

Implementation of Reverse Logistic System as a Means of Environmental and Economical Issue

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Abstract

Artery and vein is the transportation system of blood in human body as well as all vertebrate. Two directional flows are simultaneously occurred in this circulation system and for this phenomenon it is called balanced circulation with nearly zero environmental impact. An industry is like a human body and logistic deals with the transportation system. But only then the industry will be in a balance, more profitable and more environment friendly when logistic and reverse logistic play effective role consistently. Reverse logistics is the process of moving goods from their typical final destination for the purpose of capturing value. This research is going with those products which have some nonperishable parts like beverages, battery, automobile parts, electronic devices etc. This paper work has clearly shown that the benefit of reverse logistic and the scope of recycling, remanufacturing, reusing and also the environment friendly damping system for reducing the environment pollution. A framework has done in this research by which it will helpful to design the reverse logistic system. The specific scopes of remanufacturing, recycling, reforming and the importance of damping scientifically are shown clearly in this paper. Battery manufacturing company and Beverage Company was our research field.

Keywords

Green Supply Chain, Reverse logistics, Recycling, Remanufacturing, Reforming

1. Introduction

Increasing world population and standards of living have magnified resource consumption and the disposal rate. Growing concerns about climate changes, local and regional impacts of air, ground and water pollution from industrial activities have significantly expanded the interaction between environmental management and operations. This project intends to define the state of the art in reverse logistics, and to determine trends and best reverse logistics practices. Part of the research charter was to determine the extent of reverse logistics activity in the Khulna city in Bangladesh. Most of the literature examined in preparation for this research emphasized the “green” or environmental aspects of reverse logistics. In this project, green issues are discussed, but the primary focus is on economic and supply chain issues relating to reverse logistics. The objective was to determine current practices, examine those practices, and develop information surrounding trends in reverse logistics practices. This project particularly deals with battery manufacturing company where most of the elements of battery are responsible for environmental pollution intensively.

Researchers from different era and location of the world accomplished their project on this environmental safety with reverse logistics. During the last decade, reverse logistics has received increasing attention from both academic researchers and industrial practitioners. Serious and persistent environmental concerns and government regulations have created a motivation to pursue further research in this field. During the early nineties, the Council of Logistics Management published two studies on reverse logistics. First, Stock (1992) proposed the application of reverse logistics in business and society in general. One year later, Kopicki et al. (1993) elaborated the opportunities on reusing and recycling. In the late nineties, several other studies on reverse logistics were completed. Kostecki (1998) discussed marketing aspects of reuse and issues involving the extension of product life cycle. Stock (1998) investigated how to start and carry out reverse logistics programs. Rogers and Tibben-Lembke (1999) demonstrated a collection of reverse logistics business practices using a comprehensive questionnaire among US industries,

Reverse logistics studies can be divided into several categories. Dowlathahi (2000) identified five categories as follows: global concepts of reverse logistics, quantitative models, logistics (distribution, warehousing, and transportation), company profiles, and applications. Recently, many researchers have concentrated on the optimization and quantitative models in reverse logistics. Most of the proposed models are similar to traditional facility location models, and are in the shape of a mixed integer linear program for a single period of time (Kroon

and Vrijens, 1995; Ammons et al., 1997; Spengler et al., 1997; Barros et al., 1998; Marin and Pelegrin, 1998; Jayaraman et al., 1999; Krikke et al., 1999; Fleischmann et al., 2001). Other researchers studied problems with a single inbound commodity except for Spengler et al. (1997) and Jayaraman et al. (1999). Louwers et al. (1999) proposed the design of a recycling network for carpet waste. The goal of their study was to determine the locations and capacities of the regional recovery centers to minimize investment, processing, and transportation costs. They developed a nonlinear model and solved it optimally with standard software. A comprehensive review on various cases can be found in Brito et al. (2002).

We found little work addressing the environmental costs of material exchange networks. Locklear (2001) elaborated several techniques that can be applied to determine the value of environmental costs. One approach is Contingent Valuation, where external costs are based on how much the public is willing to pay for protection of the environment. Shadow Pricing is another technique, which uses existing regulations to estimate the costs that the society is willing to accept for the reduction of pollution. In 1990, Tellus Institute conducted an analysis to estimate the external costs for seven different components of air emissions including CO₂ and NO_x (Locklear, 2001). Their estimations are based on the Contingent Valuation method and have been frequently cited in the literature. According to their results, in US dollars per pound, values for CO₂ and NO_x are 0.012 and 3.4 respectively.

2. Methodology

Reverse logistics stands for all operations related to the reuse of products and materials. It is the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal and as a result near about zero environmental effect. More precisely, reverse logistics is the process of moving goods from their typical final destination for the purpose of capturing value, or proper disposal. Remanufacturing and refurbishing activities also may be included in the definition of reverse logistics. Normally, logistics deal with events that bring the product towards the customer. In the case of reverse, the resource goes at least one step back in the supply chain. For instance, goods move from the customer to the distributor or to the manufacturer and recycling, remanufacturing, reforming damping are the next steps. So two types of process are aggregated here:

1. Collection process.
2. Functional process.

2.1 Collection of product from customer

Typical reverse logistics activities would be the processes a company uses to collect used, damaged, unwanted (stock balancing returns), or outdated products, as well as packaging and shipping materials from the end-user or the reseller. Once a product has been returned to a company, the firm has many disposal options from which to choose. When a product is getting damage then customers never put their attention on it rather throws into drain. So collection is the base of the reverse logistic and analyzing this transportation network design of supply chain is initiated. Among all the types of transportation model TAILORED NETWORK is widely used here which represents shortly 'Situation demand networking system'. It is the combination of different network system where there is a well combination of supplier, customers, Distribution Centre, Cross-docking and milk run approach. The main advantage of this network is reducing the cost, time and improving the responsiveness. And also this is the perfect network for collecting product reversely.

2.1.1 Reverse Logistics and Environmental Logistics

While promoting economic development, logistics activities also increase the quantity and frequency of related activities, increase energy consumption, aggravate air pollution and waste pollution, and bring many side-effects on economic sustainable development of the whole society. The concept of environmental logistics can be described as follows: to keep a friendly environment and make good use of logistics resources, restrict the side effects on environment of logistics during operating process is very important for us to develop environmental logistics. By improving logistics stages such as transport, storage, package, load and unload as well as distributing process, the objective of reducing environment pollution and energy consumption can be attained. Reverse logistics, as an organic part of environmental logistics, plays an important role to some extent. It can make good use of existing resources, cut down the demand on raw materials and save operating costs. However, some activities related to reverse logistics may put many side-effects on environment. Even they can destroy the positive effects brought about by recycling, remanufacturing and the reuse of new products and materials, etc. Therefore, in addition to concentrating on the saving of costs, enterprises should carefully deal with the relation between reverse logistics and

environmental protection, meanwhile, strengthen research on the techniques related to reverse logistics, only by those can the side-effects on environment resulted from additional logistics activities be reduced.

2.2 Functional Process

If the product can be returned to the supplier for a full refund, the firm may choose this option first. If the product has not been used, it may be resold to a different customer, or it may be sold through an outlet store. If it is not of sufficient quality to be sold through either of these options, it may be sold to a salvage company that will export the product to a foreign market. If the product cannot be sold “as is,” or if the firm can significantly increase the selling price by reconditioning, refurbishing or remanufacturing the product, the firm may perform these activities before selling the product. If the firm does not perform these activities in-house, a third party firm may be contracted, or the product can be sold outright to a reconditioning/remanufacturing/refurbishing firm. After performing these activities, the product may be sold as a reconditioned or remanufactured product, but not as new. If the product cannot be reconditioned in any way, because of its poor condition, legal implications, or environmental restrictions, the firm will try to dispose of the product for the least cost. Any valuable materials that can be reclaimed will be reclaimed, and any other recyclable materials will be removed before the remainder is finally sent to a landfill. Generally, packaging materials returned to a firm will be reused. Clearly, reusable totes and pallets will be used many times before disposal. Often, damaged totes and pallets can be refurbished and returned to use. This work may be done in-house, or using companies whose sole mission is to fix broken pallets and refurbish packaging. Once repairs can no longer be made, the reusable transport packaging must be disposed of. However, before it is sent to a landfill, all salvageable materials will be reclaimed. So this system ensures us a controlled damping system where pollution is in environmental manner. And functional process start for the used product by breaking down as only the primary objective then other respected operation. After this related parallel operations like recycling, remanufacturing, reforming and damping are functioned.

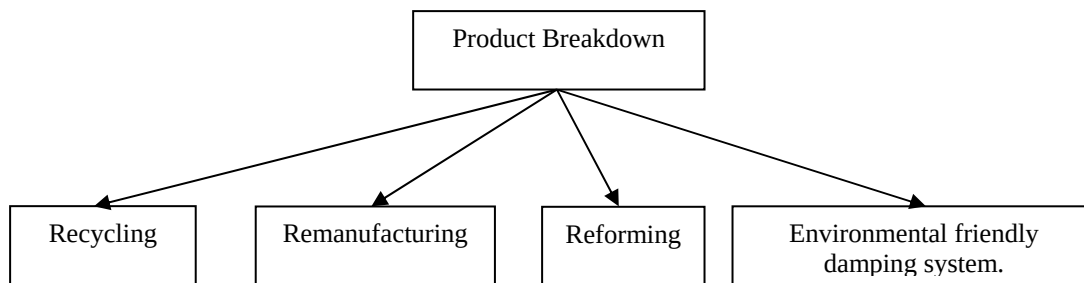


Figure 1: Functional process overview

3. Illustration

3.1 Findings of the study

Battery manufacturing company was our research field for this calculative project where maximum raw materials are collected from vendor. And most of the time they collect a reasonable percentage of raw materials from the local party who are the middleman between customer and manufacturer. A very negligible portion of some raw material is come from the company recycling plant which is really insufficient. For the purpose of this research the total logistic system of the company is observed well from the top to bottom. A flow diagram is depicted where the directional flow of product is viewed. The function of Logistic in the battery manufacturing company;

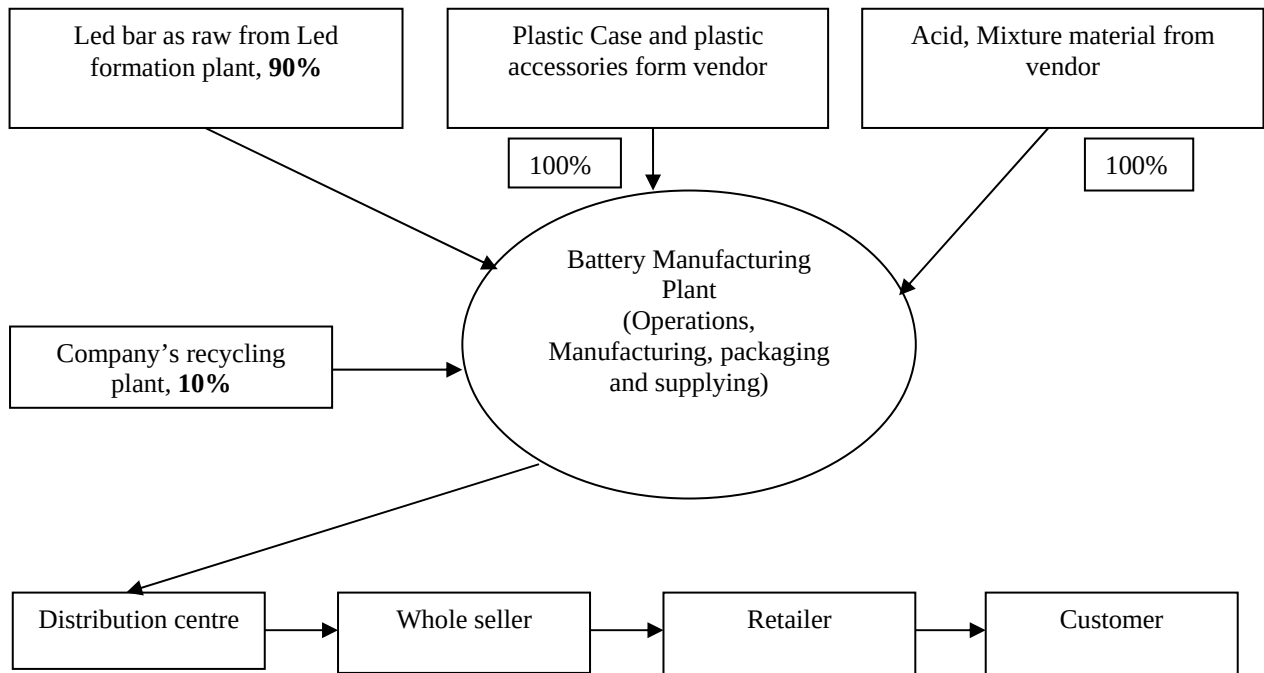


Figure 2: Flow direction of logistic

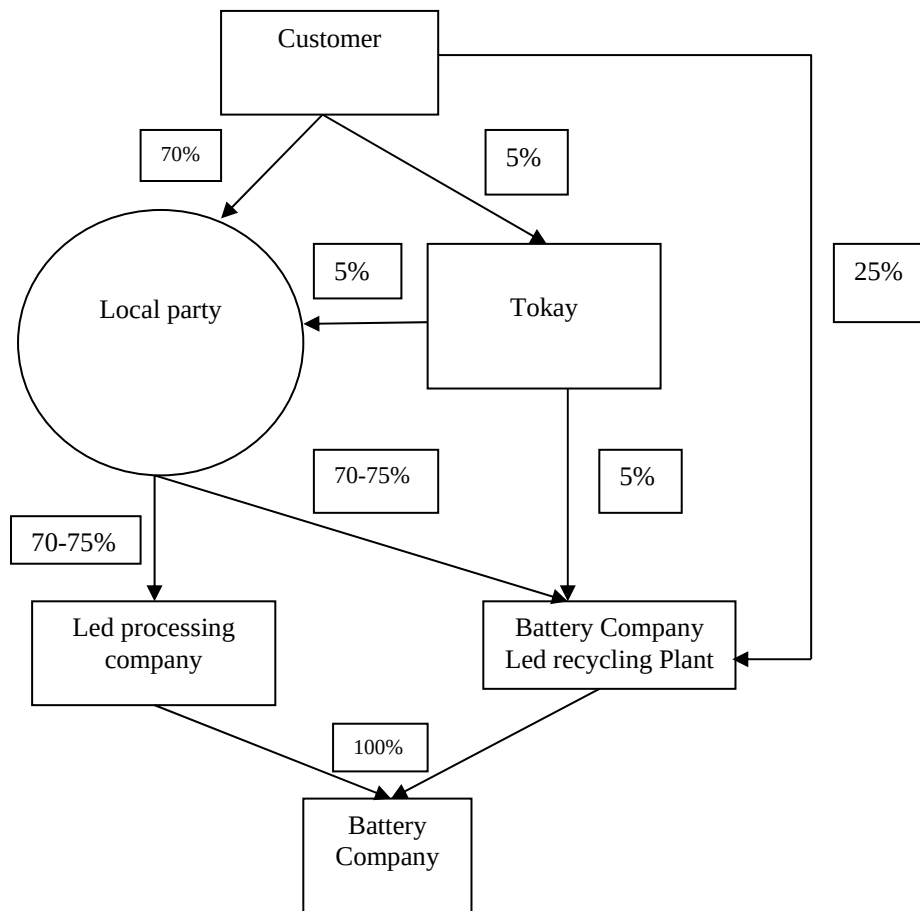


Figure 3: Flow chart of a used battery after life cycle

The company offers one year warranty for the product and the approximate life cycle is 5 years. After the damage of the battery naturally it is sold to near local party who are illegally involve in this business. They never follow the scientific approach of the recycling, dumping activities. But they sell the led to the led processing party or rarely to the battery manufacturing company. So after life cycle the flow of the battery is in Figure 3.

3.2 Improvements

Reverse logistic is one and only the way of controlling the scenario of random breaking of battery which is the main cause of environment pollution. A newly design product flow with reverse logistic can solve this problem entirely. Managing reverse logistic flow is the main concern for this purpose. A few initiatives can make the system easy and efficient like:

3.2 .1 Standardization of Processes

One of the most common difficulties is observed with current reverse logistics systems is the lack of standardization of processes throughout an organization. If processes are not standardized, it is very difficult for people in an organization to communicate to each other how to handle reverse logistics problems.

3.2 .2 Centralized Return Centers

Centralized Return Center (CRC) is must be in agreement that using a separate CRC offered many benefits. This approach is must help the user to attract to perform their activities in association with reverse logistic system.

3.2 .3 Secondary Markets

Management has to move secondary market for benefit of the company. The material which is not useable for quality product is must move to secondary market.

3.2 .4 Web-Based Secondary Markets

A trend in the disposition of goods is the utilization of the worldwide web. It appears that in the future it will be an important mechanism for dispositioning from the reverse logistics flow. The web provides a direct link to consumers.

3.2 .5 Enrich environmental safety consensuses

Adequate initiative for built national consensus on environmental safety must ensure. This activity definitely motivate user to move their useless product to CRC.

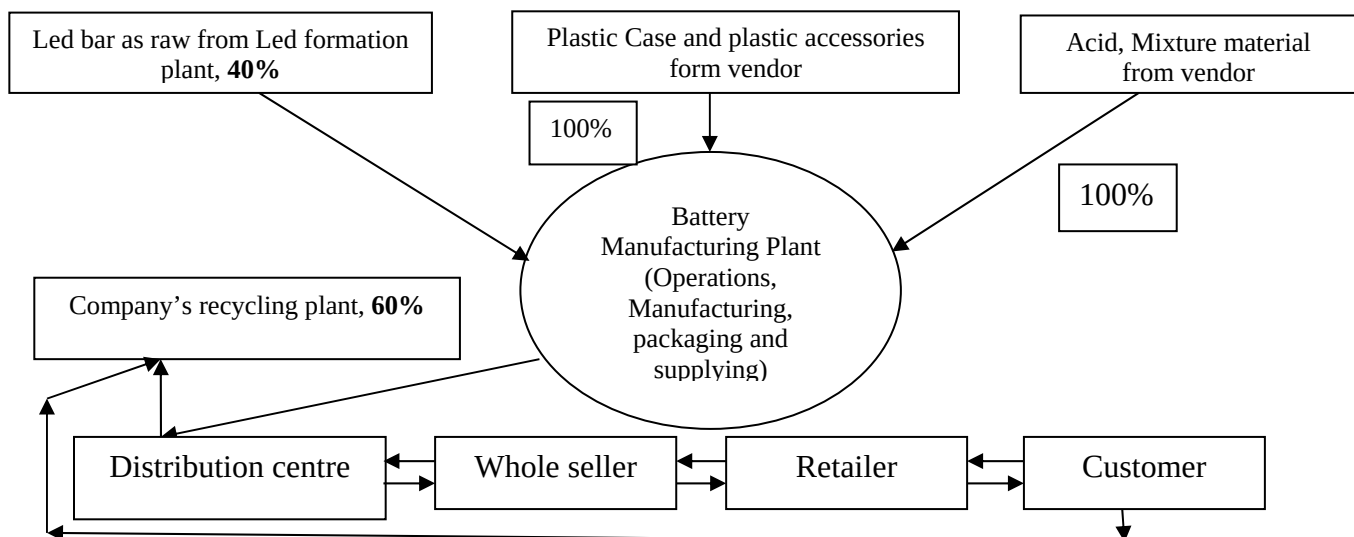


Figure 4: Product with reverse logistic

3.2 .6 Design TAILORED Network

With respect to the cost a transportation network must to design. In this research work TAILORED network is preferred for the low cost service. The transportation mode using in time of logistic is used for reverse logistic and only for this no extra transportation cost is needed. However, after considering aforementioned condition a ne flow diagram is proposed which can make the system effective and also there is a lower transportation cost. So this is stood for an advanced collection process of product from customer.

At the end of collection process battery is separating is the core element and then decision has to take which element are going to recycle, remanufacturing, reusing and damping. A percentage calculation of a battery is given below:

Table 1: Battery Content (after break down)

Name of element	Percentage (%)	Required operation	Use
Grid lead	26.70%	Recycling/Remanufacturing	75%-85%
Active material	36.0%	Reuse	100%
Top Lead	10.60%	Recycle	90%
Plastic/other	10.60%	Reuse	100%
Electrolyte	27.50%	Reuse	90%

3.2 .7 Recycling

Recycling plant is needed mandatorily in any battery manufacturing company for purpose of both environmental safety and cost. In a regional calculation of this battery company it is clear that about 70% raw materials can be collected from a well designed recycling plant. At the same time a fixed recycling plant must reduce environmental safety. Led grid and plastic Casing are the main element of recycling.

3.2 .8 Remanufacturing

Remanufacturing is the approach of reducing waste and making profit. There are some parts like some special type of plastic casing, cap and some lead grid which are useable for two or more times of a total battery. These elements can be used in repetitive manner which save money and must be for environmental friendly.

3.2 .9 Reusing

Reusing concept is totally new and effective for reducing waste. Those items which are totally useless can be used in making show piece. Some plastic item those are not useable may be sold in secondary market or in any parallel business. Raw degradable plastic can be used in making plastic goods. This approach helps to open a new dimension of business.

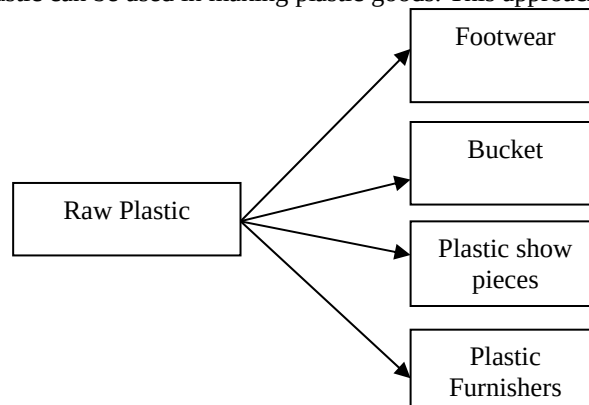


Figure 5: Reusing of raw plastic

3.2 .10 Damping

Environment has deep relation in damping system by which it may be safe or polluted. So a scientific damping system must be designed as the part of environment treatment plant. Waste acid substance must be neutralized before draining. Buffer solution can be used in this purpose.

4. Conclusion

In Battery manufacturing company Reverse Logistic system is found as profitable policy. The Battery Company has benefitted because of reverse logistic. The company has now producing IPS, remake new batteries as a new product by reusing the led plate and accessories of collecting from used battery and has been able to attain 10% more benefitted. The toxic acid has neutralized scientifically and the lead is recycled so that environmental effect has reduced. This system has ensured the nearly optimum waste which is directly saved our land as well as environment. Also the rate of water pollution due to toxic acid is limited. The developed shortlist will help to find out the scope of reverse logistic system. The era of recycling, remanufacturing and reforming has opened only for reverse logistic system. This system also helps to attain environment friendly surroundings. Reverse logistic system is such a gateway which is functioning in recycling, remanufacturing, reforming. This paper has clearly described about to design a reverse logistic system in supply chain to make it a more profitable sector. This framework has helped to find out the necessity of reverse logistic in the sector of green supply chain for the environmental safety. Although our resources are limited, but reverse logistic can make this limited resource unlimited by helping in recycling, remanufacturing, reforming sectors. In every battery company one or two year guarantee is provided as after sale service but the fact is that there is no policy after two years or more when the battery may get dam. Reverse logistic is such a change maker of this damage device. By collecting those batteries remanufacturing, recycling and reusing concept can be applied. Moreover to damp any part of the battery an environment friendly scientific damping system is followed. Thus the company gets benefitted and environment is getting free from mass pollution. In that way Beverage Companies, Toiletries Companies, Electronic Company etc can recollect their non perishable bottle, tube, packet etc and can use those as in recycling raw material for the sake of environmental safety including profit. The proposed design of reverse logistic system in this paper has shown profitability of the company.

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