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Cost Saving on Application of Green Supply Chain Practices in A 3PL Industry

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Abstract: Application of GSCP in a Third Party Logistics (3PL) industry has been demonstrated with regard to implementation of a proposed 3PL model with a single centralized warehouse to serve a bus body building company. Investment costs as well as running costs related to storage system, load units, material handling equipment, computer system, modification of existing warehouse building, inbound and outbound transportation etc for the proposed model have been computed. On comparison of existing system with the proposed model, there is an appreciable saving on implementation of proposed 3PL model. This GSCP implemented 3PL model contributes to the development of a supply chain sector, which may further be used as a model to be implemented in similar manufacturing sectors.

Keywords — Third Party Logistics, 3PL, Bus body building company, warehouse layout, Green Supply Chain Practices(GSCP)

I. INTRODUCTION

Logistics include the functions such as planning, implementing and controlling the storage and distribution of goods, services and flow of information from the source to the end user in order to satisfy the customer needs. The major activities under Logistics are Warehousing, Transportation, Inventory control, Customer care and Long term planning [1]. Third party Logistics consists of various components of logistic activities being undertaken by an external company with the provision for managing multiple services of Logistics. Utilizing a 3PL provider has become an increasing tendency for most of the modern multinational companies. 3PL proved to be extremely successful in improving logistics efficiency of majority of organizations and quickly gained popularity. A conceptual model of 3PL is shown in Figure1 [2], [3].

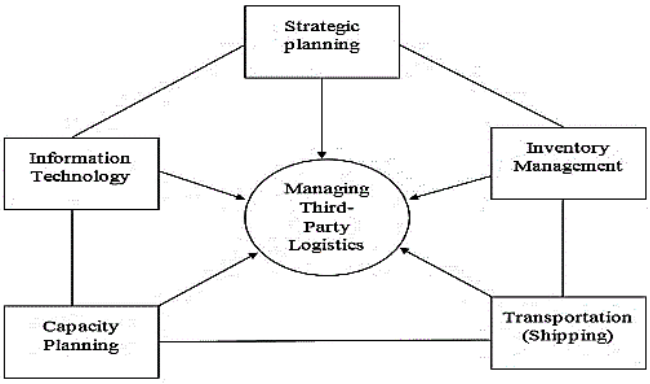

Figure 1 Conceptual model of 3PL

When Logistics is not coming under the core activities by outsourcing it, organizations may focus on their core competencies. Outsourcing Logistics can decrease costs as the 3PL providers can employ at lower pay. By outsourcing logistics, companies can decrease their asset, and deploy the capital released for other beneficial usage. Logistics outsourcing causes better cycle time and delivery performance which leads to increase in customer satisfaction. The key issues in the Logistics services have been pointed as movement of goods, movement of information, time / service, reduction of overall cost, integration with vendor, customer and within the company.

Now-a-days the 3PL providers are offering a number of value-added services like import/export management, reverse logistics, customs clearance, post-sales support, freight forwarding, distribution and so on. Organizations can outsource all these activities, and focus on their core business operations [4].

Any manufacturing company has to adopt GSCM practices and Environment management system (ISO 14001) with increased pressures from regulation, customer choice / awareness and international competitive market. Now-a-days, every organization is working towards environmental management to improve their overall performance. The conventional supply chain comprises five parts namely raw material, manufacturing, distribution, consumer and scrap. Each of the component in the supply chain can be one of the reasons for pollution, scrap and disaster to the environment. In case of raw materials, a supplier may utilize environmentally harmful materials like lead. However, organizations can insist on suppliers to utilize environment-friendly materials and processes [5]. Supply chain management is having wide scope for implementation of Green practices for making it sustainable because of global priorities to environment [6]. Green Supply Chain Practices are needed to be implemented with top priority in case of Indian 3PL providers for getting global recognition and customer satisfaction.

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II. PRESENT SETUP OF BUS BODY BUILDING COMPANY

The bus body building company is assembling buses in three different locations in South India. The location map with details of distance in kilometers is shown in Figure 2. Individual raw material stores are currently located close to the assembly lines on the same site. Due to the fact that the three assembly lines produce similar products, the parts stored in the raw material stores are also quite similar. This leads to higher stock levels, low inbound consolidation effects and higher operating costs. In addition to this, a high number of stock transfers between the sites are required to ensure adequate parts availability in all three locations and these transfers are very costly and are not part of the value adding chain. Moreover the company likes to free up the store space to enlarge their bus body assembly lines. The schematic functional layout of a Bus body assembly line is shown in Figure 3.

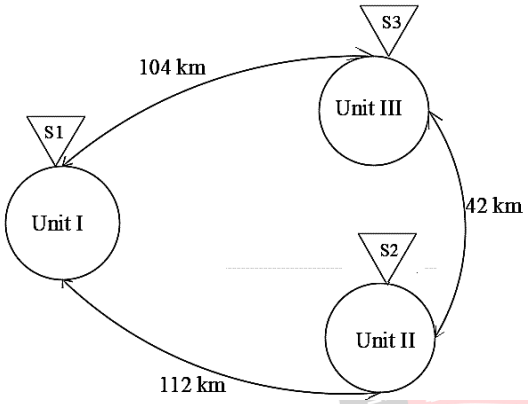

Figure 2 Location of bus body assembly units

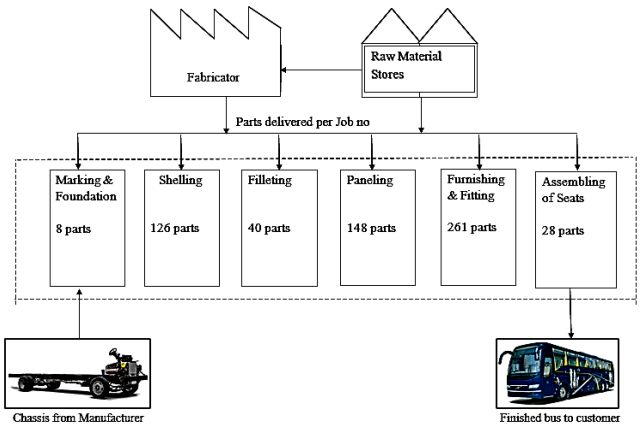

Figure 3 Functional layout of individual bus body assembly line

III. PROPOSED 3PL MODEL

It is proposed to centralize the raw material storage and supply operation for the coach assembly lines in a new warehouse close to one of the assembly locations. It is to be managed by a third party which enables a new step forward in supplying parts to the assembly lines at three locations with minimized inventory and scheduled transports. The model for centralized warehouse and 3PL operations is framed with reference to [7] and depicted in Figure 4. The task of transportation to and from fabricator is excluded from the present model.

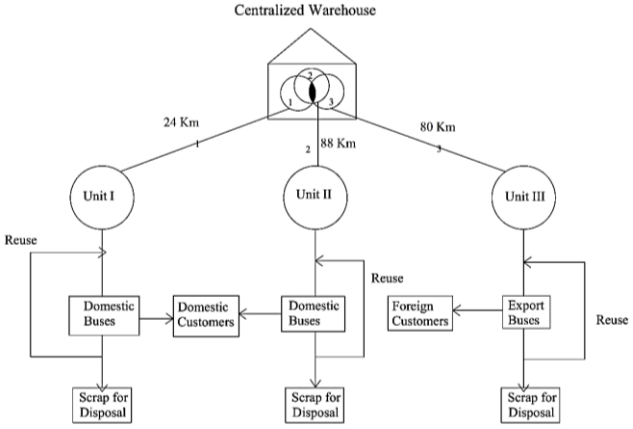

Figure 4 Proposed model of 3PL for bus body building company

The primary objectives of 3PL implementation with the significant adoption of GSCP are listed below [8], [9]:

i. Consolidation of inventory at one place leading to reduced overall stock levels and increased efficiency of operation

ii. Reduced stock transfer between sites leading to minimum transportation trips leading to less fuel consumption and less pollution

iii. Improved storage systems and material handling operations

iv. Effective grouping of parts leading to recovery of investment through selling/reuse.

IV. SELECTION OF SUITABLE WAREHOUSE LAYOUT

The proposed building of the warehouse belonging to the company has 1500m^2 floor space. It is based on the calculation of the space requirement. Several layouts for the warehouse have been conceived. However two alternatives have been considered for selection. The layouts considered conform to the alternatives suggested by [10].

In alternative 1, space utilization is optimal. This layout requires no change in existing building. The receiving and shipping area are located at opposite sides of the building. It provides more area for handling the goods in receiving and shipping zones. However, this scenario leaves a restricted area for storage and picking of parts. A narrow aisle racking for pallet storage up to 9m height can be installed which would be served by a reach truck. Handling of parts belonging to long and dangling category is difficult due to restricted aisle path. Though warehouse layout alternative-1 provides optimal space utilization and minimum travel for picking the parts, it requires high investment for special material handling equipment. It is due to handling of goods across totally separated shipping and receiving zones. Expansion within the building is not possible due to restricted storage and handling space. This layout shown in Figure 5.

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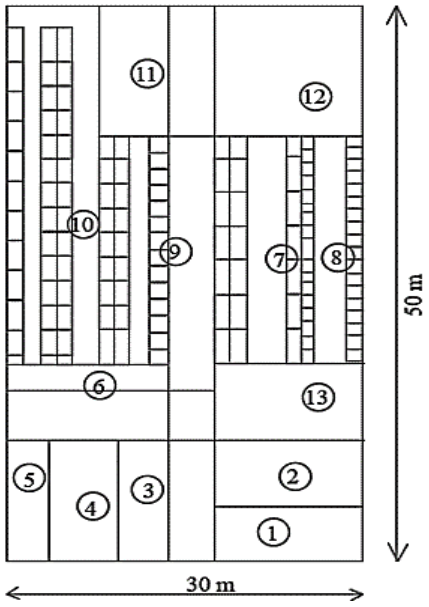
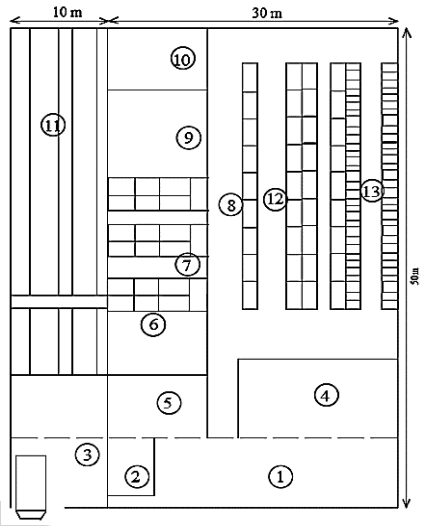


1 Shipping Area
2 Packaging and buffering area for sheets and tubes
3 Goods out Buffer and checking
4 Glasses and repacking
5 Maintenance
6 Transfer area
7 Sheet Racking
8 Cantilever Racking
9 Oversize material
10 Pallet Storage for large and Heavy items + Glass reserves
11 Goods checking and packing
12 Receiving area
13 Transfer area

Figure 5 Warehouse layout – Alternative-1

In second alternative, the shipping and receiving area are located at the front end of the warehouse leading to larger space for storage of parts. It has a wide aisle pallet racking, which ensures adequate handling and storage space for larger parts like sheets and glasses. There is no need to leave any transportation path along the lateral sides of the building due to the same side location of receiving and shipping areas. Hence, the building can be extended along the lateral side upto 10 m wide without any disturbance to the current operations, leading to sufficient space for handling. In the expanded section, a cantilever racking can be installed for storage of long and dangling items. This avoids congestions in handling these parts. The receiving and shipping areas can be utilized more flexibly according to the volume of materials handled. Separate area for cutting wires, glasses and rubber beadings can be provided between their storage place and shipping area. It is provided with a mezzanine floor that offers space for bin racking meant for storage of light-weight parts such as fasteners, door materials, auto-electricals etc. Material handling equipment like elevator can be used for easy handling and picking of these parts from receiving and shipping areas. Office room and computer facilities can be located in this floor itself. This provides enough space for the storage of large and heavy parts in the ground floor, so that there will not be any hindrance for special material handling equipment. This layout is shown in Figure 6.



1 Shipping and receiving
2 Returns operation
3 Receiving and Shipping for long items
4 Sheet picking consolidation & Goods out area
5 Goods in area
6 Cutting area for rubber, cushions, glass, wire
7 Storage area for rubber, cushions, glass, wires etc.
8 Main Transfer aisles
9 Block storage area for cushions
10 Maintenance area
11 Cantilever racking for long parts
12 Sheet racking
13 Cantilever racking

Figure 6 Warehouse layout – Alternative - 2

The following Table 1 gives a brief comparison of two warehouse alternatives.

Table 1 Comparison of warehouse layout alternatives

Alternative - 1	Alternative - 2
Goods receipt and dispatch area located at opposite ends	Shipping and receiving area located at same side
Optimal space utilization	Requirement of 50% additional space requirements
Short travel distance of parts	Separate shipping & receiving area for long & dangling parts
Expansion is not feasible due to the lateral sides of warehouse occupied for transportation path	Expansion in all directions possible without disturbing existing operations
Dependency of high end material handling equipment due to restricted storage space	Separated cantilever handling avoiding congestions and easy picking.
Restricted storage and handling space	Sufficient handling area

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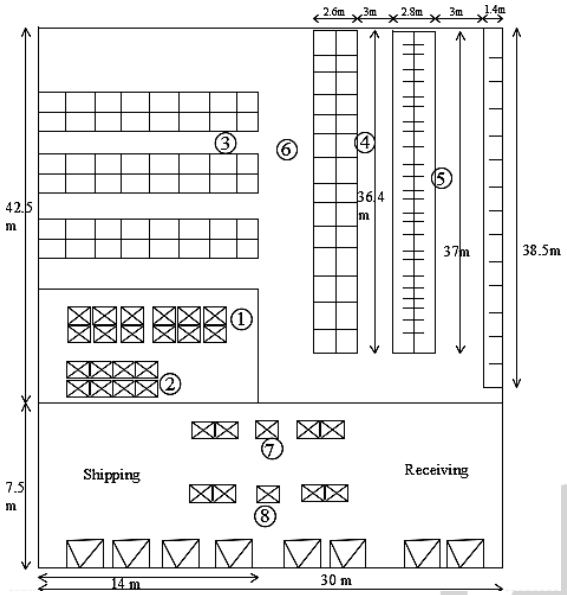
Owing to the advantages of expanding the available space by 50% and installation of a cantilever racking system within the enlargement area, Alternative-2 is recommended. Further to this, the warehouse layout has been finalized as shown in Figure 7.



1 Special Handling
2 Upright storage
3 Bin Racking
4 Sheet Racking
5 Cantilever Racking
6 Main Transfer aisle
7 Consolidation area
8 Goods out

Figure 7 Warehouse layout – Final draft

The mezzanine can be installed above the area for special handling parts to carry storage systems for totes, meant for small and medium parts. It has been designed with the maximum load bearing capacity of 500 kg per square metre, mainly supported by free-standing pillars. The layout of mezzanine floor is shown in Figure 8.

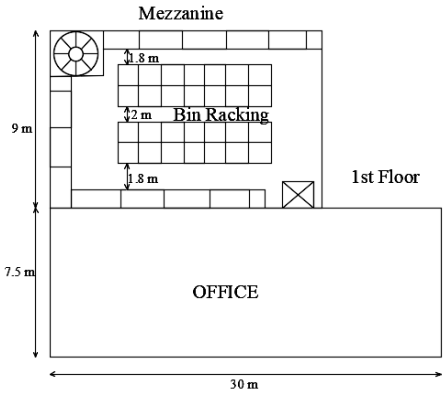


Figure 8 Layout of Mezzanine floor

The salient features of this final layout are utilization of maximum possible vertical volume, dedicated mezzanine for bin racking, parallel and short aisles for faster picking, flexible mode of shipping & receiving and optimized handling space. Hence this layout is highly adaptable for present and future needs.

V. INBOUND AND OUTBOUND TRANSPORTATION

The transportation system includes two ways namely goods in from suppliers and goods out to the three assembly units. In the existing system, distance operated is more due to unplanned inventory spread over three locations and hence more inter-branch transfers. In the proposed system, the average distance of travel between units is reduced to 192 Km from 258 km in the present system. With the establishment of 3PL warehouse, the distance to be travelled daily has been reduced by 58 km. Also the inter-unit transfers have been fully eliminated. Due to the reduction of travel distance, the transportation cost is saved reasonably. The location map is shown in the Figure 9.

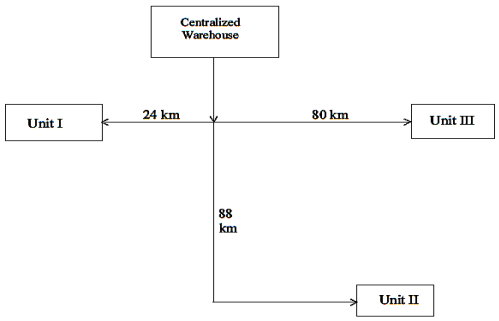


Figure 9 Location map of 3PL warehouse and three units

VI. ANALYSIS OF ACHIEVEMENT

The model of achievement is shown in Figure 10. Also the achieved model of 3PL Company is shown in the Figure 11. The significant adoption of GSCP among the various functional domains have been indicated thereon.

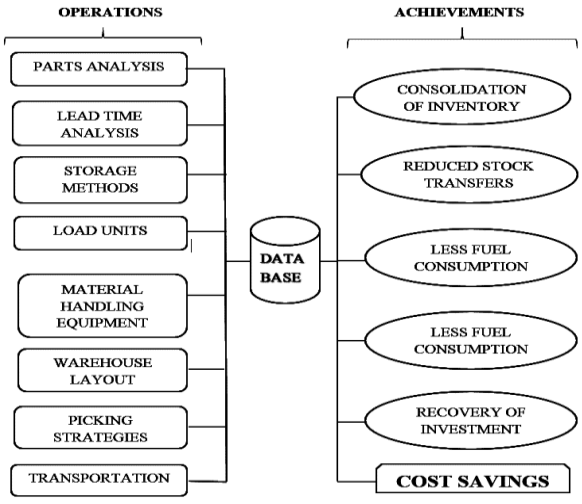


Figure 10 Model of achievement

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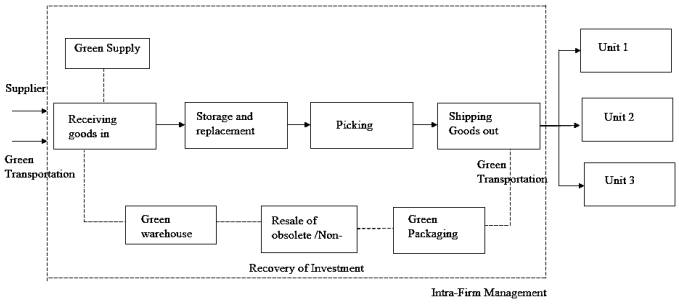

Figure 11 3PL Model achieved with adoption of GSCP

After the analysis of parts structure and storage characteristics, the requirement of storage structure, load units and material handling equipment has been determined. The cost estimated for floor preparation, shed for storage of hazardous materials and dock leveler has been worked out. Based on the computation of investment required under various categories such as storage structure, material handling equipment, load units, additional cost for modification of warehouse building and computer systems, the average running cost per annum has been estimated.

Based on the computation of various 3PL cost elements, the expected logistics cost during the first year of operation and its comparison with the cost incurred in present system has been figured out in Table 2. These cost elements of existing system and potential savings are clearly shown in Figure 12 and 13. A cost saving of 31.26% is reported in this analysis.

Table 2 Expected cost savings

Contents	Present system	Proposed 3PL system	Potential savings
	Rupees in lakhs per annum		
Salaries	41.49	16.56	24.93
Depreciation	36.3	34.17	2.13
Interest	30.12	19.87	10.25
Energy cost	3.70	7.40	-3.70
Maintenance	4.18	10.12	-5.94
Transport In	1.75	1.10	0.65
Transport Out	24.60	10.53	14.07
Inventory cost	54.87	35.67	19.20
Total	197.01	135.42	61.59

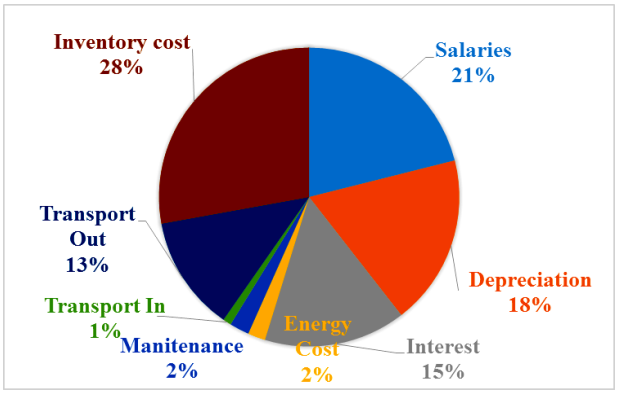

Figure 12 Cost elements of existing system

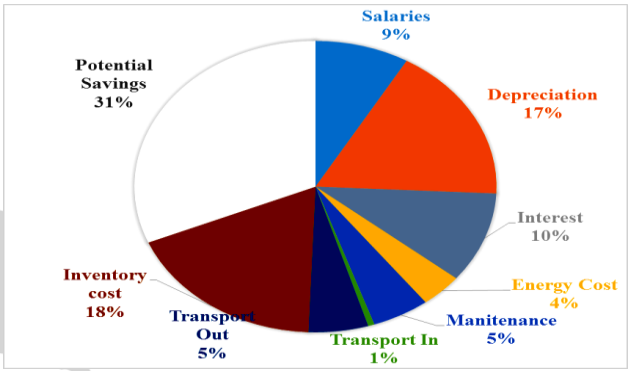

Figure 13 Potential savings after implementing 3PL

VII. CONCLUSION

The proposed model of GSCP-adopted 3PL provides a reduction in salaries due to minimum personnel enough for automated storage and handling system. Moreover the 3PL providers can employ at lower pay. However, energy consumption and maintenance is increased due to the usage of special material Handling equipment and increased lighting system for wide area of warehouse. This may be decreased by proper implementation of GSCP under Green warehouse such as usage of LED lights and employing Non-conventional energy sources. Inbound transportation cost is reduced due to consolidation effects. Transportation cost for delivery of parts to three assembly units has got reduced due to proper planning, avoidance of inter-unit transfers and minimum travel distance. Further it may be reduced by engaging less pollution/fuel economy vehicles. Inventory control has got improved due to centralized planning leading to reduced stock levels. The non-moving items or obsolete items may be sold for investment recovery. The final draft of storage layout, storage systems and load units discussed in this thesis offer an optimized potential for the expected short and medium term future development. This potential enables the 3PL division to have greatest possible flexibility for the storage of parts, safe procedures and clear material flow structures. Avenues are present to enlarge the building in suitable modules if necessary and adapt flexibly on future development with reduced pay back risk. This

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model can also be well utilized by 3PL network designers for similar kind of operations with the significant adoption of GSCP.

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