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Saving Cost in valve assembly using Internal Factors

Anuj Kumar Shrivastava[1], Mahesh Shahapure[2] and Santosh Dalvi[3]

[1]Project Associate, Research and Development, Knorr-Bremse Technology Centre, Pune, India
[2]Head, Research and Development, Knorr-Bremse CVS, Pune, India
[3]Profesor, Department of Mechanical Engineering, Lokmanya Tilak College of Engineering, Navi Mumbai, India
anujkumar.shrivastava91@gmail.com

ABSTRACT

The company Knorr-Bremse is a leader in braking systems in both rail and commercial vehicles. The concern always faced by company is survival of competition with various costing strategies. Voss connectors are one of the major components of assembly in products of the valves manufactured here and each product has a separate Voss assembly station. With the help of this project, the internal costs have been controlled and efficiency of the plant is considered. The main focus is on setting of common assembly station and then sending the valves to the assembly line for further operations. With the present work company could save on cost of assembly stations, operators, inventory, cost on maintaining spares for maintenance and the floor space consumed. The research work helped to save approximately 42 lakhs by just modifying the existing facility with no investments. Thus it contributes in the fight for the market share without modifying the product or compromising the quality.

Key words: Competition, Costing strategies, Internal Costs, Common Assembly station

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INTRODUCTION

Knorr-Bremse ('Bremse' meaning brake) is a manufacturer of braking systems for rail and commercial vehicles that has operated in the field for over 100 years. It has been a world leader with many big brands like Bendix, Hasse & Wrede, Merak, New York Air Brake, Sigma, Zelisko and many more under a roof. The research mainly focuses on the cost incurred in assembly of Voss Connectors to various valves, manufactured at Indian production unit at Pune.

The Voss connector is the design of the VOSS Company and we are sourcing it for our requirement. The VOSS push-in connection system 230 permits the rapid joining of nylon tubes. Merely a wrench is needed to undo the connection. The VOSS 230 also consist three sub types i.e. NG 6, 8 and 12 of which KB uses only NG 8 and 12 for applications.

At present there are 13 different types of valves majorly produced here on different assembly lines and each assembly line has a separate Voss Assembly station having the combination of both NG8 and NG12 assembled depending on the variants required. Thus there is an additional cost to the product being transferred thus losing a competitive advantage making it costlier to manufacture. There are various internal factors which can help in fighting the cost and survive the competition. Some of them discussed in the paper are as follows.

Fig.1 Fixtures for Voss Assembly

Fig.2 Storage bins of Voss Connectors

Inventory and Carrying Cost

Inventory plays a major role in the working of any plant. Inventory turnover ratio must be as high as possible to make sure that the plant has the required material at time and there is no extra stock except the safety stock. This makes Supply Chain strong and indirectly supports the concepts like Vendor Manage Inventory, Lean Management and Milk run which has lots of cost hidden in it.

Currently company stores inventory at various places, like central inventory, inventory at each work stations which has cost at each point. In the research, the focus is on setting the Economic Order Quantity (EOQ) and Reorder Level (ROL). After implementing this, company has saved a large sum after by reducing the ordering cost and the inventory cost. The Voss are now stored only at common assembly point and central inventory.

Operations and Plant Layout

Operations and plant layout are the factors which are often missed out. Many research in past have showed that the process time is just the small part of total lead time on an assembly line. It is to reduce process cost by various investments, automation, but the major factors like waiting time on workstation, Bottle neck in the assembly line leads to huge loss and have high potential for the saving in long run. Proper line balancing and ensuring that no work station and labor is idle helps to run a plant with high efficiency.

The research here have tried eliminating the extra assembly lines for Voss Connectors of NG8 and NG12 ensuring the efficient utilization of the assembly station and making the labours not being idle at any point as this is common operation for many valves and could be bottle neck.

LITERATURE REVIEW

It has always been a fight for the market share and the ways to survive the competition. Many a times, product reaches its maturity level and there is no scope in the product modification except doing the VAVE analysis or finding the internal costs to overcome competitors pricing strategy.

The aim of any business is to generate the highest level of customer satisfaction and deliver to shareholder to survive and prosper. Thus it is always a challenge to attain maximum profit in short period and not raise the prices and attain cost saving. Hence it is important to eliminate inefficiencies involved in supply chain and look for solutions beyond their respective operations [1].

Coordination is essential for successful supply chain management. There is growing interest from industry and academic disciplines regarding coordination in supply chains, particularly addressing the potential coordination mechanisms available to eliminate sub optimization within supply chains [2]. Strategic costing plays a major role in the integration of Supply Chain and Operations. The research by Shank talks about the various difficulties in evaluating the hidden potential of cost [3].

Mr. Ford in General Electric helped to develop a formula for EOQ to determine how much product to buy. The objective is to minimization of total operating cost. The ordering cost includes all the cost included in the purchasing like preparing invoices, stationary, salaries of clerks, stationary etc. [10]. Inventory always has a cost hidden in it. While studying the inventory management, Toomey explained that EOQ plays a major role in setting up a level of the inventory and hence needs to be set up in an organization [4].

There exists a strong relationship between the Supply chain Strategies and Company strategies. The results from the survey has shown that the selected purchasing practices and customer relation are strongly associated with the perceived financial and market success of the firms [5].

A study showed that by having a realistic Re-Order Level you would not only ensure that you have enough stock when required but also that you do not overstock. The Re-Order level is the point at which stock on a particular item has diminished to a point where it needs to be replenished [8].

A research was conducted in a forging company which focuses at implementation of lean philosophy in a forging company by radial forging production flow lines. Here, the prime motive is to evolve and test several strategies to eliminate waste on the shop floor [7].

Lean manufacturing is a multi-dimensional management practice including just in time-quality systems, work teams, cellular manufacturing, supplier management etc. The popular definition of Lean Manufacturing and the Toyota Production System usually consists of the following [6].

Replacing the assembly lines from the mass production to make to order reduces the customer lead-time, and is expressed in a random arrival sequence of different model types to the line. Additional common characteristics of such mixed model lines in a make-to-order environment are: small numbers of work stations, a lack of mechanical conveyance, and highly skilled workers [9].

RESEARCH METHODOLOGY

Primary Research

The primary Research was done on the shop floor by collecting data at various points at the assembly line to get the realistic data. The worker utilization was measured and actual the time taken by worker to assemble the Voss was calculated. It was found that at many points this operation was a bottle neck and hence was keeping the worker idle

Secondary Research

Secondary Research for the system was done by collecting the data from various support departments like Production, Purchase, Sales and Stores. The data was later analysed using excel functions of filter and sort and mathematical formulas.

Volume data

The data for the volumes was very crucial as it would have direct impact on the number of workstations to be calculated. The sales data for last year and the planning was considered to find out the average monthly consumption of calculated.

Cost and Inventory data

It was necessary to understand the cost of the variants of Voss (NG8 and NG 12) and the pattern of ordering them and storing them. The inventory department helped with the data of the current stock helping to ensure the safety stock whereas the Purchase department provided the key data like the current suppliers, cost of ordering, lead time, cost of components and the other hidden cost associated with it.

Line Balancing and Capacity Utilization

The inputs like time taken to assemble the Voss connectors to valve, actual man hours available and cost of the workstation were provided by the Industrial Engineering department. The hourly labour rate and the line balancing data were used as a reference to ensure the plant utilization is maximum.

RESULTS AND DISCUSSION

Various cost saved were as follows

Reduction of the Voss Assembly Stations

Considering the assembly time for a Voss is 20 sec using skilled labour and 25 working days

Table -1 Annual Volumes

	Product	NG12/Month	NG8/Month	Total Assembly Time (Monthly)	Total Assembly Time(Daily)	Change Over Time
1	HBV	5000	5000	3333.3	133.3	5.0
2	FBV	8000	4000	4000.0	160.0	5.0
3	QRV	7500	0	2500.0	100.0	5.0
			7500	2500.0	100.0	5.0
4	RV	24000	8000	10666.7	426.7	5.0
5	LSV	4000	12000	5333.3	213.3	5.0
			4000	1333.3	53.3	5.0
6	ALSV	200	0	66.7	2.7	5.0
			10000	3333.3	133.3	5.0
7	PLV	200	0	66.7	2.7	5.0
			10000	3333.3	133.3	5.0
8	3/2 Valve		1000	333.3	13.3	5.0
9	ACRV	150	0	50.0	2.0	5.0
			100	33.3	1.3	5.0
10	SCV	1000	0	333.3	13.3	5.0
11	SBA	6000	0	2000.0	80.0	5.0
12	FCA	14000	0	4666.7	186.7	5.0
		500	0	166.7	6.7	5.0
13	Air Dryer	3500	3500	2333.3	93.3	5.0
14	ARV	1500	500	666.7	26.7	5.0
15	PCV	2000	0	666.7	26.7	5.0
		4000	0	1333.3	53.3	5.0
16	LACV	2500	7500	3333.3	133.3	5.0
			10000	3333.3	133.3	5.0
	TOTAL				2228.7	120.0

Actual available time can be calculated as

(445 min X 2) – Total Change Over Time

890 – 120 = 770 min

Number of Machines Required (Total Time Required daily) / Actual Available Time

i.e. 2228.67 min/ 770 min = 2.8 machines

As per the calculations the assembly stations reduced to 3 to 13, i.e. saving 10 assembly points. Cost of each assembly station is INR 3 lakhs.
The saving here would be 10 X 300000 = INR 30 lakhs

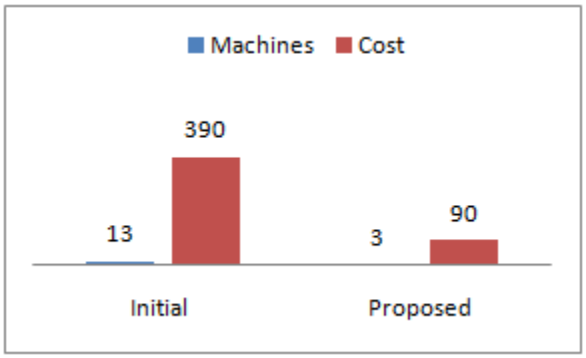

Fig.3 Machines and cost Comparison

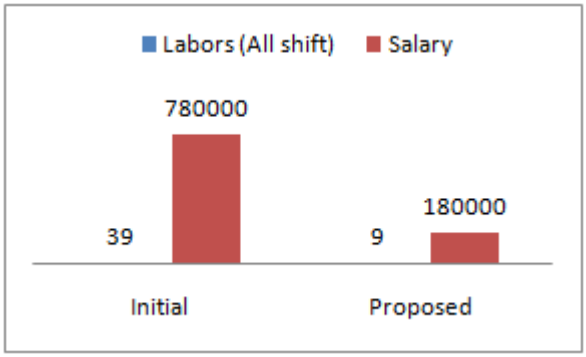

Fig.4 Labours and Salary Comparison

Reduction in the Cost of Labours Working on Station

As the numbers of assembly lines are reduced, there would also be the saving in the cost of the salary to them. The savings for this can be calculated workers for the 3 shifts at 10 assembly points at INR 20000/- per month
10 x 3 x 20, 000 = INR 6 lakhs
i.e. INR 72 lakhs annually

Cost saved on Inventory and Ordering Cost

The annual volumes of the Voss connectors are calculated by considering all the valves manufactured in the plant. The cost of the NG12 Voss connector is Rs 36.6/- per piece and NG 8 at Rs 27.8/- per piece. Thus the total cost spent on the connectors per year is shown in table-2.

After setting the ROL, the additional cost saved would be on logistics, freight and ordering cost (This is taken as 12% of the cost of Inventory)

Annul saving can be given as:-
12% X (3076230+2310180) (Refer table for cost)
Hence the saving here is Rs 64, 6369/-

Table -2 Total Volumes and Cost

	NG 12	NG 8
Volumes	84050.00	83100.00
Cost	3076230.00	2310180.00

Other Hidden Cost Savings and Benefits

As the numbers of the assembly stations are reduced, the cost associated to the space and the area consumed would come down. The spares associated with the assembly lines and the maintenance would come down helping in saving substantial amount.

CONCLUSION

With the implementation of the Common Voss assembly station, setting EOQ to find ROL, company has saved cost without making much investment. The capacity utilization of the assembly lines is maximum with no idle capacity. This has helped finally to reduce the cost on the valves which gives an edge to Knorr-Bremse to fight the existing competitors passing the advantage to the customers if required.

The above research would be limited if there is sudden fluctuation in the demand and the production changes beyond the safety level considered while calculating the new assembly stations

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