Raw Material Inventory Management in a Cattle Feed Industry

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Abstract

The aim of the paper is to investigate how industry is currently managing the flow of raw materials. And Understanding the techniques and data measurements to meet the actual demand and thereby satisfying the customer requirements. Study on the techniques that can be adopted by the company to come over the present crisis of shortage of products and customer dissatisfaction. The techniques like forecasting demand with the available data of previous year actual demand would be suggested to provide protection against uncertainty. The application of the proposed method in an industry and conducting a comparison based on cost for studying the advantages of proposed method with that of the existing method followed by the company.

Keywords: EOQ and Reorder Point, ANN, Conceptual Model

I. INTRODUCTION

The firm faces the large problem within supply and demand. There is a large shortage of supply. It could be easily understood from month wise report of current years demand and supply. To understand the raw material inventory management in a cattle feed plant. To identify the causes behind the inaccuracy in managing inventory. Forecasting demand and determining EOQ and Reorder point calculation for the current year to reduce inaccuracy.

II. NEED FOR REDESIGN

When the reasons for shortage of supply is considered The major problem faced in the industry is shortage production affecting large problem of additional cost to meet customer needs the various factors were analyzed and the major problem was identified as the shortage of raw materials. The plant has enough capacity to meet the demand for the products but unable to attain due to shortage of raw materials.

III. LITERATURE SUMMARY

Peter Wanke (2014): A conceptual framework for inventory management: Focusing on low consumption, this article evaluates the premise of demand adherence to normal distribution in inventory management models, showing that this can lead to significant distortions, mainly to stock control of very low and low consumption items. The article thus proposes a framework to help managers determine the best stock policy to be adopted given product demand characteristics. Jose L. Gonzalez and Daniel González (2010): Analysis of an Economic Order Quantity and Reorder Point Inventory Control Model for Company XYZ As a result to today's uncertain economy, companies are searching for alternative ways to stay competitive. In which, Company XYZ has been faced with an ineffective forecasting method that has lead to multiple product stock outs. The issue faced has caused sales loss as well as profit loss, which companies cannot afford to lose if they want to stay competitive. This project goes through the process of analysing the company's current forecasting model and recommending an inventory control model to help them solve their current issue. As a result, an Economic Order Quantity (EOQ) and a Reorder Point was recommended along with two forecasting techniques to help them reduce their product stock outs. JOHN M P & MANOJ P K (2014): Prospects of cattle feed industry in India and strategies for utilizing the market potential: a study in Kerala with a focus on factors influencing buyer behaviour: Indian feed industry is about 50 years old and it primarily consists of cattle feed and poultry feed segments.

Christine Mekel, Samuel PD Anantadjaya, Laura Lahindah (2013): Stock Out Analysis: An Empirical Study on Forecasting, Re-Order Point and Safety Stock Level at PT. Inventory is one of the most important assets in the companies, especially in

manufacturing company. In the event of problems related to inventory. H.A. Salaam, S. B. How, M. F. Faisae(2010): This study starts with identifying suitable company to do this project. The main criteria used to select a company are small medium enterprise (SME). This is because SME companies did not have enough capital to hire expertise to help them to improve their production line productivity, quality of the product produced and at the same time reduce the number of defect products. The company that has been chooses is a paper box producer company located in Kuantan, Pahang.

IV. PROBLEM IDENTIFICATION AND PROBLEM STATEMENT

The cattle feed plant with installed capacity of 300 MT production daily faces large problem in effective utilization of the available capacity resulting deficit of supply. Due to shortage of supply the firm produces the products outside the plant causing huge cost of additional expenses. The average daily production attained is only 200 to 250 MT per day. The government policy of subsidized price of products and compulsoriness to meet demand of farmers at any cost. Shortage of supply affects the future market of the products, large difficulty of customer retention. The firm faces the large problem within supply and demand. There is a large shortage of supply. It could be easily understood from month wise report of current years demand and supply.

A. Problem Statement

"Inefficient utilisation of plant capacity due to lack of inventory management causing increased cost to meet market demand in a cattle feed industry"

V. PROBLEM DEFINITION

The firm faces the large problem within supply and demand. There is a large shortage of supply. It could be easily understood from month wise report of current years demand and supply.

Table - 1
Production and Demand details for last year

Month	*Production (MT)*	*Demand (MT)*
April	*5760*	*6200*
May	*5800*	*6140*
June	*5450*	*5900*
July	*5745*	*6185*
August	*5480*	*6150*
September	*5620*	*6190*
October	*5565*	*6020*
November	*5865*	*6125*
December	*5925*	*6245*
January	*5680*	*6037*
February	*5862*	*6230*
March	*5690*	*6180*

When the output for the past few years was analyzed, it is found that the production is showing a decreasing trend and not able to meet the demand. The major problem faced in the industry is shortage production affecting large problem of additional cost to meet customer needs the various factors were analyzed and the major problem was identified as the shortage of raw materials.

Table - 2

Factors	*Percent Contribution*
Raw Material Shortage	*39*
Strikes And Lockouts	*12*
Power Failure	*15*

VI. PROCEDURE

A. Stage 1

1) ANN

Artificial intelligence forecasting techniques have been receiving much attention lately in order to solve problems that are hardly solved by the use of traditional methods. ANNs have the ability to learn like humans, by accumulating knowledge through repetitive learning activities. Animal brain's cognitive learning process is simulated in ANNs. ANNs are proved to be efficient in modeling complex and poorly understood problems for which sufficient data are collected .ANN is a technology that has been mainly used for prediction, clustering, classification, and alerting of abnormal patterns. The capability of learning examples is probably the most important property of neural networks in applications and can be used to train network with the records of past response of a complex system.

$$\text{The demand } D_t = B_0 + B_1 (D_{t-1}) + D_{t-1} + B_2 T_t + B_3 R_t + CH_t$$

B. Stage 2

1) Conceptual Model Development

Taking the theoretical framework presented in previous sections as a point of departure, the present article proposes a conceptual framework for inventory management based on the segmentation of annual demand into three categories – very low consumption, low consumption and mass consumption – and the coefficient of the variation of demand into two categories – high uncertainty and low uncertainty. Using these two demand pattern-associated variables, the conceptual framework indicates the most appropriate inventory management model for low, very low, and mass consumption items, thus supporting decision-making based on the most adherent premises to answer the questions of how much to order, when to order and how much stock to keep in safety stocks.

In the conceptual framework, extremely low consumption items are considered to be those with an average historical demand of less than one unit per year. Low consumption items correspond to items whose average historical demand may vary between one and 300~500 units per year, or a maximum of one unit per day, while mass consumption items are those with a demand of over approximately 300~500 units per year, The cut-off point for the coefficient of the variation of demand is 0.5.

The aim of this article is to analyze the pattern of demand as the main intervening factor in inventory management. It first of all discusses, how the frequently adopted premises regarding the adherence of demand to Normal distribution may not be realistic and cause distortions, especially in the case of very low – when the annual demand is less than one – and low consumption items – when the annual demand ranges between one and a value sufficiently high, say three hundred or five hundred units per year, in order to characterize a daily demand close to one. Section proposes a conceptual framework designed to support inventory management, which synthesizes those models that are most adequate for specific patterns of demand Since the consumption is less than one unit applying binary model (zero or one);

The decision to keep or not to keep one unit is to be taken in the case, Cost analysis is done to support the decision. The determining factor is the difference between cost of keeping a unit and cost of not keeping a unit in stock.Cost associated with policy of not keeping a unit in stock is (*CTO*), Cost associated with policy of keeping a unit in stock is (*CT1*), Cost associated with policy of not keeping a unit in stock is (*CTO*) = $\boldsymbol{\lambda}$*(CTR + Cip) Where $\boldsymbol{\lambda}$ is average consumption, CTR is ordering cost, Cip penalty cost. Alternative policy needs an evaluation of expected fraction of time in stock (FTECE). FTECE = $\frac{1}{1+\boldsymbol{\lambda}*TR}$ (TR is replenishment lead time)Expected value of occurrence during expected fraction of time out of stock is $\boldsymbol{\lambda}$* (1-FTECE)

$$CT1 = [\frac{1}{1+\boldsymbol{\lambda}*TR} * Caq*1]+[CTR*\boldsymbol{\lambda}]+[Cip*\boldsymbol{\lambda}*(\frac{1}{1+\boldsymbol{\lambda}*TR})]$$

Where each part represents respectively opportunity cost, replenishment cost, and unavailability cost.

In the case of phosphorous

$\boldsymbol{\lambda}$ =0.6432 Mt

CTO = $\boldsymbol{\lambda}$*(CTR + Cip)

= 0.6432*(1000*500)

=321600

FTECE = $\frac{1}{1+\boldsymbol{\lambda}*TR}$

= $\frac{1}{1+.6432*24}$

= 0.0608

CTI= $[\frac{1}{1+\boldsymbol{\lambda}*TR} * Caq*1]+[CTR*\boldsymbol{\lambda}]+[Cip*\boldsymbol{\lambda}*(\frac{1}{1+\boldsymbol{\lambda}*TR})]$

= [0.0608*300*1]+[1000*.6432]+[500*0.6432*0.0608]

= 680

Since the calculated value of CTO> CT1 the policy of not keeping a unit in stock is costlier than keeping a unit in stock, inventory decision regarding phosphorous is to keep a unit always in stock.

C. Stage 3

1) Determining EOQ and Reorder Level

With today's uncertain economy, companies are searching for alternative methods to keep ahead of their competitors by effectively driving sales and by cost reduction. Big retail companies do not stand a chance in today's environment if they do not have an appropriate inventory control model intact. The Economic Order Quantity and a Reorder Point,(EOQ/ROP) model have been used for many years, but yet some companies have not taken advantage of it. An Economic order quantity could assist in deciding what would be the best optimal order quantity at the company's lowest price. Similar to EOQ, the reorder point will advise when to place an order for specific products based on their historical demand. The reorder point also allows sufficient stock at hand to satisfy demand while the next order arrives due to the lead time. Since retail can be unpredictable and competitive, the interest of seeing how forecasting can affect the economic order quantity (EOQ) and reorder point.

Table - 3

Raw material	*Holding cost (Rs)*	*Ordering cost(Rs)*	*Lead time (days)*	*Eoq (MT)*	*Reorder point (MT)*
Oiled rice bran	*500*	*900*	*2*	*258*	*262*
DE oiled rice bran	*500*	*900*	*2*	*247*	*240*
Corn	*500*	*900*	*3*	*198*	*207*
Mustard cake	*600*	*1000*	*2*	*175*	*131*
Coconut cake	*600*	*1000*	*2*	*168*	*120*
Molasses	*650*	*1000*	*3*	*154*	*110*
Calcium	*350*	*1000*	*2*	*115*	*23*
Salt	*250*	*600*	*2*	*92*	*12.3*
Zinc	*100*	*750*	*3*	*98*	*6.75*
cobalt	*100*	*800*	*3*	*102*	*6.8*

VII. RESULT

Causes of inefficiency in flow of raw materials was found to be mainly due to inadequate method of forecast, no method for classifying based on their importance, lack of communication between departments.. Forecasting method was used to determine the optimum stock that should be maintained in the firm to prevent shortages and loss of customer. Cost analysis of the proposed as well as the existing method was carried out which revealed that the cost can be reduced to very lower value than the existing method. If the number of years of actual demand available is more then this can increase the accuracy of the forecast made by the proposed method. The company should keep the record of actual demand and actual sales and continuously measure the variation in demand and supply and rectify the forecast error to improve the error.

VIII. CONCLUSION

Demand management is the supply chain management process that balances the customer requirements with the capabilities of the supply chain. The importance of determining the appropriate level of raw material inventory helps for proper planning and control of factory operations and optimization of the overall process. In this thesis.causes of inaccuracy were found to be related to not using proper forecasting technique, no classification of raw materials based on its consumption, etc. In reference to the problems defined, a new forecasting methodology was designed to determine the optimum stock of raw materials to be maintained in the firm.

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