

Inspection Methods in Recycling Plastics from Reverse Logistics

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Abstract: Reverse logistics can be defined as moving goods from customer side towards manufacturer in order for the goods to be refilled, reprocessing, repaired or waste disposal. It is a separate chain where maximum value from the goods is absorbed ensure proper disposal. It becomes a matter of importance when the materials salvaged can be recycled to make new products cutting the cost of new raw materials. By moving with this aspect, we must also ensure that quality is also not compromised in the new product coming out with recycled material. Such that various inspection methods that are used in choosing the plastics must also not be random. Recycling is also chosen to reduce the production of waste but a main method of rapid resource is a reusing. This paper is submitted by studying various papers from different journals with the required knowledge. A conceptual framework is made as a base to obtain maximum insight about the methods used to inspect the material before recycling and quality.

Keywords: Reverse Logistics, Plastic Recycling.

I. INTRODUCTION

Reverse logistics is defined “All activities associated with a product/service after the point of sale, the ultimate goal to optimize or to make more efficient aftermarket activity, thus saving money and environment resources” Reverse Logistics Association, 2009. “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 or creating value or proper disposal” given by Rogers and Tibben-Lembke, (1999). The main purpose of reverse logistics is reducing the cost and maximum utilisation of resources. Reverse logistics are carried out due to variety of reasons such as refilling, repairs and refurbishing, product recall, recycling and waste disposal.

Plastic recycling is defined as recovering scrap or waste plastic and reprocessing the material into entirely new from their original state. This closed-loop operation has taken place since the 1970's and has made the production of some plastic products amongst the most efficient operations today. Plastic from reverse logistics are being a huge proportion and produces a various challenges to environment and companies. With the emerge of reverse logistics and various other chains, plastics have been playing a important role due to its mouldable form and ability to synthesize easily. But, this changes to a major threat to environment and sustainable development. A various designs and reusable structures are made to be used in reverse logistics, still a majority of plastics are not chosen for recycling due to the reason of Quality.

The plastics coming from various reverse logistics channels are diverse and common of them are Polyethylene Terephthalate (PET), High density Polyethylene (HDPE), Low-density Polyethylene (LDPE), Polyvinyl Chloride (PVC), Polypropylene (PP) and Polystyrene (PS). These plastics serve a category of uses and can reused to maximum efficiency, while some of them have to be recycled to be given a new form and new use to facilitate recreation.

Coming back to reverse logistics, a various combination of reverse channels give an idea how products reach the End users with change of various hands.

II. LITERATURE REVIEW

Terrence L. Pohlen and M. Theodore Faris II, (1992) provided a separate channel where materials going to be recycled will travel towards the manufacturer. Marisa P de. Brito and Rommert Dekker, (2003) gave a theoretical background on what basis and why the products get into the system of reverse logistics, who overlooks the operations. G Dodbiba and T. Fujita, (1990) gave the methods in separation of plastics for recycling. Jefferson and et al, (2009) with variables provides a base on how different types of packaging material can be recycled. Dr. Chee Wong, (2010) explained a brief on Plastic Recycling Supply Chain to show how plastics are moved. Bupe G Mwanza, Charles Mbohwa and Arnesh Telukdarie, (2017) implied the need for plastic recycling along with reverse logistics. Mădălina Elena Grigore, (2017) analysed various methods to recycle thermo-plastics which has increased over 60 years due to its ideal properties. at al, (2016) statistically proved a way of choosing the best recycling method to be carried out with real life data. Hendy Suryana, Gatot Yudoko, Heru Purboyo Hidayat Putro, Puspita Dirgahayani,(2019) provided a insight about recycling LDPE and HDPE along with the help of reverse logistics. Eric P. Jack et al, (2009) gave a depth introduction to cost savings in reverse logistics and capabilities. Joseph R. Huscroft et al, (2012) provided a findings of seven key issues that reverse logistics managers are facing. P. Fraser Johnson,(1998) briefed about the need to manage value and role of intermediaries in reverse logistics. Vanessa Goodship, (2007) in the second edition of Plastics Recycling gave entirely theoretically and practical full view of recycling. AliReza Rahimi and Jeannette M. García, (2017) presented a scientific paper on chemical recycling of plastics for new materials with various techniques to obtain as much material as possible. Jeannette M. Garcia and Megan L. Robertson , (2017) pointed out to a function that only 8.8% of PET plastics are recycled and others are landfilled out to a maximum.

D.S. Achilias et al, (2007) gave a in-depth view of recycling LDPE, HDPE and PP with various methods to enable complete breakdown and provide feedstock for the production of new materials. Dale S. Rogers and Ronald Tibben-Lembke, (2001) came with a foreword that reverse logistics play a important role and needs to be carefully monitored to provide more competitive strategy. M. K. Eriksen et al, (2019) presents well-structured steps for recycling of PET with very high recovery rate by Closing the loop method. Dylan Jubinville et al, (2020) implied on using PE and PP to high extent such that recycling can be done at the very last stage until needed. Leonidas Milios et al, (2018) focused on factors that inhibit the use of recycled plastics and diminishing them, gave a wide range of options to make differences in Inspection methods. Yi-Bo Zhao et al, (2018) provided a solvent based recycling method for plastics and explained about the high staying power of plastics after their production. Wogene Tesfaye and Daniel Kitaw, (2020) studies about the methods used in the recycling practices and merging them with reverse logistics as a strategic tool which is an important base in our study. Kuan Siew Khaw and Zulkifi Mohamed Udin, (2013) provided a connection of what we need to do by combining reverse logistics and green product design such that production of new material is reduced. Marion Steven, (2004) gave a network analysis of reverse logistics to enhance the operational ability that helps in recycling stages also. Nick T. Thomopolus, (2016) exposed the value of the returned goods from the user and as well as when the goods are aged and of no use, such that the company must enhance reverse logistics to maximum salvage of value from the products. James H. Barnes, (1982) study brings out maximum of the study's purpose to reduce plastics from huge markets which is absolutely needed for our research study.

Stanislava Draganova Kovacheva and Adriana Strelalovska-Garkova, (2020) provides a global view of the reverse logistics and deep information about integrative waste management to fight waste production and achieve sustainability, this gives a major importance to find all the methods to be implemented in recycling. Zach G. Zacharia and John T. Mentzer, (2007) provided a basic understanding on how new product development can be affected by logistics which we must consider for our research study as recycled plastics are used for the production of new goods. R. Glenn Richey et al, (2004) explains the time interval and resources effect on logistics and provided a base for further research so as to deduce a different models for sustenance. M. Fehr and F. C. Santos, (2013) conducted a survey to find the accumulation of municipal solid waste and recycling it methods by reverse logistics which provides us a way of chain also to carry out plastic recycling. Ramazan Kaynak et al, (2013) gives the importance of logistics center that is there are vital in carrying out reverse logistics and administrative operations for smooth carry over. S.M. Al-Salem , P. Lettieri, J. Baeyens, (2009) gave detailed view of different ways which the plastics can be carried over to effective production. W. Kaminsky, J. Menzel and H. Sinn, (1976), major insight about plastic recycling methods are given such that it's helpful for the study to choose the ways to inspect. Tadao Kasakura, Reiji Noda, Kenichi Hashiudo, (1999), various trends that now have to a saturated state has been provided and information is consolidated. Nitin H. Mutha, Martin Patel, V. Premnath, (2006), prepared a plastic materials flow study solely based on Indian topography. Wang Bei and Sun Linyan, (2004) and Saurabh

Agrawal et al, (2015) gave a literature review about reverse logistics review till present at that date. This paper provided a major exploded view of reverse logistics. Dennis W. Krumwiede, Chwen Sheub, (2002) provides how the third party logistics can help in backward flow of goods. S. K. Sharma, B. N. Panda, S. S. Mahapatra, and S. Sahu, (2011) gives a brief Indian Study to why products are coming into reverse logistics chain and going backwards. Eva Ponce, José Ángel González Manteca, Spain Ruth Carrasco, (2011) gives a detailed information in separating hazardous and non-hazardous materials from reversed mobile phones in Spain. It also indicates a similar scenario in India.

III. METHODOLOGY

This paper considered various journal papers to get the conceptual framework about merging reverse logistics and plastic recycling to get the maximum material into the recycled product. With secondary data collection further more data can be obtained and with extensive review of various journals and papers, we propose a model for the inspection model of recycling plastics obtained from reverse logistics.

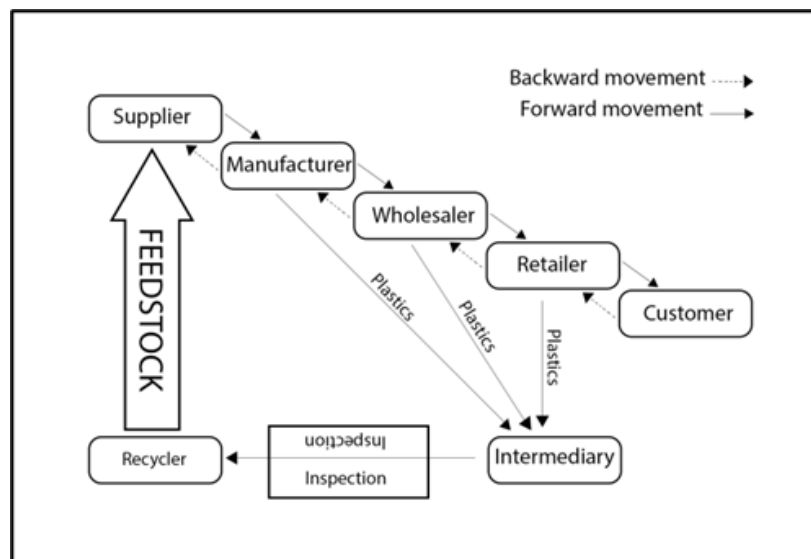


Fig. 1

IV. CONCLUSION

This paper presents a review of literature in reverse logistics. The review has been made around forty two papers having the practices of reverse logistics and plastic recycling. The recycling process may vary from economy to economy but reusing substitute and recycling are very low in reverse logistics. So, it is a big dangerous issue for the environment and us too. Many authors have discussed with statistical data and formulation the ability to make reverse logistics more green. But there is no specific study to prove the reuse of plastics as much as possible and its benefits to forward logistics. This study is to fill the research gap that prevails in the name of quality. After a extensive and comprehensive study in areas and context of reverse logistics, plastic recycling, types of plastics and various practices can be found and a proposed model is derived that brings out the part of Inspection in recycling. The various methods used can be found by collecting data from various different companies under different operations.

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