

## **“Supply Chain Improvement Through Shift In Vendor Location: An Analytical Study In An Automobile Industry”**

**Author: Mr. Rohan P. Dahivale** (Assistant Professor)

**Co-Author: Mr. Praveen Chavan** (Student)

**Address:** Rajgad Institute of Management Research Development, Dhankawadi, Pune

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### **Abstract:**

*Supply Chain Management (SCM) is the new buzzword is today's world. The main objective of this research is to study the supply chain improvement through Value Analysis technique and to analyze its affects on entire supply chain system. SCM comprises of material flow, cash flow, information flow right from tier two suppliers to ultimate customer. In this research we have tier one supplier & Original Equipment Manufacturer (OEM) transaction only which involves material & information flow and worked on shift of supplier location.*

*In this research we analyze the existing supply chain transaction between supplier & OEM with considering various factors like inventory trend in number of days & also inventory in value, type of material packaging, transportation terms and freight costs. From this analysis we want to test the scope of improvement from supply chain point of view if we shift supplier location from existing one. Improving productivity is crucial factor in facing the challenge of competition & this involves driving down the cost of all aspects of business activities. Since there is maximum scope of cost reduction in the area of materials, doing the job of efficient & effective management of materials is seen as the key to higher productivity.*

*The expected result is improvement in the supply chain in terms of quality & quantity of raw material, inventory reduction, packaging improvement without any further investment.*

**Keywords:** Supply Chain Management, Inventory Management, Value Analysis

### **CONCEPTS**

The literature of SCM has exploded during last decade; it is a new buzz word for the current business models. SCM focuses all activities involved in production and delivering a final product or service, from the various sub-tiers to end customers, its theoretical framework originated from multi-echelon inventory models (Clark and Scarf 1960). The idea of cost-cost tradeoffs was introduced showing that the lowest total cost might be achieved by pursuing the lowest cost of each logistics process constituent. Hence, the concept of logistics integration was introduced by Bowersox (1969).

The idea of SCM is to evaluate the process of planning, implementing and controlling the movements of materials and finished goods all the way into end users.

Copra and Meindl (2001) defines the objective of SCM is to maximize the overall value of each of the chain. This is in accordance with what Siem (2005) has stated, SCM strives to get “the right things to right places at the right times for maximum profits”

### **OBJECTIVES OF THE STUDY**

1. To study and observe the supply chain process of an automobile company.
2. To analyze the effect on shift in vendor location.
3. To analyze improvements in supply chain management.

**DATA & DATA ANALYSIS:** Vehicle Manufacturing Company at Chakan produces variety of models. There is in house production of vehicle engine only, rest of the child parts are procured from tier one suppliers. Being an OEM, company procure child parts, components & subassemblies needed for production from vendors & sale the finished products i.e. vehicles to customers. Hence the major functions at company, Chakan are purchasing of child parts & assembly of the same. All purchase related activities are looked after by department SCM which is considered as backbone of the plant as it ensure the right material, in the right quantities, with the right delivery (time and place), from the right source, and at the right price with the help of smooth supply of material, information & money along the whole chain right from supplier to ultimate customer. There is commodity wise procurement of child parts at company namely Casting & Forging, Electrical & Proprietary, DAC, Trim and Sheet Metal researchers have done research in electrical & proprietary commodity which encompasses parts pertaining to electrical system, ignition system, lighting system and engine assembly parts. Vendor group is having two different plants one at Nasik and another at Chakan, Pune. Vendor group keep supplying carryover parts of Chakan plant along with child parts from their old Nasik plant. Also they have established new plant at Chakan for supplying wiring harnesses to trucks. The below table furnishes details of child parts supplied by vendor. Also below table furnishes information regarding transportation of material from supplier end to Company

Part No	Description	Vendor CODE	Vendor Location
1801CA0480N	ROOF LAMP WIRING HARNESS	DV043B	Nasik
1801EA0160N	HIGH MOUNTED STOP LAMP W/H	DV043B	Nasik
0098780	EARTH CABLE -VE MDI SC/DC	DV043B	Nasik
1401CA0751N	BATTERY CABLE POSITIVE	DV043B	Nasik
1401CA0741N	BATTERY CABLE NEGATIVE	DV043B	Nasik
7905UAP00161N	WIPER MOTOR HARNESS	DV043D	Pune
7905UAP00061N	W/H GPS	DV043D	Pune
7905EAP00171N	WIRING HARNESS DBV vendor	DV043D	Pune
7905UAP00190N	WIRING FOR SPEEDO GROUND	DV043D	Pune
7905FAU00041N	W/H AIR PRESSURE TRANSDUCER	DV043D	Pune
7905UAQ00011N	W/H AIR FILTER CLOG SENSOR	DV043D	Pune
7905UAP00071N	W/H GPS Speaker	DV043D	Pune

V code	Location	INCO terms	Transporter	Approximate distance from Company
DV043B	Nasik	Ex works	Third party	250 KM
DV043D	Chakan	Free delivery	Vendor's own	5 KM

INCO terms mean (IN-warding Condition) terms:

Mainly there are two types of INCO terms. These are as follows:

- Ex works – Company picks consignment from Vendor end through third party logistics.
- Free delivery – Vendor delivers consignment to Company through his own transport.

INCO terms for vendor Nasik are Ex-works where material is delivered to Company through Transportation Company which is having collaboration with Company logistics. Vendor used to deliver material at Transportation Company's warehouse which then subsequently gets delivered to Company.

**INVENTORY DATA**

Inventory is commonly used to describe the goods and materials that any firm holds for certain purpose. In other word stock is commonly used to describe the capital invested in a business. Generally raw material inventory is important from purchasing point of view. Inventory management is a science primarily about specifying the shape and percentage of stocked goods. How much to carry? Is the main question in inventory management, as one has to keep this inventory value as low as possible to have less investment of capital in material at the same time one has to ensure that there will not be any production loss due to non availability of raw material with right material, at right time & right place. The generic formula for calculating this inventory value or quantity, below mentioned are considered.

- Average Daily Demand (ADD).
- In Transit Lead Time (ITLT) - in days.
- Vendor Response Time (VRT) - in days.
- Internal Lead Time (ILT) - in days.
- Safety Stock (SS) - in days.

So minimum inventory which need to be carried is calculated as:

$$\text{Minimum Inventory} = \text{ADD} * (\text{VRT} + \text{ITLT} + \text{ILT} + \text{SS})$$

The same formula is applied for vendor Nasik, the data we found is furnished in below tables.

Inventory in no of days & value in rupees involved when parts are supplied from Nasik plant.

Part Number	Description	Supplier	SS (Days)	ITLT (Days)	ILT (Days)	VRT (Days)	Total
1401CA0751N	Battery Cable Positive	Vendor-Nasik	7	2	1	2	12
1401CA0741N	Battery Cable Negative	Vendor-Nasik	7	2	1	2	12
1801CA0480N	Roof Lamp Wiring Harness	Vendor-Nasik	7	2	1	2	12
1801EA0160N	High Mounted Stop Lamp W/H	Vendor-Nasik	7	2	1	2	12
0098780	Earth Cable -Ve Mdi Sc/Dc	Vendor-Nasik	7	2	1	2	12

Part No	Description	Supplier	Total	ADD	LL	Moving Average Price	Monthly Requirement
1401CA0751N	Battery Cable Positive	Vendor-Nasik	12	250	3000	153.56	460680
1401CA0741N	Battery Cable Negative	Vendor-Nasik	12	250	3000	117.44	352320
1801CA0480N	Roof Lamp Wiring Harness	Vendor-Nasik	12	100	1200	43.85	52620
1801EA0160N	High Mounted Stop Lamp W/H	Vendor-Nasik	12	100	1200	28.16	33792
0098780	Earth Cable -Ve Mdi Sc/Dc	Vendor-Nasik	12	100	1200	18.77	22524
						<b>Total (Rs.)</b>	<b>921936</b>

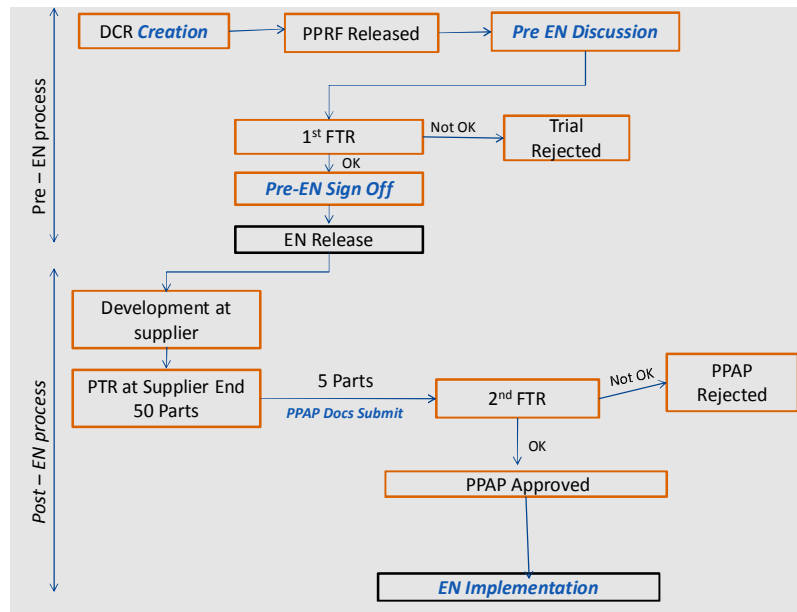
**After analyzing the data researcher have following findings**

- Child parts supplied by vendor Nasik plant are having more inventories, so the capital blocked in the same is more.
- More freight cost involved during the transport from Nasik to Chakan.
- Packaging of child parts is corrugated box leading to quality issue & scrap generation.
- More follow up from buyer in getting the material till it reaches the destination.
- Possibilities of material damage in transit & due to more material handling.
- Restricts more fluctuations in body trim in plan.
- Supply chain is little bit complicated because of involvement of third party logistics.
- No synchronizing at vendor end between production & supply of parts i.e. there is time lag.

In order to overcome above mentioned issues, it was necessary to find out what else would do the job. After successive discussion with other members from commodity, researchers conclude that the only option that can sort out all above mentioned problems is to start supply of all parts from vendor Chakan plant instead of vendor Nasik plant.

Researchers have discussed the entire subject with vendor with help of the concern buyer & convinced them to start supply from their Chakan plant by explaining the consequences of the switch over. They agreed in the same & acknowledge their consent.

Then there is need to follow Company standard procedure for this switch over, this process is known as EN – Engineering change Notice. Following is the process flow EN.



Terms involved in EN process are as follows:

- DCR – Design Change Request
- PPRF – Proto Parts Request Form
- FTR – Fitment Trial Run
- PTR – Production Trial Run

- PPAP – Production Part Approval Process
  - PSW – Parts Submission Warrant
- After successful completion of EN process, Vendor Chakan commenced supply of material to Vehicle Manufacturing Company.
- Below are the major consequences observed after commencing supply from Chakan plant:
- Packaging Improvement
  - Inventory reduction
  - Freight cost reduction
  - Less in transit damages
  - Vendor code elimination

### **PACKAGING IMPROVEMENT**

Packaging is the science, art, and technology of enclosing or protecting products for distribution, storage, sale, and use. Packaging also refers to the process of design, evaluation, and production of packages. Packaging can be described as a coordinated system of preparing goods for transport, warehousing, logistics, sale, and end use. Packaging contains, protects, preserves, transports, informs, and sells.

Vendor was supplying child parts through corrugated boxes from their Nasik plant. It is one time activity of supply through non returnable boxes as once it is used could not be recycled over period of time. From vendor Nasik to Company Chakan supply in returnable packaging is not possible because of the difficulties in movement of empty returnable bins from Company to vendor. There are chances of holding of material dispatches due to non availability of returnable bins at right time & at right location which may result into vehicle production loss which is not acceptable at all.

Consequences of these non returnable packaging are:

- It may causes quality issue to battery cables & wiring harnesses
- It is resulting into scrap generation at Company
- Unnecessary cost incurred in corrugated boxes.
- It becomes undesirable for material movement not only from Nasik to chakan but also during in plant material movement.
- Indirectly affecting environment due to tree cutting required for manufacturing of boxes

Supply from Chakan plant has reduced the considerable distance between vendor & customer from 250 km to 5 km. This has got simplified movement of empty bins from Company to vendor which is much easier task than earlier one. So vendor is supposed to commence supply of battery cables & wiring harnesses through returnable packaging i.e. Bins. They provided packaging sign off for each child part in standard format prepared by Company team, that packaging sign off was signed by vendor representative & by members of different departments viz. SCM, Production, Quality Assurance once it got finalized.

After successive completion of formalities, procurement of child parts through returnable bins started.

### **Change in INCO terms**

Drawbacks of Ex-works are as follows:

- This system is little bit complex.
- It requires much follow up with transporter & driver by buyer which is hectic & non value adding task.
- Also cost associated in this transaction is more than actually required.
- There are possibilities of optimal utilization of vehicle capacity. Vehicles are not loaded to their full capacities.
- There is less synchronization between production at vendor end & dispatch of material resulting into time lag.

While INCO terms for vendor Chakan plant is free delivery so it is possible to overcome above mentioned drawbacks of Ex-works.

Below table furnishes the 'Transport Cost' Company is paying annually

Freight rate/ Trip	No of trips / Month	Freight cost / Month	Freight cost / Year
3000	10	30000	3,60,000

Hence, after shifting vendor to Chakan there would be saving of Rs. 360000 per year.

**INVENTORY REDUCTION**

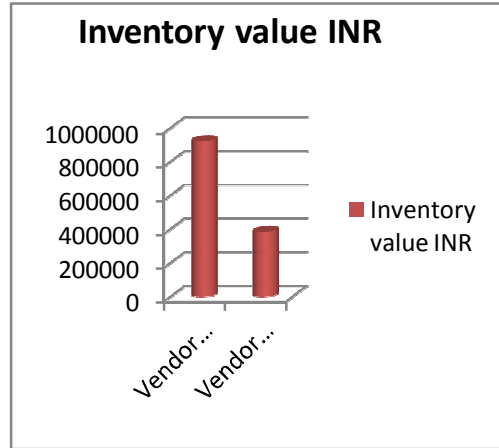
In case of vendor Chakan there is different scenario, no of days & inventory value have been reduced marginally:

Part No	Description	Supplier	SS (days)	ITLT (days)	ILT (days)	VRT (Days)	Total
1401CA 0751N	BATTERY CABLE POSITIVE	Vendor-Pune	1.5	0.5	1	2	5
1401CA 0741N	BATTERY CABLE NEGATIVE	Vendor-Pune	1.5	0.5	1	2	5
1801CA 0480N	ROOF LAMP WIRING HARNESS	Vendor-Pune	1.5	0.5	1	2	5
1801EA0 160N	HMSL W/H	Vendor-Pune	1.5	0.5	1	2	5
0098780	EARTH CABLE -VE MDI SC/DC	Vendor-Pune	1.5	0.5	1	2	5

Part No	Description	Supplier	Total	ADD	Lower limit	MAP	Value
1401CA 0751N	BATTERY CABLE POSITIVE	vendor-Pune	5	250	1250	153.56	191950
1401CA 0741N	BATTERY CABLE NEGATIVE	vendor-Pune	5	250	1250	117.44	146800
1801CA 0480N	ROOF LAMP WIRING HARNESS	vendor-Pune	5	100	500	43.85	21925
1801EA0 160N	HMSL W/H	vendor-Pune	5	100	500	28.16	14080
0098780	EARTH CABLE -VE MDI SC/DC	vendor-Pune	5	100	500	18.77	9385
						<b>Total (Rs.)</b>	<b>384140</b>

So due change in supply from Nasik to Chakan there is reduction in days as well as in inventory carrying value as shown in below table:

Supplier	Inv in days	Inventory value INR
Vendor Nasik	12	921936
Vendor Chakan	5	384140
<b>Reduction</b>	<b>7</b>	<b>537796</b>



**FINDINGS:** Once shifting supply of wiring harnesses from Nasik plant to Chakan plant there is lot of improvement in various parameters. Below table furnishes the before & after situations of parameters once commencing supply from Chakan plant:

Parameter	Before	After
Location	Nasik	Chakan
Distance	250 km	5 km
Inventory In Days	7	3
Inventory Value	Rs.921936	Rs.384140
Packaging	Corrugated	Returnable
INCO Terms	Ex-works	Free delivery
Transport Cost	Rs.3.6 lac/year	Rs. 0
In Transit Damage	More	Zero
Follow Up	More	Less

**CONCLUSION** The manufacturing industry in India as well as other parts of the world is witnessing the most challenging period it has experienced in recent history. However this is the time for these firms to have a close look at their operations. It is a time to initiate performance improvement programs without losing any more time. The case study shows that such initiatives will not only pay back but will help the organizations build much needed advantage over competition and retain profitability.

**LIMITATIONS OF THE STUDY**

1. Since this is a special activity, there was some restriction to share information.
2. Supply chain process becomes time consuming process and hence sometimes it affects on monthly targets also.
3. Before trying any method or technique proper knowledge is required otherwise wastage of raw material & other resources becomes greater cause of concern.

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