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Application of Improved Kanban Systems in Indian Auto Ancillary Industry for SCM

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Abstract:-- **Supply Chain Management (SCM) is management of material and information flow in a supply chain to provide the highest degree of customer satisfaction at the lowest possible cost. SCM requires commitment of supply chain partners to work closely to coordinate order generation, order taking and order fulfillment thus, creating an "extended enterprise" spreading far beyond the producer's location. Supply chains encompass the companies and the business activities needed to design, make, deliver and use a product or service. Businesses depend on their supply chains to provide them with what they need to survive and thrive. Supply chain management is the integration of key business processes from initial raw material extraction to the final or end customer, including intermediate processing, transportation and storage activities and final sale to the end customer. Today, the practice of supply chain management is becoming extremely important to achieve and maintain competitiveness. The paper will aim to improve the Inventory problems which are faced by all types of industry all over the globe, thus making it a kind of universal problem. The primary goal of any company is to minimize the inventory. The improvement which the report suggests can be termed as a kind of practical improvement i.e. usage of improved Kanban Systems resulting in Inventory optimization.**

This research is expected to help government and private industry in selecting the most influencing problem area and its optimization. It will also help in establishing the relations between various problems areas to that of cost reduction. This increase the prediction accuracy in supply chain thus helping organizations to draft there strategic plans and policy up gradation. With the use of improved Kanban Systems, resulting in more Inventory Optimizing and in turn more cost saving.

Keywords: **Kanban, Inventory optimization**

I. INTRODUCTION

With the emergence of a business era that embraces change as one of its major characteristics; manufacturing success and survival are becoming more and more difficult to ensure. The emphasis is on adaptability to changes in the business environment and on addressing market and customer needs proactively. Changes in the business environment due to varying needs of the customers lead to uncertainty in the decision parameters. Also communications and relations are affected. Flexibility is needed in the supply chain to counter the uncertainty in the decision parameters. A supply chain adapts the changes if it is flexible and agile in nature. A framework is published in this Paper, which encapsulates inventory control; of supply chain performance also explores the relationship among problem areas.

II. LITERATURE REVIEW AND ANALYSIS FOR LITERATURE

1. Literature Review

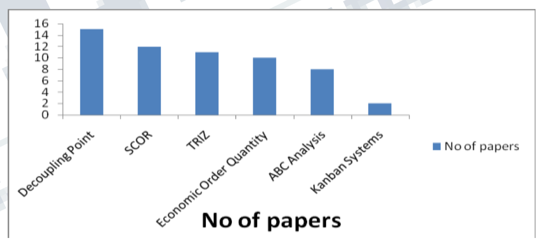

Table1: Category used for inventory control

2. Review summary

The list of methods which can be used for optimization given below: (calculated for past 5 years, Shown is a general scenario)

- Decoupling Point
- SCOR
- Economic Order Quantity
- ABC Analysis
- Kanban Systems
- TRIZ

3. Gap in Literature

The survey shows that there are very large numbers of papers for optimizing of Logistics problem area (Inventory) using various techniques such as Decoupling Point, SCOR, TRIZ etc, but very few papers which focus on Inventory optimization using Kanban systems. Thus an effort will be made in future to optimize the inventory using the Kanban System.

III. IDENTIFICATION OF THE CASE STUDY

Business organizations today are facing great competitions and challenges as the economy is growing. The growth and fall of the company depend upon how well the company uses its resources. Also the success of an organization depends upon the satisfaction the customer gets because of the timely delivery and quality product. An organization has to be efficient to survive in competitive world. Such important area to control in order to achieve desired success is Inventory and Smooth flow of information. In manufacturing industry, it is utmost necessary to maintain the inventory level and Smooth flow of information. Lack of Smooth flow of information can create confusion about the number of products manufactured or number of product to be purchased which ultimately results in excess cost. Again, use of pull technology for material movement is gaining major role nowadays for reducing the excess inventory.

The company is manufacturer of Sheet metal, Plastic Injection Moulded, Turned and Machined Components, its assemblies and Dies, Moulds, Jigs and Fixtures. It is a medium scale industry with a turnover of 15 Crores.

IV. IMPROVED SYSTEMS FOR KANBAN

Kanban formula from (Leonilde R. Varela (2010))

K = RE + LO + WI + TI+SA

K=Number of Kanban cards

RE=Replenishment Time coverage

LO=Lot Size coverage

WI=Withdrawal Peak coverage

TI-TIme gap coverage

SA=Safety Stock

The main improvement in the formula will be based on changes in SA only that is Safety Stock. According to Leonilde R. Varela (2010) SA can be calculated as.

$$SA = \frac{PRxSTx60}{NPTxSNP}$$

Where

PR-Daily Demand in units

ST-Safety Time in minutes

NPT-Planned Operating Time (Available time in a day) in minutes

SNP -Number of Parts per Kanban in units

Safety time usually as per to industry standards and company safety requirements; but in reality taking ST can be improved considering the various conditions and parameters.

Proposed changes in the SA parameter in the Kanban Formula:

SA shows the additional Kanban that are required to cover unknown internal and external fluctuations and poor stability.

The given SA can be seen as combination of

1. Unknown fluctuations in output and lead time in the production process.
2. Unknown fluctuations in customer demands.
3. Additional safety (e.g. problems in the information flow, start-up etc.).

Let us assign the new parameters as

SA1: unknown fluctuations in output and lead time in the production process

SA2: unknown fluctuations in customer demands

SA3: additional safety (e.g. problems in the information flow, start-up etc.)

Calculation:

$$\textbf{SA1} = \frac{WAEXT-WA}{SNP} + \frac{WAEXT-WA}{SNP} X \text{ (scrap in \% + rework in \%) /100}$$

WAext [units]: Extended Withdrawal Amount Maximum cumulative withdrawal quantity or

Planned customer demand for part number within the extended replenishment lead time within RTLoop.

Usually WAext is 25% to 30% that of WA

$$\textbf{SA2} = \frac{WA}{SNP} \text{ x deviation in \%/100}$$

WA-Withdrawal Amount (Maximum withdrawal for part number within RTLoop) in Units

SNP - Number of Parts per Kanban in Units

Deviation [%]: Difference between planned and actual customer requirements.

$$\textbf{SA3} = \frac{\text{Additional quantity}}{\text{SNP}}$$

SNP -Number of Parts per Kanban in Units.

Taking the case study

Consider a part whose daily demand is 2600

Acc to Leonilde R. Varela (2010)

$$SA = \frac{PR \times ST \times 60}{NPT \times SNP} = 143 \text{ cards}$$

PR=2600parts
NPT=1305minutes
SNP=50parts
ST= 60 min-Assumed according case study standards

According to improved kanban Formula

SA = SA1 + SA2 + SA3

SA1 – Covering unknown fluctuations in unplanned stoppages.

$$SA1 = \frac{WA_{EXT} - WA}{SNP} + \frac{WA_{EXT} - WA}{SNP} \times (\text{scrap in \%} + \text{rework in \%}) / 100$$

$$= \frac{12000-9500}{50} + \frac{12000-9500}{50} \times (0.5 + 1.5)/100$$

= 51Kanban cards --------------7

Usually WAext is 25% to 30% that of WA i.e. =1.25x9500=12000 (Company Specific)
WA=9500 parts
rework in %=1.5
scrap in %=0.5

SA2 – Cover deviations between planned and actual withdrawals by the customer

$$SA2 = \frac{WA}{SNP} \times \text{deviation in \%}/100$$

$$SA2 = \frac{9500}{50} \times 0.25 = 48 \text{Kanban cards}$$

Deviation [%]: Difference between planned and actual customer requirements for the customer process in the past usually taken as 25 percent

SA3-Covering additional uncertainties

$$SA3 = \frac{\text{Additional quantity}}{\text{SNP}}$$

$$= \frac{250}{50} = 5 \text{Kanban cards}$$

Additional quantity: 250 assumed based on production conditions.

SA = SA1 + SA2 + SA3
SA=51+ 48 + 5
SA=104Kanban cards

Results:

1. Percentage improvement in kanban cards usage:

$$= \frac{\text{Kanban cards before} - \text{Kanban cards after}}{\text{Kanban cards before}} \times 100$$

$$= \frac{143-104}{143} \times 100 = 27\%$$

Total of 27 percent have been decreased in inventory due to the use of improved kanban Systems.

2. Total Cumulative saving from the implementation of improved kanban systems is 75000Rs to 80000Rs per RT loop considering the cost of a part of spring on an average as 25Rs. In a month on an average there will be 7 RT loops which will yield 500000 Rs.

3. Along with the monetary value Divine industries will also benefit from the space which is been made available due to reduction in inventory. Here around 10 Sqmts is made available.

Findings

1. The proposed improved kanban system can decrease the inventory level usage of 104 Kanban cards against 143 Kanban cards in case study (making it 27 percent in inventory reduction).

Future Work

This improved is shown is taking a case of Tier 2 industry it will be interesting to see the results for Tier1 and OEM industries

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