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Products And Supplies Managed by a Variety of Inventory Management Systems

Satish Prajapati[1], Kalpana Sachan[2], Harimohan Soni[3]

[1]*Mechanical Engineering Department, Bansal Institute of Science and Technology, Bhopal (M.P.), India.*
[2]*Mechanical Engineering Department, Bansal Institute of Science and Technology, Bhopal (M.P.), India.*
[3]*Mechanical Engineering Department, Bansal Institute of Science and Technology, Bhopal (M.P.), India.*

Abstract - The majority of Indian manufacturing enterprises' current assets consist mostly of inventory. The major goal of this research is to determine if several goods in the Manufacturing Company may be analysed and grasped utilising inventory management techniques. The research is characterised as a qualitative single-case study. The applied study technique includes ABC analysis. Data is mostly collected through interviews with the manager and other workers involved in inventory control operations. Secondary data is obtained from the information system to create yearly reports, sales reports, purchasing reports, and associated journals for the company. The study's research and results provide an answer to the critical question of effective inventory management by an organisation. This thesis advises an appropriate amount, quality, and timeliness of materials.

***Key Words*:** Inventory, ABC analysis, quality management, organisation behaviour.

1. INTRODUCTION

At present, there is a notable concern among both employees and management regarding the quality of work-life balance, ergonomic practices, and progress in occupational safety and health measures. Advancements in information and communication technology, along with specialised tasks that require repetition, highlight the importance of human factors in engineering. Through careful analysis, development, testing, and evaluation of workplace and interpersonal dynamics, professionals in this field can foster an environment that is productive, safe, and rewarding. Information Technology plays a vital role in the field of industrial engineering.

In various sectors, the allocation of resources towards production inventory represents a substantial share of the company's assets. The substantial investment requires profit-driven sectors to concentrate on optimising returns on their material expenditures. The purchasing division is expected to achieve this objective, even in the face of various conflicting circumstances; the final decision on the acquisition may have to be made with limited information and under time pressures. The determination of purchase amount has attracted increased focus in recent years.

The objective of inventory systems is to reduce both the stock levels and the capital tied up in manufacturing materials. The inventory control method known as materials requirement planning is utilised in manufacturing systems and various trading enterprises to regulate production in accordance with established demand requirements. In these contexts, demand exhibits non-deterministic characteristics, and procurement lead times vary; nonetheless, fluctuations and trends can be effectively approximated through a cumulative probability distribution function. This type of inventory system, known as stockiest inventory systems, is employed to support management in making decisions amidst uncertainty. Inventory or stock represents a crucial element of corporate investment and requires effective management to maximise profit. The main challenges associated with inventory include a lack of control, inefficiency, elevated costs, and unreliability.

Organisations frequently uphold high inventory levels to ensure that products are accessible when needed. Nevertheless, this represents a considerable investment that yields a reduced return on the capital deployed. A comprehensive inventory solution can significantly improve your inventory management capabilities, allowing you to:

A) Ensure accurate inventory of necessary products. B) Enhance inventory turnover.
C) Decrease the optimal inventory and safety stock levels
D) Achieve reduced raw material costs via innovative supplier networking.
E) Minimize downtime F) Decrease taxes
G) Decrease insurance expenses
H) Decrease storage expenses
I) Enhance cash flow and working capital
J) Augment cash flow and working capital
K) Remove outdated stuff

An inventory solution may help your company teach materials planners, buying agents, quality assurance professionals, inventory control personnel, manufacturing engineers, and materials management experts while also lowering costs. The complete inventory solutions provided are available to anybody looking to reduce their current inventory levels and save millions of rupees on excess stock. It is also committed to providing timely, prioritised, and quantified results with no hidden costs. The basic goal is to sustain a profitable organisation. As a result, industrial engineers use human, informational, material, financial, and technological resources to optimise the production of products and services. Engineering economics and decision analysis, human factors (human-machine/computer interaction), manufacturing systems, production, distribution, and material handling, statistics, and stochastic systems are the most common areas of specialisation. Industrial engineering is concerned with the design, development, and operation of industrial and service systems with the goal of producing and distributing goods and services efficiently. The basic role of industrial engineering is to integrate human resources, materials, equipment, computers, information, and control systems to create complex systems. The industrial engineering faculty conducts research in mathematical programming, operations and facility design, and industrial control. The industrial engineering faculty actively engages in research in the areas of mathematical programming, operations and facilities design, and industrial control.

2. MATERIAL HANDLING AND INVENTORY MANAGEMENT

It plays a crucial part in business and commerce, but its significance is unparalleled in the effective functioning of manufacturing, housing, and distribution. Individuals who specialize in this field comprehend how material handling techniques, equipment, and systems can enhance productivity. They regard the material handling process and the available technologies as strategic competitive elements that contribute to cost reduction, increased throughput, and improved responsiveness in business operations. These factors are directly influenced by the effectiveness of an organization's material handling system.

Bill of Material Repulsion:

A bill of materials or product structure is a comprehensive enumeration of the raw materials, sub-assemblies, intermediate assemblies, sub-components, pieces, and their respective amounts required for the production of an end product. A Bill of Materials (BOM) may facilitate communication across production partners or be restricted to a singular manufacturing facility. A bill of materials is frequently associated with a manufacturing order, the issue of which may create reserves for in-stock components and requisitions for out-of-stock components.

A Bill of Materials (BOM) can delineate items in terms of their design, ordering, construction, or maintenance. The many forms of BOMs are contingent upon the specific business requirements and planned applications. In process industries, the Bill of Materials (BOM) is sometimes referred to as the formula, recipe, or ingredients list. The term "bill of material" (BOM) is commonly employed by engineers as an adjective to denote the present production configuration of a product, differentiating it from changed or enhanced versions under consideration or testing.

In electronics, the BOM denotes the inventory of components utilized on the printed wire board or printed circuit board. Upon completion of the circuit design, the Bill of Materials (BOM) is forwarded to the PCB layout engineer and the component engineer, who will acquire the necessary components for the design.

The goods holding cost refers to the expenses associated with the storage and maintenance of goods for a specified duration. Inventory expenses are generally expressed as a percentage of the yearly inventory value. They fluctuate significantly based on the industry, although they always remain elevated. Carrying expenses typically account for around 25% of the value of inventory held. Consequently, formulating a precise definition is challenging. The terminology related to inventory expenses, including inventory cost, total inventory cost (TIC), and total cost of inventory ownership, may be complex, with definitions varying somewhat across different sources and industries. This article emphasizes the expenses associated with a "static" inventory, rather than those incurred by inventory fluctuations. We set aside the issues concerning the flow of commodities to concentrate exclusively on the expenses associated with possessing a specific quantity of inventory. We also embrace a commercial viewpoint on the issue.

Cost: An amount that must be paid or relinquished to obtain something.
In business, cost often represents a monetary assessment of (1) work, (2) materials, (3) resources, (4) time and utilities utilised, (5) risks undertaken, and (6) opportunities for forfeited in the production and delivery of a products or service. All expenses are costs; however, not all costs, such as those associated with the acquisition of an income-generating asset, qualify as expenses.

Stockout cost: A stockout, or out-of-stock (OOS) occurrence, refers to an event that leads to the depletion of inventories. Although out-of-stocks can arise throughout the whole supply chain, the most conspicuous instances are retail out-of-stocks in the fast-moving consumer goods sector. Stockouts are the antithesis of overstocks, characterised by an insufficient inventory level.

Setup expenses:
Setup costs refer to the expenses associated with preparing a machine for a production run. This expense is classified as a fixed cost of the corresponding batch, so its cost is allocated across the quantity of units produced.

Inventory carrying costs:
This is the expense a firm incurs over a specific duration to maintain and keep its inventory. Businesses utilise this metric to ascertain the potential profit from existing inventory. It also assists businesses in determining whether to increase or decrease production to manage expenditure or sustain the same revenue stream.

Total economic cost:
Total cost (TC) in economics and cost accounting refers to the comprehensive economic cost of production. It comprises variable costs, which fluctuate with the quantity of goods produced and encompass inputs such as labour and raw materials, alongside fixed costs, which remain constant regardless of production volume and include inputs (capital) that cannot be adjusted in the short term, such as buildings and machinery. Total cost in economics encompasses the complete potential cost associated with each item of production, integrating it into both fixed and variable costs.

The rate of change in total cost relative to changes in production quantity is referred to as marginal cost. This is often referred to as the marginal unit variable cost.

Anticipated annual demand
A distribution centre for a collection of items is a warehouse or specialised facility, frequently equipped with refrigeration or air conditioning, that is stocked with goods for redistribution to retailers, wholesalers, or directly to customers.

A definition of the term "EBQ," or Economic Batch Quantity, is provided. It pertains to economic batch quantity. EBQ is identified as the ideal batch size for producing an item or component at minimal cost. The batch size represents a trade-off, since unit prices escalate with. Economic order quantity
The economic batch quantity (EBQ), commonly referred to as the 'optimal batch amount' or economic production quantity, is

a metric utilised to ascertain the number of units that may be produced at the lowest average costs within a certain batch or production run. The Economic Production Quantity model, or EPQ model, is an extension of the Economic Order Quantity.

Economic order quantity (EOQ) is the order quantity that minimises overall holding and ordering expenses. It is among the most ancient classical production scheduling schemes. The methodology employed to ascertain this order quantity is referred to as the Wilson EOQ Model, Wilson Formula, or Andler Formula.

Anticipated inventory holding cost: In business management, holding cost refers to the expenditure incurred to retain and preserve a stock of products in storage.
The primary holding costs encompass rent for the necessary space; charges for equipment, materials, and personnel to manage the space; insurance; security; interest in capital invested in inventory and space; and other direct expenditures. Certain held items become outdated before the sale, diminishing their income contribution without impacting their keeping cost. Certain commodities are compromised by handling, environmental conditions, or other factors. Certain items are lost due to carelessness, inadequate record-keeping, or theft, a category referred to as shrinkage.

The holding cost encompasses the potential cost associated with diminished responsiveness to consumers' evolving needs, delayed launch of enhanced products, and the value and direct expenditures of the inventory, since those funds may be allocated to alternative uses.

Particular	Qty	Rates per units	Total amount
Glove pair leather	100 PAIRS	40	140
Apron leather	100 NOS	108	10800(4)
Screen welding hand	200	65	13000(2)
Google pair welder	100	14	1400
Hammer scaling .25 kg with handle	100	37	3700
Chisel cold flat `19mm	200 NOS	50	1000
Centre punch9mm*	500 NO	22	11000(3)
Square hollow tubes	30 00	38/KG	114000
Rectangular hollow tubes	25 000	39/KG	975000
Flats tubes	25000	36/KG	900000
Steel primer	200 LITRES	375	75000
Welding rod	100 BOX	300	30000
Nuts	1000	20	20000
Bolts	1000	20	20000
Rivert	1000	5	5000
Rubber washer	500 NOS	3	15000
Gi sheets	1000SHEETS	1600	160000
Angles in different shapes	2500 KG	52 RS/KG	130000
Anchor bolts	300 NOS	22	6600
Pipes	3000 KG	42	126000
DUCO paint	500 LITRES	250	125000
Japany sheets	800 SHEETS	2000	1600000
Corrugated japany sheet	80 SHEETS	2200	176000
Self threading screw	200 NO	25	5000
Gi ANGLE	50 kg	52	25000
DIVIDER	50	42	2100
CALIPPER OUTSIDE 15CM	60NO	25	1500
Wire brush 15 cm *3.7 cm	100	22	2200
Spark lighter	25	22	550
Chipping screen hand	20	72	1440
Square blade 15 cm	20	43	860
Sriver 15 cm	20	18	360
Tongs holding 30 cm	12	72	864

The strategies employed in the collection and analysis of data are referred to as research methodology. This section endeavors to provide a framework and approach to research. This encompasses the research design, analysis, and data collection method.

2.1 Strategy

A case study is described as a strategy for conducting research that entails an empirical investigation of a specific

contemporary phenomenon within its real-life context, utilising multiple sources of evidence. It is essential to remain vigilant regarding the necessity for diverse sources of evidence. “Every piece of evidence holds value for the case study investigator: nothing is dismissed.” However, this does not imply that it should engage with numerous individuals; rather, it must seek various forms of evidence: the statements made by individuals, their actions, the creations or productions they undertake, and the information presented in documents and records.

The current situation of inventory management at SOLAR System Ltd, Mandideep, was examined through a variety of evidence sources, including interviews with the manager and other relevant staff members at the company. Direct observation of the warehousing operation was also carried out. There exist two primary categories of case studies: the single-case study and the multiple-case study. Yin (2003) states that a single-case study resembles a single experiment, and many of the conditions that validate a single experiment also validate a single-case study. In contrast to single-case studies, evidence from multiple cases is frequently viewed as more persuasive, and the overall research is seen as more rigorous.

A single-case study approach was employed to carry out the research project at SOLAR System Ltd, Mandideep. The single-case study strategy facilitated a comprehensive understanding of the research context and provided insights into specific management issues. 3.2 Approaches to Gathering Data Essential information for this work was provided by primary and secondary sources.

2.2 sources include:

a) The first step is to conduct an interview with a few key individuals from the company's retail, buying, production, and inventory departments. It was necessary to observe the production process in order to have a better understanding of the flow of items during the conversion phase.
b) Observations were also made about the methods for patrolling and inspecting, as well as the handling and storage of materials.
c) The annual reports, product catalogue, sales reports, purchase reports, and purchasing reports of the firm, as well as the journals that are linked to the company, were researched and analyzed to collect relevant data.
d) A survey of the relevant literature focused on the ABC model was conducted in order to collect theoretical background material. The usage of e-mails was also employed to disseminate queries and collect replies.

3. Analysis of existing material management system

Various machinery and instruments are in need of frequent maintenance and repair at S.D. Solar India Pvt Ltd. The total cost of these devices and equipment is approximately 5 to 7 crores, and the spare parts and other materials required for their maintenance and repair work are approximately 1.5 to 1.75 crores.
An analysis of the material management system is necessary to ensure its effective utilisation and maintenance of a high-quality inventory system, as a significant sum of money has been invested.

Various kinds of analyses have been conducted on the current system, which includes all of the apparatus and materials that cost approximately Rs 15 crores.

3.1. ABC Analysis

The ABC Analysis will disclose the appropriate use of investment in the various equipment and materials used, which have varying costs.

ABC Analysis is a fundamental analytical management instrument that allows senior management to allocate resources to areas where they will yield the most significant results. The alphabetical approach, also known as "always better control," is a technique that has universal applications in a wide range of human endeavours. In an effort to ascertain the priority of any characteristic, the distribution is analysed by its monetary value. In material management, this technique has been implemented in areas that require selective control, including inventory, criticality of items, stocks, purchasing orders, material reception, inspection, storekeeping, and bill verification. The purpose of conducting ABC Analysis is to establish policy guidelines for selective control, thereby reducing the overall inventory by rationalising the number of orders.

3.2. The ABC analysis is implemented through the following steps:

a). Classify the items in inventories by determining the expected use in units and the price per unit for each item.
b). Multiply the expected units by the unit price of each item to ascertain the total value.
c). Sort the items in order of their total value, with the highest total value items being ranked first, and so forth.
d). Determine the ratios of the total value of each item to the total value of all items and the number of units of each item to the total units of all items (percentages).
e) Combine items according to their relative value to establish three categories: A, B, and C.

Item designated as "A"

According to the sample calculation analysis, the cost of 70% of the available spares and spares items is approximately 10% of the cost of inventory, while approximately 13% of the items cost approximately 70% of the cost of inventory. In other terms, A-items are goods with the maximum annual consumption value. Only 10-20% of the total inventory items are typically accounted for by the top 70-80% of the company's annual consumption value.

'B' Item: In other words, B-items are interclassing items with a medium consumption value, accounting for approximately 18% of the total inventory cost of material and parts. 30% of the total inventory items are typically accounted for by 15-25% of annual consumption value.

'C' Items: C items are those that have a value of approximately 10-12% of the cost and account for approximately 70% of the total inventory items.

3.3. ABC ANALYSIS:

A few thousand tonnes of fuel are consumed by an average medium-sized organization would be neither practicable nor worthwhile for an organization to select a high level of control over each item, as not all items are of equal importance, given the amount of work involved. Therefore, it is advisable to classify and group the items based on their significance, subjecting each class or group of items to control in a manner that is commensurate with their importance. This is the principle of selective control as it is applied to inventories and classified, which is referred to as "always Better Control". "The annual consumption is analyzed based on the principle of "vital few" -- "trivial many," with the criterion being the amount of money spent rather than the quantity consumed.
Items labelled as "A"
Based on the analysis, it is possible that approximately 10% of the commodities cost more than 75% of the inventory cost. This is classified as "A" items. From a control perspective, these are the most critical elements. To minimize the investment in these items, they should be ordered on a monthly, weekly, or even daily basis at the time of receipt. Their movement through the shop should be prioritized, and the movement time should be kept to a minimum. Stock or reserve stocking on such commodities should be kept to the utmost minimum. It is imperative to maintain a vigilant eye on the procurement and issuance of these items in order to optimize inventory management.

4. Results and discussion:

The year-wise income and expenditure for various sorts of machinery and equipment have been derived from the analyses conducted. The actual operating hours for the specified machinery and equipment have been determined. It demonstrates that the operational hours of machinery and equipment that are properly maintained and repaired promptly are significantly more than those that are undergoing repairs. Several pieces of equipment are undergoing repairs due to the unavailability of replacement components. When the spare parts are available, the maintenance working hours have been enhanced. The total income generated by machines and equipment with extended working hours is significantly higher, leading to increased corresponding expenditure and repair costs. However, comparative analysis reveals that the net income from these machines far exceeds that of the ideal machines. All these factors depend on the ABC components presented in the table.

1). The investigation indicates that the availability of replacement parts during maintenance enhances the operational hours of machines and equipment, hence increasing net income generated.
2). The acquisition of spare parts when needed is essential.
3). The inventory of commonly required spare parts enhances maintenance operations, hence increasing revenue savings.
4). The initial inventory of optimal spares must be verified. The absolute and utilitarian components may be discarded.
(5). ABC analyzes various elements based on cost and the significance of spare parts inventory.

The diverse outcomes suggest that savings are achieved in the procurement of various materials according to specific requirements. Minimise the inventory maintained throughout the year. This also enhances the operational hours for economically procuring things. It also provides the value of safety stock.
The aforementioned analysis also maintains a record of the purchase times, appropriate quantities of commodities, and the inventory balance in storage. Redundant objects may be disposed of periodically.

5. Conclusion:

The organization can enhance efficiency and ultimately generate more income by implementing the numerous references obtained from the analysis. The subsequent recommendations have been suggested.
(1). The inventory of a variety of items must be maintained in accordance with the ABC spare parts products.
(2) In order to prevent stock shortages, it is imperative to consider the quantity and timing of frequently purchased items.
(3). The periodic maintenance schedule must be planned, and the necessary parts must be ordered accordingly.
(4) In the event that the working hours of high-efficiency devices decline below the standard working hours, the underlying causes should be analysed and reported.

Consequently, the implementation of these recommendations will enhance efficiency and decrease the expense of superfluous materials that are either purchased or stored in inventory. It will contribute to the production of a greater amount of net income.

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