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V-Skills

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1. OVERVIEW OF MATERIALS MANAGEMENT

1.1. Overview

Material Management is a branch of logistics that deals with the tangible components of supply chain. Specifically this covers the acquisition of spare parts & replacements quality control of purchasing & ordering such parts & standards involved in ordering, shipping & warehousing. The material management is ideal for the industries who are seeking foolproof tracking of the flow & management of material information in their enterprises from purchase, inventory management to aspects of production & sales. It can also be a stepping stone for the future ERP solutions. In other words we can say that material management is acting as bone of the organization On the basis of it we can measure the health of an organization now day's industries related to Manufacturing, production & other verticals can use this tool to run their organization in a profitable way & to enhance their profit. Material management can help the student to understand the importance of MM. This course is a very useful collection of all the relevant information related to MM which will be helpful for the student to understand this aspect in a better wayAfter completion of the course shall develop the following skills & competencies: A:-Basics of Marketing management B:-Appropriate idea about the uses of MM in an organization C: Concept of MM D:-Future of MM in organization development

Material Management

Every organization, big or small, depends on materials and services from other organizations to Varying extents. These materials and services are obtained through exchange of money. The various materials used as inputs, such as raw materials, consumables & spares, are required to be purchased & made available to the shops / users as & when needed to ensure uninterrupted production. Therefore, efficient management of input materials is of paramount importance in a business organization for maximizing materials productivity, which ultimately adds to the profitability of the organization. The main concern of any Business management is to maximize the Return on Investment (ROI). The relationship of various entities here can be expressed as:

$$ROI = \frac{\text{Profit}}{\text{Sales}} \times \frac{\text{Sales}}{\text{Current Asset} + \text{Fixed Asset}}$$

Thus ROI = profit margin + asset turnover rate

A firm's profit margin reflects management's ability to control costs in relations to revenue. The asset turnover rate reflects management's ability to effectively utilize the firm's productive assets. Hence a firm can improve ROI in three ways:-

- ✓ By reducing cost
- ✓ By getting more sales from available assets or Get Currency converter
- ✓ By some combination of the above Thus, it is the cost control that holds the key.

In many manufacturing organizations, the cost of materials alone happens to range from 40 % to 60 % of the total expenditure. Obviously, a better management of material is expected to ensure reduction in overall cost of operation and smoothness in supply of inputs.

This requires well coordinated approach towards various issues involving decision making with respect to materials.

All the materials related activities such as material planning & indenting, procedure, variety reduction through standardization & rationalization, reducing uncertainties in demand & supply, handling & transportation, inspection, proper storage & issue of materials to the internal customers, inventory management, vendor management & finally disposal of obsolete, surplus & scrap materials etc. taken together is termed as "INTEGRATED MATERIAL MANAGEMENT".

To carry out these functions efficiently, it is essential to have a very good supplier base, order booking process & inventory management system as well as expert MATERIALS MANAGEMENT (MM) Professional

Materials management is just managing all types of materials in an organization. It can be broken down into three areas: acquisition, quality control, and standards.

Quality Assurance

Materials management also ensures that parts and materials used in the supply chain meet minimum requirements by performing Quality Assurance (QA). While most of the writing and discussion about materials management is on acquisition and standards, much of the day to day work conducted in materials management deals with QA issues. Parts and material are tested, both before purchase orders are placed and during use, to ensure there are no short or long term issues that would disrupt the supply chain. Material management is most important for industrial point of view Quality assurance, or QA for short, refers to planned and systematic production processes that provide confidence in a product's suitability for its intended purpose. It is a set of activities intended to ensure that products (goods and/or services) satisfy customer requirements in a systematic, reliable fashion. QA cannot absolutely guarantee the production of quality products, unfortunately, but makes this more likely.

Two key principles characterize QA: "fit for purpose" (the product should be suitable for the intended purpose) and "right first time" (mistakes should be eliminated). QA includes regulation of the quality 8 of raw materials, assemblies, products and components; services related to production; and management, production and inspection processes.

It is important to realize also that quality is determined by the intended users, clients or customers, not by society in general: it is not the same as 'expensive' or 'high quality'. Even lowly bottom-of-the- range goods can be considered quality items if they meet a market need.

Standards

The final component of materials management is standards compliance. There are standards that are followed in supply chain management that are critical to a supply chain's function. For example, a supply chain that uses Just In Time or lean replenishment requires absolute perfection

in the shipping of parts and material from purchasing agent to warehouse to place of destination. Systems reliant on vendor-managed inventories must have up-to-date computerized inventories and robust ordering systems for outlying vendors to place orders on. Materials management typically insures that the warehousing and shipping of such components as are needed follows the standards required to avoid problems. This component of materials management is the fastest changing part, due to recent innovations in SCM and in logistics in general, including outsourced management of warehousing, Mobile computing and real-time logistical inventories

Materials management, thus, can be defined as a joint action of various materials activities directed towards a common goal and that is to achieve an integrated management approach to planning, acquiring processing and distributing production materials from the raw material state to the finished product state.

Materials Management as such is a key business function that is responsible for co-ordination of planning, sourcing, purchasing moving, storing and controlling materials in an optimum manner so as to provide a pre-decided service to the customer at a minimum cost.

Materials Management's scope is vast. Its sub functions include Materials planning and control, Purchasing, Stores and Inventory Management besides others.

In its process of managing, materials management has such sub fields as inventory management, value analysis, receiving, stores and management of obsolete, slow moving and non moving The various activities represent these four functions:-

- ✓ Planning and control
- ✓ Purchasing
- ✓ Value analysis and
- ✓ Physical distribution

1.2. Role of Material Management

The fundamental objectives of the Materials Management function are acquisition of materials and services, often called the famous 5 Rs of Materials Management:

- ✓ of the right quality
- ✓ in the right quantity
- ✓ at the right time
- ✓ from the right source
- ✓ at the right time

From the management point of view, the key objectives of MM are:

- ✓ To buy at the lowest price, consistent with desired quality and service
- ✓ To maintain a high inventory turnover, by reducing excess storage, carrying costs and inventory losses occurring due to deteriorations, obsolescence and pilferage
- ✓ To maintain continuity of supply, preventing interruption of the flow of materials and services to users

- ✓ To maintain the specified material quality level and a consistency of quality which permits efficient and effective operation
- ✓ To develop reliable alternate sources of supply to promote a competitive atmosphere in performance and pricing
- ✓ To minimize the overall cost of acquisition by improving the efficiency of operations and procedures
- ✓ To hire, develop, motivate and train personnel and to provide a reservoir of talent
- ✓ To develop and maintain good supplier relationships in order to create a supplier attitude and desire furnish the organisation with new ideas, products, and better prices and service
- ✓ To achieve a high degree of cooperation and coordination with user departments
- ✓ To maintain good records and controls that provide an audit trail and ensure efficiency and honesty
- ✓ To participate in Make or Buy decisions

Definition & Scope of Materials Management

Materials Management thus can be defined as that function of business that is responsible for the Coordination of planning, sourcing, purchasing, moving, storing and controlling materials in an optimum manner so as to provide service to the customer, at a pre-decided level at a minimum cost.

The broad Materials function has the following as identified and interlinked sub functions:

Materials planning and control: Materials required for any operation are based on the sales forecasts and production plans. Planning and control is done for the materials taking into account the materials not available for the operation and those in hand or in pipe line. This involves estimating the individual 10 requirements of parts, preparing materials budget, forecasting the levels of inventories, scheduling the orders and monitoring the performance in relation to production and sales.

Purchasing: Basically, the job of a materials manager is to provide, to the user departments right material at the right time in right quantity of right quality at right price from the right source.

To meet these objectives the activities undertaken include selection of sources of supply, finalization of terms of purchase, placement of purchase orders, follow up, maintenance of relations with vendors, approval of payments to vendors, evaluating, rating and developing vendors.

Stores: Once the material is delivered, its physical control, preservation, minimization of obsolescence and damage through timely disposal and efficient handling, maintenance of records, proper locations and stocking is done in Stores.

80:20An illustration of a company's supply chain; the arrows stand for supplier-relationship management, internal SCM and customer-relationship management.

Supply chain modeling

There are a variety of supply chain models, which address both the upstream and downstream sides. The SCOR (Supply Chain Operations Reference) model, developed by the Supply Chain

Council, measures total supply chain performance. It is a process reference model for supply-chain management, spanning from the supplier's supplier to the customer's customer. It includes delivery and order fulfillment performance, production flexibility, warranty and returns processing costs, inventory and asset turns, and other factors in evaluating the overall effective performance of a supply chain.

Supply chain management

In the 1980s the term Supply Chain Management (SCM) was developed to express the need to integrate the key business processes, from end user through original suppliers. Original suppliers being those that provide products, services and information that add value for customers and other Stakeholders. The basic idea behind the SCM is that companies and corporations involve themselves in a supply chain by exchanging information regarding market fluctuations, production capabilities.

If all relevant information is accessible to any relevant company, every company in the supply chain has the possibility to and can seek to help optimizing the entire supply chain rather than sub optimize based on a local interest. This will lead to better planned overall production and distribution which can cut costs and give a more attractive final product leading to better sales and better overall results for the companies involved.

Incorporating SCM successfully leads to a new kind of competition on the global market where competition is no longer of the company versus company form but rather takes on a supply chain versus supply chain form.

The primary objective of supply chain management is to fulfill customer demands through the most efficient use of resources, including distribution capacity, inventory and labor. In theory, a supply chain seeks to match demand with supply and do so with the minimal inventory. Various aspects of optimizing the supply chain include liaising with suppliers to eliminate bottlenecks; sourcing strategically to strike a balance between lowest material cost and transportation, implementing JIT (Just In Time) techniques to optimize manufacturing flow; maintaining the right mix and location of factories and warehouses to serve customer markets, and using location/allocation, vehicle routing analysis, Dynamic programming and, of course, traditional logical optimization to maximize the efficiency of the distribution side.

There is often confusion over the terms supply chain and logistics. It is now generally accepted that the term Logistics applies to activities within one company/organization involving distribution of product whereas the term Supply chain also encompasses manufacturing and procurement and therefore has a much broader focus as it involves multiple enterprises, including suppliers, manufacturers and retailers, working together to meet a customer need for a product or service.

Integrated Materials Management

Various functions served by materials management include the material planning, purchasing, receiving, stores, inventory control, scrap and surplus disposal. All these functions can have separate working norms including the one for performance.

Efficient management of input materials is of utmost importance in a business organization for maximizing materials productivity, which ultimately adds to the profitability of the organization

This requires well coordinated approach towards various issues involving decision making with respect to materials.

All the materials related activities such as material planning & indenting, purchase systems & Procedure, variety reduction through standardization & rationalization, reducing uncertainties in demand & supply, handling & transportation, inspection, proper storage & issue of materials to the internal customers, inventory management, vendor management & finally disposal of obsolete, surplus & scrap materials etc. taken together is termed as Integrated Materials Management

While inventory manager would like to have minimum level of inventory to show off his performance, purchasing manager would like to place bulk orders in order to lessen his work load and show discounts as reductions. Both of these acts may be little contradictory from the organizational point of View. That is if some of the functions were to be handled separately, a conflict of interests may occur.

Therefore, the conflicting objectives need to be balanced and intertwined from a total organizational viewpoint so as to achieve optimum results for the organization as a whole.

In an integrated set up, one materials manager (usually the chief) is responsible for all suchinter related functions and he is in a position to exercise control and coordinate all the activities with a view to ensure proper balance of the conflicting objectives of the individual functions.

Integration also attains the synergetic advantage in terms of eliminating water tight compartments that set in a disjointed environment of working. The resulting benefits can be seen in terms of rapid transfer of data, through effective and informal communication channels.

This is crucial as the materials management function involves handling vast amount of data. Therefore, integrating the various functions identify themselves to a common materials management department which in turn results in greater coordination and better control.

Now days, in many traditions bound companies too, even the spare part planning which hitherto was done by the operation people has been brought under the umbrella of an Integrated materials Management.

Better accountability ,better coordination, better performance, better adaptability to EDP are some of the tangible advantages of the Integrated Materials Management besides a perceptible team spirit , morale and cooperation are the intangible gains.

Training and development of staff and executive through rotation of people is another great advantage because of a bigger canvas produced by integration of Materials function. To carry out these functions efficiently, it is essential to have a very good supplier base, order booking process & inventory management system as well as expert Materials Management (MM) professionals.

1.3. Meaning of Quality Assurance Standards of Material Management

Quality assurance, or QA for short, refers to planned and systematic production processes that provide confidence in a product's suitability for its intended purpose. It is a set of activities intended to ensure that products (goods and/or services) satisfy customer requirements in a

systematic, reliable fashion. QA cannot absolutely guarantee the production of quality products, unfortunately, but makes this more likely.

Two key principles characterize QA: "fit for purpose" (the product should be suitable for the intended purpose) and "right first time" (mistakes should be eliminated). QA includes regulation of the quality of raw materials, assemblies, products and components; services related to production; and management, production and inspection processes.

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Quality assurance versus quality control

Whereas quality control emphasizes testing and blocking the release of defective products, quality assurance is about improving and stabilizing production and associated processes to avoid or at least minimize issues that led to the defects in the first place. However, QA does not necessarily eliminate the need for QC: some product parameters are so critical that testing is still necessary just in case QA fails.

Failure testing

A valuable process to perform on a whole consumer product is failure testing, the operation of a product until it fails, often under stresses such as increasing vibration, temperature and humidity. This exposes many unanticipated weaknesses in a product, and the data is used to drive engineering and manufacturing process improvement Often quite simple changes can dramatically improve product service, such as changing to mould-resistant paint or adding lock-washer placement to the training for new assembly personnel.

Statistical control

Many organizations use statically process control to bring the organization to SIX Sigma levels of quality, in other words, so that the likelihood of an unexpected failure is confined to six standard deviation on the normal distribution. This probability is less than one-millions. Items controlled often include clerical tasks such as order-entry as well as conventional manufacturing tasks.

Traditional statistical process controls in manufacturing operations usually proceed by randomly sampling and testing a fraction of the output. Variances in critical tolerances are continuously tracked and where necessary corrected before bad parts are produced

Total quality control

Deep analysis of QA practices and premises used about them is the most necessary inspection control of all in cases where, despite statistical quality control techniques or quality improvements implemented, sales decrease.

The major problem which leads to a decrease in Sales was that the specification did not include the most important factor, "What the specifications have to state in order to satisfy the customer requirements?"

The major characteristics, ignored during the search to improve manufacture and overall business performance were:

- ✓ Reliability
- ✓ Maintainability
- ✓ Safety
- ✓ Strength

As the most important factor had been ignored, a few refinements had to be introduced:

- ✓ Marketing had to carry out their work properly and define the customer's specifications.
- ✓ Specifications had to be defined to conform to these requirements
- ✓ Conformance to specifications i.e. drawings, standards and other relevant documents, were introduced during manufacturing, planning and control.
- ✓ Management had to confirm all operators are equal to the work imposed on them and holidays, celebrations and disputes did not affect any of the quality levels.
- ✓ Inspections and tests were carried out, and all components and materials bought in or otherwise, conformed to the specifications, and the measuring equipments was accurate , this is the responsibility of the QA/QC department.
- ✓ Any complaints received from the customers were satisfactorily dealt with in a timely manner.
- ✓ Feedback from the user/customer is used to review designs.
- ✓ Consistent data recording and assessment and documentation integrity.
- ✓ Product and/or process change management and notification.

Standards

The final component of materials management is standards compliance. There are standards that are followed in supply chain management that are critical to a supply chain's function. For example, a supply chain that uses just-in time or lean replenishment requires absolute perfection in the shipping of parts and material from purchasing agent to warehouse to place of destination. Systems reliant on vendor-managed inventories must have up-to-date computerized inventories and robust ordering systems for outlying vendors to place orders on. Materials management typically insures that the warehousing and shipping of such components as are needed follows the standards required to avoid problems. This component of materials management is the fastest changing part, due to recent innovations in SCM and in logistics in general, including outsourced management of ware housing, mobile computing, and real-time logistical inventories

1.4. Corporate Policy of MM/JIT/Kanban

Just-in-time (JIT) is an inventory strategy implemented to improve the return on investment of a business by reducing in-process inventory and its associated costs In order to achieve JIT the process must have signals of what is going on elsewhere within the process. This means that the process is often driven by a series of signals, which can be kanban), that tell production processes when to make the next part. Kanban are usually 'tickets' but can be simple visual signals, such as the presence or absence of a part on a shelf. When implemented correctly, JIT can lead to dramatic improvements in a manufacturing organization's return on investment quality, and efficiency. Some have suggested that "Just on Time" would be a more appropriate name since it

emphasizes that production should create items that arrive when needed and neither earlier nor later.

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This is crucial as the materials management function involves handling vast amount of data. Therefore, integrating the various functions identify themselves to a common materials management department which in turn results in greater coordination and better control
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Just-In-time (JIT)

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Quick communication of the consumption of old stock which triggers new stock to be ordered is key to JIT and inventory reduction. This saves warehouse space and costs. However since stock levels are determined by historical demand , any sudden demand rises above the historical average demand, the firm will deplete inventory faster than usual and cause customer service issues. Some have suggested that recycling Kanban faster can also help flex the system by as much as 10-30%. In recent years manufacturers have touted a trailing 13 week average as a better predictor for JIT planning than most forecasters could provide.

The technique was first used by the Ford Motor Company as described explicitly by Henry Ford 's My Life and Work (1923): "We have found in buying materials that it is not worthwhile to buy for other than immediate needs. We buy only enough to fit into the plan of production, taking into consideration the state of transportation at the time. If transportation were perfect and an even flow of materials could be assured, it would not be necessary to carry any stock whatsoever. The carloads of raw materials would arrive on schedule and in the planned order and amounts, and go from the railway cars into production. That would save a great deal of money, for it would give a very rapid turnover and thus decrease the amount of money tied up in materials. With bad transportation one has to carry larger stocks." This statement also describes the concept of "dock to factory floor" in which incoming materials are not even stored or warehoused before going into production. The concept needed an effective freight management system (FMS); Ford's Today and Tomorrow (1926) describes one.

The technique was subsequently adopted and publicized by Toyota Motor Corporation of Japan as part of its Toyota production System (TPS). However, Toyota famously did not adopt the procedure from Ford, but from Piggly Wiggly .Although Toyota visited Ford as part of its tour of American businesses, Ford had not fully adopted the Just-In-Time system, and Toyota executives were appalled at the piles of inventory lying around and the uneven work schedule of the employees of Ford. Toyota also visited Piggy Wiggly, and it was there that Toyota executives first observed a fully functioning and successful Just-In-Time system, and modeled TPS after it.

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Philosophy

The philosophy of JIT is simple - inventory is defined to be waste. JIT inventory systems expose the hidden causes of inventory keeping and are therefore not a simple solution a company can adopt; there is a whole new way of working the company must follow in order to manage its consequences. The ideas in this way of working come from many different disciplines including statistics, industrial engineering, production management and behavioral science. In the JIT inventory philosophy there are views with respect to how inventory is looked upon, what it says about the management within the company, and the main principle behind JIT.

Inventory is seen as incurring costs, or waste, instead of adding and storing value, contrary to traditional accounting. This does not mean to say JIT is implemented without unawareness that removing inventory exposes pre-existing manufacturing issues. With this way of working, businesses are encouraged to eliminate inventory that does not compensate for manufacturing process issues, and then to constantly improve those processes so that less inventory can be kept. Secondly, allowing any stock habituates the management to stock keeping and it can then be a bit like a narcotic. Management is then tempted to keep stock there to hide problems within the production system. These problems include backups at work centers, machine reliability, and process variability, lack of flexibility of employees and equipment, and inadequate capacity among other things.

In short, the just-in-time inventory system is all about having "the right material, at the right time, at the right place, and in the exact amount", without the safety net of inventory. The JIT system has implications of which are broad for the implementers.

Stocks

JIT emphasis's inventory as one of the seven wastes (Production, waiting time, transportation, inventory, processing, motion and product defect), and as such its practice involves the philosophical aim of reducing input buffer inventory to zero. Zero buffer inventories means that production is not protected from exogenous (external) shocks. As a result, exogenous shocks reducing the supply of input can easily slow or stop production with significant negative consequences. For example, Toyota suffered a major supplier failure as a result of the 1997 Aisin

fire which rendered one of its suppliers incapable of fulfilling Toyota's orders. In the U.S., the 1992 railway strikes resulted in General Motors having to idle a 75,000-worker plant because they had no supplies coming in.

Transaction cost approach
JIT reduces inventory in a firm. However, unless it is used throughout the supply chain, it can be hypothesized that firms are simply outsourcing their input inventory to suppliers (Naj 1993). This effect was investigated by Newman (1993), who found, on average, suppliers in Japan charged JIT customers a 5% price premium.

Environmental concerns
During the birth of JIT, multiple daily deliveries were often made by bicycle; with increases in scale has come the adoption of vans and Lorries (trucks) for these deliveries. Cushman (1994) has highlighted the potential and actual problems this causes with regard to gridlock and the burning fossil fuels. This violates three JIT wastes:

- ✓ Time; wasted in traffic jams
- ✓ Inventory; specifically pipeline (in transport) inventory and
- ✓ Scrap; with respect to petrol or diesel burned while not physically moving.

Price volatility
JIT implicitly assumes a level of input price stability such that it is desirable to inventory inputs at today's prices. Where input prices are expected to rise storing inputs may be desirable.

Quality volatility
JIT implicitly assumes the quality of available inputs remains constant over time. If not, firms may benefit from hoarding high quality inputs.

Demand stability
Carmaker (1989) highlights the importance of relatively stable demand which can help ensure efficient capital utilization rates. Carmaker argues without a significant stable component of demand, JIT becomes untenable in high capital cost production. In the U.S., the 1992 railway strikes resulted in General Motors having to idle a 75,000-worker plant because they had no supplies coming in

Benefits
As most companies use an inventory system best suited for their company, the Just-In-Time Inventory System (JIT) can have many benefits resulting from it. The main benefits of JIT are listed below.

- ✓ *Set up times are significantly reduced in the factory.* Cutting down the set up time to be more productive will allow the company to improve their bottom line to look more efficient and focus time spent on other areas that may need improvement. This allows the reduction or elimination of the inventory held to cover the "changeover" time, the tool used here is SMED
- ✓ *The flows of goods from warehouse to shelves are improved.* Having employees focused on specific areas of the system will allow them to process goods faster instead of having them vulnerable to fatigue from doing too many jobs at once and simplifies the tasks at hand. Small

or individual piece lot sizes reduce lot delay inventories which simplifies inventory flow and its management.

- ✓ *Employees who possess multiple skills are utilized more efficiently.* Having employees trained to work on different parts of the inventory cycle system will allow companies to use workers in situations where they are needed when there is a shortage of workers and a high demand for a particular product.
- ✓ *Better consistency of scheduling and consistency of employee work hours.* If there is no demand for a product at the time, workers don't have to be working. This can save the company money by not having to pay workers for a job not completed or could have them focus on other jobs around the warehouse that would not necessarily be done on a normal day.
- ✓ *Increased emphasis on supplier relationships.* No company wants a break in their inventory system that would create a shortage of supplies while not having inventory sit on shelves. Having a trusting supplier relationship means that you can rely on goods being there when you need them in order to satisfy the company and keep the company name in good standing with the public.
- ✓ *Supplies continue around the clock keeping workers productive and businesses focused on turnover.* Having management focused on meeting deadlines will make employees work hard to meet the company goals to see benefits in terms of job satisfaction, promotion or even higher pay.

Problems

Within a JIT system

The major problem with just-in-time operation is that it leaves the supplier and downstream consumers open to Supply Socks and large supply or demand changes. For internal reasons, this was seen as a feature rather than a bug by Ohno used the analogy of lowering the level of water in a river in order to expose the rocks to explain how removing inventory showed where flow of production was interrupted. Once the barriers were exposed, they could be removed; since one of the main barriers was rework, lowering inventory forced each shop to improve its own quality or cause a holdup in the next downstream area. One of the other key tools to manage this weakness is Production Leveling to remove these variations. Just-in-time is a means to improving performance of the system, not an end.

With very low stock levels meaning that there are shipments of the same part coming in sometimes several times per day, Toyota is especially susceptible to an interruption in the flow. For that reason, Toyota is careful to use two suppliers for most assemblies. As noted in Liker (2003), there was an exception to this rule that put the entire company at risk by the 1997 Aisin Fire However, since Toyota also makes a point of maintaining high quality relations with its entire supplier network, several other suppliers immediately took up production of the Aisin-built parts by using existing capability and documentation. Thus, a strong, long-term relationship with a few suppliers is preferred to short-term, price-based relationships with competing suppliers. This long-term relationship has also been used by Toyota to send Toyota staff into their suppliers to improve their suppliers' processes. These interventions have now been going on for twenty years and result in improved margins for Toyota and the supplier as well as lower final customer costs and a more reliable supply chain. Toyota encourages their suppliers to duplicate this work with their own suppliers.

KANBAN

Kanban where Kan, means "visual," and ban, means "card" or "board") is a concept related to lean and Just In Time (JIT) production. The Japanese word kanban (pronounced Kanban) is a common everyday term meaning "signboard" or "billboard" and utterly lacks the specialized meaning that this loanword has acquired in English. According to Taiichi ONO, the man credited with developing JIT, kanban is a means through which JIT is achieved.

Kanban is a signaling system to trigger action. As its name suggests, kanban historically uses cards to signal the need for an item. However, other devices such as plastic markers (kanban squares) or balls (often golf balls) or an empty part-transport trolley or floor location can also be used to trigger the movement, production, or supply of a unit in a factory

It was out of a need to maintain the level of improvements that the kanban system was devised by Toyota. Kanban became an effective tool to support the running of the production system as a whole. In addition, it proved to be an excellent way for promoting improvement.

Origins

The term kanban describes an embellished wooden or metal sign which has often been reduced to become a trade mark or seal. Since the 17th century, this expression in the Japanese mercantile system has been as important to the merchants of Japan as military banners have been to the samurai. Visual puns, calligraphy and ingenious shapes — or kanban — define the trade and class of a business or tradesman. Often produced within rigid confusion restrictions on size and color, the signs and seals are mast MR Pieces of logo and symbol design. For example, sumo wrestler, a symbol of strength, may be used as kanban on a pharmacy's sign to advertise a treatment for anemia.

Operation

An important determinant of the success of "push" production scheduling is the quality of the demand forecast which provides the "push". Kanban, by contrast, is part of a pull system that determines the supply, or production, according to the actual demand of the customers. In contexts where supply time is lengthy and demand is difficult to forecast, the best one can do is to respond quickly to observed demand. This is exactly what a kanban system can help: it is used as a demand signal which immediately propagates through the supply chain. This can be used to ensure that intermediate stocks held in the supply chain are better managed, usually smaller. Where the supply response cannot be quick enough to meet actual demand fluctuations, causing significant lost sales, then stock building may be deemed as appropriate which can be achieved by issuing more kanban. Taiichi Ohno states that in order to be effective kanban must follow strict rules of use (Toyota, for example, has six simple rules) and that close monitoring of these rules is a never-ending problem to ensure that kanban does what is required.

A simple example of the kanban system implementation might be a "three-bin system" for the supplied parts (where there is no in-house manufacturing) — one bin on the factory floor, one bin in the factory store and one bin at the suppliers' store. The bins usually have a removable card that contains the product details and other relevant information — the kanban card. When the bin on the factory floor is empty, the bin and kanban card are returned to the factory store. The factory store then replaces the bin on the factory floor with a full bin, which also contains a kanban card.

The factory store then contacts the supplier's store and returns the now empty bin with its kanban card. The supplier's inbound product bin with its kanban card is then delivered into the factory store completing the final step to the system. Thus the process will never run out of product and could be described as a loop, providing the exact amount required, with only one spare so there will never be an issue of over-supply. This 'spare' bin allows for the uncertainty in supply, use and transport that are inherent in the system. The secret to a good kanban system is to calculate how many kanban cards are required for each product. Most factories using kanban use the colored board system (Hiejunka Box). This consists of a board created especially for holding the kanban cards

E-Kanban Systems

Many manufacturers have implemented electronic kanban systems Electronic kanban systems, or E-Kanban systems, help to eliminate common problems such as manual entry errors and lost cards. E-Kanban systems can be integrated into Enterprise Resource Planning (ERP) systems. Integrating E-Kanban systems into ERP systems allows for real-time demand signaling across the supply chain and improved visibility. Data pulled from E-Kanban systems can be used to optimize inventory levels by better tracking supplier lead and replenishment times.

1.5. Organization Of Materials Management Functions

The overall objectives of an organization tend to be achieved most efficiently when the organization is structured by grouping similar activities together. The process begins by dividing the total operation into its basic functional components. Each component, in turn, is divided into a number of sub-functions. The process is continued until each individual job encompasses a reasonable number of related tasks. The basic aim is to have a system that is functionalized, has proper control over the activities and is well co-ordinate.

Materials Management provides an integrated systems approach to the co-ordination of the materials activities and the control of total material costs. Obviously, the MM organization is derived from its fundamental objectives. Since Materials management function ranges from receiving the material requisition to placement of purchase orders and then on the other hand to receiving the material and making it available to the users, a commonly seen organization of materials management is divided into integrated sections as:

- ✓ Purchasing
- ✓ Stores
- ✓ Inspection
- ✓ Traffic

Purchasing: Once the whole Materials Management function has been divided into its different sub-functions as above, the sub-functions too are divided into their functions which are usually seen to be as:

Administrative: Purchasing administration involves all the tasks associated with the management process, with emphasis on the development of policies, procedures, controls and the mechanics for coordinating purchasing operations with those of other departments.

Buying: It addresses to a wide gamut of activities such as reviewing requisitions, analyzing specifications, investigating vendors, interviewing sales people studying costs and prices and negotiating.

Expediting: This is basically the order follow up activity involving various types of vendor relationship work.

Reviewing Order status, providing clarifications on transportation, writing and emailing vendors etc.

Special projects (Non routine) : In order to facilitate smooth purchasing in a highly competitive business environment , purchasing authorities have to keep building the capacity to do better by taking up as special projects activities such as vendor development, vendor registration, value analysis, market studies, system studies etc

Routine : Purchasing process or procedure involving routine or every day activities such as dealing specific purchase file , placing orders, maintaining records of commodities, vendors etc.

Purchasing

Purchasing refers to a business or organization attempting to acquire goods or services to accomplish the goals of the enterprise. Though there are several organizations that attempt to set standards in the purchasing process, processes can vary greatly between organizations. Typically the word "purchasing" is not used interchangeably with the word "procurement", since procurement typically includes Expediting, Supplier Quality, and Traffic and Logistics (T&L) in addition to Purchasing.

Overview

Purchasing managers/directors, and procurement managers/directors guide the organization's acquisition procedures and standards. Most organizations use a three-way check as the foundation of their purchasing programs. This involves three departments in the organization completing separate parts of the acquisition process. The three departments do not all report to the same senior manager to prevent unethical practices and lend credibility to the process. These departments can be purchasing, receiving; and accounts payable or engineering, purchasing and accounts payable; or a plant manager, purchasing and accounts payable. Combinations can vary significantly, but a purchasing department and accounts payable are usually two of the three departments involved.

Historically, the purchasing department issued Purchase Orders for supplies, services, equipment, and raw materials. Then, in an effort to decrease the administrative costs associated with the repetitive ordering of basic consumable items, "Blanket" or "Master" Agreements were put into place. These types of agreements typically have a longer duration and increased scope to maximize the Quantities of Scale concept. When additional supplies are required, a simple release would be issued to the supplier to provide the goods or services.

Another method of decreasing administrative costs associated with repetitive contracts for common. +material is the use of company credit cards, also known as "Purchasing Cards" or simply "P Cards". P-card programs vary, but all of them have internal checks and audits to ensure

appropriate use. Purchasing managers realized once contracts for the low dollar value consumables are in place, procurement can take a smaller role in the operation and use of the contracts. There is still oversight in the forms of audits and monthly statement reviews, but most of their time is now available to negotiate major purchases and setting up of other long term contracts. These contracts are typically renewable annually.

This trend away from the daily procurement function (tactical purchasing) resulted in several changes in the industry. The first was the reduction of personnel. Purchasing departments were now smaller. There was no need for the army of clerks processing orders for individual parts as in the past. Another change was the focus on negotiating contracts and procurement of large capital equipment. Both of these functions permitted purchasing departments to make the biggest financial contribution to the organization. A new terms and job title emerged –Strategic sourcing and Sourcing Managers. These professionals not only focused on the bidding process and negotiating with suppliers, but the entire supply function. In these roles they were able to add value and maximize savings for organizations. This value was manifested in lower inventories, less personnel, and getting the end product to the organization's consumer quicker. Purchasing manager's success in these roles resulted in new assignments outside to the traditional purchasing function – logistics, materials management, distribution, and warehousing. More and more purchasing managers were becoming Supply Chain Managers handling additional functions of their organizations operation. Purchasing managers were not the only ones to become Supply Chain Managers. Logistic managers, material managers, distribution managers, etc all rose the broader function and some had responsibility for the purchasing functions now.

In Accounting, purchases are the amount of goods a company brought throughout this year. They are added to Inventory. Purchases are offset by Purchase Discounts and Return & Allowances When it should be added depends on the Free on Board (FOB) policy of the trade. For the purchaser, this new inventory is added on shipment if the policy was FOB shipping point, and the seller remove this item from its inventory. On the other hand, the purchaser added this inventory on receipt if the policy was FOB destination, and the seller removes this item from its inventory when it was delivered.

Goods brought for the purpose other than direct selling, such as for Research & Development, are added to inventory and allocated to Research and Development expense as they are used. On a side note, equipments brought for Research and Development are not added to inventory, but are capitalized as assets

Selection of Bidders

This is the process where the organization identifies potential suppliers for specified supplies, services or equipment. These suppliers' credentials (qualifications) and history are analyzed, together with the products or services they offer. The bidder selection process varies from organization to organization, but can include running credit reports, interviewing management, testing products, and touring facilities. This process is not always done in order of importance, but rather in order of expense. Often purchasing managers research potential bidders obtaining information on the organizations and products from media sources and their own industry contacts. Additionally, purchasing might send Request for Information (RFI) to potential suppliers to help gather information. Engineering would also inspect sample products to determine if the

company can produce products they need. If the bidder passes both of these stages engineering may decide to do some testing on the materials to further verify quality standards.

Bidding Process

This is the process an organization utilizes to procure goods, services or equipment. Processes vary significantly from the stringent to the very informal. Large corporations and governmental entities are most likely to have stringent and formal processes. These processes can utilize specialized bid forms that require specific procedures and detail. The very stringent procedures require bids to be open by several staff from various departments to ensure fairness and impartiality. Responses are usually very detailed. Bidders not responding exactly as specified and following the published procedures can be disqualified. Smaller private businesses are more likely to have less formal procedures. Bids can be in the form of an email to all of the bidders specifying products or services. Responses by bidders can be detailed or just the proposed dollar amount.

Most bid processes are multi-tiered.

Acquisition Process

The revised acquisition process for major systems in industry and defense is shown in the next figure. The process is defined by a series of phases during which technology is defined and matured into viable concepts, which are subsequently developed and readied for production, after which the systems produced are supported in the field.

The process itself includes four phases of development

- ✓ Concept and Technology Development: is intended to explore alternative concepts based on assessments of operational needs, technology readiness, risk, and affordability.
- ✓ Concept and Technology Development phase begins with concept exploration. During this stage, concept studies are undertaken to define alternative concepts and to provide information about capability and risk that would permit an objective comparison of competing concepts.
- ✓ System Development and Demonstration phase. This phase could be entered directly as a result of a technological opportunity and urgent user need, as well as having come through concept and technology development.
- ✓ The last, and longest, phase is the Containment and Disposal phase of the program. During this phase all necessary activities are accomplished to maintain and sustain the system in the field in the most cost-effective manner possible.

Material Planning

In any integrated Materials Management environment, planning for getting the materials is the starting point for the whole MM function. Materials planning set the procurement function and the subsequent material functions rolling.

Material planning is a scientific way of determining the requirements starting with raw materials, consumables, spare parts and all other materials that are required to meet the given production plan for a certain period. Material planning is derived from the overall organizational planning and

hence it is always a sub-plan of the broad organizational plan. What it does is forecasting and initiating for procurement of materials

Factors affecting Material planning:

- ✓ **Macro factors:** Global factors such as price trends, business cycles, government's import and export policies etc are called the Macro factors. Credit policy of the government is a critical factor as banks follow these guidelines only while extending financial support to a business entity.
- ✓ **Micro factors:** These are essentially the factors existing within the organization such as corporate policy on Inventory holding, production plan, investments etc. For any organization, factors such as Lead time of procurement, acceptable inventory levels, working capital, seasonality, delegation of power are micro factors.

Techniques of planning materials:

There are a few techniques used for planning material for the given period. The following two are, however, commonly used:

- ✓ Materials Requirement Planning (ERP)
- ✓ Requirement based on past consumption

Material Requirement Planning:-

ERP has, as its starting point, the annual production plan of the manufacturing concern. Once a firm determines its annual production plan, the overall material requirement, to meet the given production plan, is worked out. It is a detailed analysis encompassing the materials and quantities available for use, materials with quantities not available and hence needing procurement, the actual lead time of procurement etc.

Since, it is always possible to have a situation where some parts of an assembly are available and some others not available, Bill of Materials is exploded. It is quantifying all the materials (components) needed for various assemblies, all needed as per the production plan. BOM is thus a list displaying the code, nomenclature of an item, its unit and quantity, location of use and also the estimated price of each component.

An explosion chart is a series of bills of materials grouped together in a matrix form so that combining the requirements for different components can be made. Once the BOM is ready, the same is handed over to the Purchasing wing which initiates the purchasing activities. ERP thus keeps in view the Lead time also. Using computers, preparation of BOM through explosion of lists is quite easy and smooth

Techniques of Material planning:-

- ✓ JIT
- ✓ Kanban
- ✓ Push Or Pull

Requirement of material planning:-

An MP system is intended to simultaneously meet three objectives:

- ✓ Ensure Materials and products are available for production and delivery to customers.
- ✓ Maintain the lowest possible level of inventory.
- ✓ Plan manufacturing activities, delivery schedules and purchasing activities

The basic objective of the material planning is to perform the manufacturing operation in a proper way thus they can achieve the desired results.

Manufacturing organizations, whatever their products, face the same daily practical problem - that customers want products to be available in a shorter time than it takes to make them. This means that some level of planning is required.

Companies need to control the types and quantities of materials they purchase, plan which products are to be produced and in what quantities and ensure that they are able to meet current and future customer demand, all at the lowest possible cost. Making a bad decision in any of these areas will make the company lose money. A few examples are given below:

- ✓ If a company purchases insufficient quantities of an item used in manufacturing, or the wrong item, they may be unable to meet contracts to supply products by the agreed date.
- ✓ If a company purchases excessive quantities of an item, money is being wasted - the excess quantity ties up cash while it remains as stock and may never even be used at all. However, some purchased items will have a minimum quantity that must be met, therefore, purchasing excess is necessary.
- ✓ Beginning production of an order at the wrong time can cause customer deadlines to be missed.

ERP is a tool to deal with these problems. It provides answers for several questions:

- ✓ What items are required
- ✓ How many are required
- ✓ When are they required

ERP can be applied both to items that are purchased from outside suppliers and to sub-assemblies, produced internally, that are components of more complex items.

The data that must be considered include:

- ✓ The end item (or items) being created. This is sometimes called Independent Demand, or Level "0" on BOM (Bill Of material)
- ✓ How much is required at a time.
- ✓ When the quantities are required to meet demand.
- ✓ Shelf life of stored materials.
- ✓ Inventory status records. Records of net materials available for use already in stock (on hand) and materials on order from suppliers. Bills of materials. Details of the materials, components and subassemblies required to make each product.
- ✓ Planning Data. This includes all the restraints and directions to produce the end items. This includes such items as: Routings, Labor and Machine Standards, Quality and Testing

Standards, Pull/Work Cell and Push commands, Lot sizing techniques (i.e. Fixed Lot Size, Lot-For-Lot, Economic Order Quantity), Scrap Percentages, and other inputs.

Outputs

There are two outputs and a variety of messages/reports:

- ✓ Output 1 is the "Recommended Production Schedule" which lays out a detailed schedule of the required minimum start and completion dates, with quantities, for each step of the Routing and Bill of Material required to satisfy the demand from the MPS.
- ✓ Output 2 is the "Recommended Purchasing Schedule". This lays out both the dates that the purchased items should be received into the facility AND the dates that the Purchase Order or Blanket Order Release should occur to match the production schedules.

Messages and Reports:

- ✓ Purchase Order: An order to a supplier to provide materials.
- ✓ Reschedule notices: These recommend canceling, increasing, delaying or speeding up existing orders.

Note that the outputs are recommended. Due to a variety of changing conditions in companies, since the last ERP / ERP system Re-Generation, the recommended outputs need to be reviewed by trained people to group orders for benefits in set-up or freight savings. These actions are beyond the linear calculations of the ERP computer software.

Bill of materials (BOM) is the term used to describe the raw materials, sub-assemblies, intermediate assemblies, sub-components, components, parts and the quantities of each needed to manufacture a final product. It may be used for communication between manufacturing partners or confined to a single manufacturing plant.

A BOM can define products as they are designed Engineering bill of material), as they are ordered (sales bill of material), as they are built Manufacturing Bill of Material), or as they are maintained (service bill of material). The different types of BOMs depend on the business need and use for which they are intended. In process industries, the BOM is also known as the formula, recipe, or ingredients list. In electronics, the BOM represents the list of components used on the printed wiring board or printed circuit board. Once the design of the circuit is completed, the BOM list is passed on to the PCB layout engineer as well as component engineer who will procure the components required for the design.

BOMs are hierarchical in nature with the top level representing the finished product which may be a sub-assembly or a completed item. BOMs that describe the sub-assemblies are referred to as Modular BOMs An example of this is the NAAMS BOM that is used in the automotive industry to list all the components in an assembly line. The structure of the NAAMS BOM is System, Line, Tool, Unit and Detail.

The first hierarchical databases were developed for automating bills of materials for manufacturing organizations in the early 1960s. A bill of materials "implosion" links component pieces to a major assembly, while a bill of materials "explosion" breaks apart each assembly or sub-assembly into its component parts.

A BOM can be displayed in the following formats:

- ✓ **A single-level BOM** that displays the assembly or sub-assembly with only one level of children. Thus it displays the components directly needed to make the assembly or sub-assembly.
- ✓ An indented BOM that displays the highest-level

Technical Evaluation

Technical Evaluations, evaluations of the technical suitability of the quoted goods or services, if required, are normally performed prior to the Commercial Evaluation. During this phase of the procurement process, a technical representative of the company (usually an engineer) will review the proposal and designate each bidder as either technical acceptable or technically unacceptable.

Commercial Evaluation

Payment Terms
Cost of Money - Cost of Money is calculated by multiplying the applicable currency interest rate multiplied by the amount of money paid prior to the receipt of GOODS. If the money were to have remained in the Buyer's account, interest would be drawn. That interest is essentially an additional cost associated with such Progress or Milestone payments.

Manufacturing Location - The manufacturing location is taken into consideration during the evaluation stage primarily to calculate freight costs and regional issues which may be considered. For instance, in Europe in is common for factories to close during the month of August for summer holiday. Labor agreements may also be taken into consideration and may be drawn into the evaluation if the particular region is known to frequent labor unions.

Manufacturing Lead-Time - the manufacturing lead-time is the time from the placement of the order (or time final drawings are submitted by the Buyer to the Seller) until the goods are manufactured and prepared for delivery. Lead-times vary by commodity and can range from several days to years.

Transportation Time - Transportation time is evaluated while comparing the delivery of goods to the Buyer's required use-date. If Goods are shipped from a remote port, with infrequent vessel transportation, the transportation time could exceed the schedule adjustments would need to be made.

Delivery Charges - the charge for the Goods to be delivered to a stated point. Bid Validity Packing Bid Adjustments Terms and Conditions Seller's Services Standards Organizations Financial Review Payment Currency Risk Analysis - market volatility, financial stress within the bidders testing