of a planner are to :

1. Launch (release) orders to purchasing
2. Reschedule due dates of open (existing) orders as required
3. Reconcile errors and try to find their cause
4. Solve critical material shortage by expediting or replanning
5. Coordinate with other function in project team, and purchasing to resolve problems

5.3.2 Quality Control

Incoming inspection processes are performed by almost all warehouses and stores. In some cases they are formal and in others, informal. Informal inspection can be as simple as instructing the receiver to open and look at anything that appears damaged on the outside. Problems can be brought to the attention of the receiving supervisor. Informal inspection procedures can work well for inventory facilities that receive material only from internal sources and in facilities that have relatively low receiving volumes, uncomplicated materials,and few receipt. Most larger facilities, however, operate with more formal inspection procedures which consist of :

- Drawing sample to be inspected and moving them to an inspection area.
- Establishment of a ***hold*** on the material received to prevent use of the material until inspection is completed.

- Testing the sample tests consist of a wide variety of measurements, inspections, and analyses. Some tests are destructive and some are not.
- Upon completion of the tests, either release the hold on the material or reject it. If the material is rejected, a disposition must be determined and carried out.
- When tests are nondestructive, sample units must be moved to stock. In some instances it is necessary that they be merged with the original lot; in other cases they can simply be stored in a convenient location.
- Throughout the process, sample numbers, serial numbers, and lot numbers may be tracked.
- And, throughout the process, records are kept for later analysis.

5.3.3 Put away

Received material must be put away. Although handling methods and storage devices vary from place to place, the basic steps required are almost universal :

- A storage location must be selected. Selection can be made by the inventory control system, by a supervisor, or by the material handler who puts the material away. When material handlers select locations, they often do so according to a prespecified scheme. The warehouse or store, for instance, may be divided into zones or areas and the material handlers directed to put certain materials in certain areas.

- A material handler must be assigned the put-away task. The assignment may be made prior to selecting a storage location or after the selection is done.

- The material must be physically put away.

- The storage location must be recorded and the fact that material has been put in it must be confirmed.

5.4 Issuing

As stress that stores exist to provide a service to users, this service should be both effective and efficient. Materials should be issued against reasonable and authorized demand. Stores are the custodian of materials. Their responsibility is to ensure its ready availability for issue to legitimate users giving appropriate notice.

Authorized signatories

This is a well established procedure for ensuring that responsibility for stocked items is transferred to legitimate users. The practice in many organizations is to produce a list of authorized signatories. Such a list will be updated. Problems arise when particular individuals are not available to sign and procedures must cater for such emergencies. Normally, the issue note would be passed to a senior or another nominated person for signature.

Identification and retrieval of materials

To ensure that materials in stock are available for issue to time requires a number of objectives being met. Firstly, ***correct identification is essential***. Secondly, ***location should be as recorded***. Many users experience lengthy delays while stores staff locate required items. Retrieval is the next consideration. An item might be located quickly. However, it may not be readily retrievable because of the way it has been stored. It could lie at the bottom of a stack of material or special lifting equipment may be required. The correct-balance must be sought between ***space utilization*** and ***quality of service***.

A final appropriate point is the manner in which material is protected to prevent damage in stock. Stores received an urgent request to issue a material. Following a lengthy delay in locating the material, an even lengthier delay ensured because it was over-protected. It took several hours to chip off the very hard protective coating applied prior to putting into stock. The right balance must be sought between ***the degree of protection*** and ***retrieval time***.

Material must leave stores for use in good condition, which means the manner of its handling must be satisfactory. The right types of handling and transporting equipment are required, which includes, in special cases, supports and securing devices. Handling procedures must be adequate to facilitate the smooth transfer from the stock location to the user, avoiding damage in transit.

Economic issue quantities

Users must obviously bear the primary responsibility for determining issue quantities, except in special cases where units of issue have been designated by stores, e.g. items in boxes of 20. However, the stores staff can often significantly reduce the incidence of abnormal issue rates. Consider the example where particular sized bolts and nuts are to be used on a major assembly contract on-site over a period of several months. Assume the usage rate is 1000 nuts and bolts a week. Would it be reasonable for the user to withdraw one month's requirements at one time ? If they did, there would be strong probabilities that high losses, would occur, with a subsequent request for replacements. Control needs to be exercised in determining what are economic issue rates. This takes into account marshaling and handling costs, paperwork, transport costs, site or sub-store costs and security.

Transport

Stores may provide transport for internal and external distribution of materials to sub-stores, or users. Appropriate authorized documentation is submitted giving the required notice to enable stores issue staff to marshal requirements and load vehicles.

5.5 Documentation of Inventory Control

Issue voucher

This document is the authority to withdraw stated materials from stores, and its onwards journey indicates that the materials have been issued and have thus passed from the control of stores into the hands of the user who will then became responsible.

The requisition, representing the prime recording of the issue of the materials, is subsequently processed for the materials control records and valued for costing purposes.

This document ensures quantity control and removes risks of incorrect material requests. Often a special copy of the prepared requisition passes direct to the stores to give advance advice of the materials required, thus making certain of their availability and readiness for issue.

Surplus issues of material returned to stores for further use are listed on a stores return note.

Material Requisition (MR)

The material requisition is a request to the purchasing department (SMP) to purchase. Usually these requisitions are used to replace stocks of materials in stores, either through the judgment of the storekeeper, or prompted by the material control records.

Purchase Order (PO)

On receipt of the purchase requisition, the purchaser negotiates with a supplier and sends a purchase order, which is a formal contract for the supply of the materials. The order should clearly state the materials required and the price, and provide information such as delivery period and destination. The supplier returns an acknowledgment of order accepting the contract and perhaps stating any changes he requires. Mutual agreement to any changes is required in the form of an amendment to order.

A purchase order is a binding contract to both purchaser and supplier, and may only be broken by mutual consent. At times it can allow for a payment as compensation to the supplier.

Supplier's Dispatch/Advice Note

When the supplier dispatches the materials he advises the purchaser by sending an ***advice note*** describing the goods and referring to the purchase order and the means of transport. The purchaser is thus aware of the impending arrival of the materials, and should they not arrive within a period allowed for the journey the sender is informed, and he initiates

enquiries which may result in a claim on the carrier or an insurer if the supplier has insured the materials in a specific or a general manner.

Accompanying the materials in transit to the purchaser is the ***dispatch note***, which is usually one copy of a set of documents with an advice note and others, prepared together in one operation. The dispatch note provides details of the materials consigned.

Materials Received Note

This is an internal document which records the materials received and accepted. It quotes relevant information from the dispatch and advice notes such as details of the supplier and purchase order, and gives a full description of the materials and the quantities checked on arrival.

Both the condition and quality of the materials may need checking, and for materials with a high degree of accuracy and performance a formal inspection may be necessary. This will need an inspection report, which is sometimes incorporated in the form of the materials received note, indicating the items accepted and rejected, with reasons.

Several copies of the materials received note are prepared as part of a document set, one going to each department interested in the arrival of the materials, including stores, purchasing (SMP) and accounts.

Reject/Dispatch Note

It may be necessary to return any rejected materials to the supplier, either for credit or replacement, in which case this dual-purpose document is prepared to initiate the return-one copy accompanying the goods and one being sent to the supplier to advise him of the dispatch, each stating the causes for reject. Interest internal departments are also advised with appropriate copies.

5.6 Making Payment

Payment depends on the terms agreed on any particular order, and any terms which differ from normal practice should be considered individually. The general practice is either 30 days or one month and the accepted interpretation is that all materials received and invoiced in any one month are paid for together at the end of the following month.

Although commitment is incurred on receipt of the materials, qualification for payment is usually based on receipt of invoice. Usually both materials and invoice are received during the same month and it is only transactions coming towards the close of the month that incur the possibility of the materials arriving in one month and the invoice in the following month. In practice, the more crucial factor in qualification for payment is the time cycle in the business for the passing of invoices. In a well-regularized system a time-limit is fixed for invoices to be channeled into the accounts for each accounting period, and payment is usually confined to those invoices cleared and posted to the respective bought ledger accounts.

The basic data for payment qualification are the individual bought ledger accounts, which should be checked with the statement received each month from the supplier that represents a summary of his indebtedness. Items claimed but not cleared for payment may be due to :

invoice not received from supplier
invoice received but mislaid internally
invoice received but in process of clearance
invoice cut out by the internal time limit
invoice subject to query of materials received, quantity, price etc.

When agreement is made as to which invoiced items qualify for payment, a list is drawn up in the form of a remittance advice; deduction is made for any discounts applicable and a cheque is drawn for the net amount. The cheque is sent to the supplier with a copy of the remittance advice so that he receives a clear indication of the composition of the payment.

5.7 Physical Inventory and Reporting

Inventory control, to be successful, are dependent on accurate knowledge of the quantities of items in stores. If this information is not accurate, decisions based on the information will be incorrect, leading to shortages and excess inventories. To avoid these errors, it is necessary to audit the inventories-counting the number of units in stock and reconciling this quantity with the quantity in the inventory records. This process is called ***physical inventory***.

5.7.1 Selecting the items to be counted

A number of approaches are used in selecting the items to be counted. These approaches can be, and usually are, combined :

1. ***ABC classifications*** - A items may be counted monthly, B items quarterly and C items annually.
2. ***Zero balances*** - Where the inventory record shows a zero balance, the counter may be directed to check the bin. If the bin is indeed empty, this count is obtained at minimum cost.
3. ***Negative balance*** - A negative balance indicates that an error has occurred and the inventory should be checked.
4. ***Randomized lists*** - Lists of items to count may be selected at random, perhaps within some limits such as ABC categories. This is used where the inventory items are pilferable. If an entirely systematic method is used, thieves may determine which items will not be counted for a long time and steal those knowing that the theft will not soon be discovered.
5. ***Cost minimization*** - Each day, the available time of the counting staff may be allocated to counting that set of items that will result in minimizing expected costs. These costs are composed of shortage costs if the inventory is actually lower than recorded and the replenishment order is issued too late, and excess carrying costs if the inventory is actually higher than recorded and the replenishment order is issued sooner than necessary. This strategy results in counting items that will shortly reach reorder points when improved information will make a difference in the reorder decision.
6. ***Each X Transaction*** - This approach assumes that items tend to become inaccurate as the number of transactions increases. For example, if we counted an item in a location three months ago, and there have been no transactions, the probability of that item still being correct is relatively high. On the other hand, if there have been three or four transactions per day, the probability of that item still being correct is

relatively low. Thus, we can define the number of transactions that will occur for a given item, before we want to count again.

5.7.2 When to count

Physical counts can be scheduled at regular intervals or on special occasions. Some selection criteria are :

When an order is placed

Items are counted just before an order is placed. This has the advantage of detecting errors before the order is placed and reducing the amount of work by counting at a time when stock is low.

When an order is received

Inventory is at its lowest level.

When the inventory record reaches zero

Again, this method has the advantage of reducing work.

When a specified number of transactions have occurred

Errors occur when transactions have occurred more transactions and are more prone to error.

When an error occurs

A special count is appropriate when an obvious error is detected. This may be a negative balance on the stock record or when no items can be found although the record shows some in stock.

5.7.3 Cutoff

A problem arise in that transactions may occur prior to the counting that have not yet been entered in the inventory records. This problem was more severe under manual systems when the record of a transaction was a document that might be in the company mail system or else already received but not yet entered. With real-time computer systems, the problem is greatly reduced. The strategy to assure effective cutoff is as follows :

1. The counting may be performed at the end of the day after the records of all transaction for the day have been processed.
2. Put away or withdrawal of items to be counted on a given day may be held up until counting is complete.
3. Records of all transactions of items to be counted on a given day may be time stamped so that the book inventory balance at time of the count can be adjusted to take into account transactions that has occurred but were not yet reflected in the inventory record.

5.7.4 Reconciliation

Once the count is made and compared with the book inventory, if the error is within a certain tolerance level, it is accepted and the book inventory is adjusted to agree with the count. If the error is outside the tolerance level, an other employee is sent to count the item again. If the count is still outside the tolerance level, an investigation is initiated to determine the cause of the problem.

5.7.5 Tolerance

To judge inventory accuracy, a tolerance level for each part must be specified. For some items, this may mean no variance; for others, it may be very difficult or costly to measure and control to 100% accuracy such as nuts or bolts etc. For these reasons, tolerance are set for each item. Tolerance is the amount of permissible variation between an inventory record and a physical count.

Tolerances are set on individual items based on value, critical nature of the item, availability, lead time, ability to stop work, safety problems or the difficulty of getting precise measurement.

Material item	Inventory Record (units)	Physical Count (units)	Tolerance (± %)	Within Tolerance (√)	Outside Tolerance (√)

Table 5-1 : Inventory record accuracy with tolerances

Table 5-1 shows inventory items, their physical count, the quantity shown on their record and includes tolerances. This information tells us exactly what inventory accuracy is.