INCINERATION AS AN ALTERNATIVE IN THE RECOVERY HIERARCHY OF REVERSE LOGISTICS

Dr. Mangesh Purushottam Dande Asst. Prof., Indira School of Business Studies PGDM, Pune. (Maharashtra).

ABSTRACT

Current businesses are not only driven by economic motives. Statutory and social responsibility drivers also play a highly active role. Businesses are characterized by both forward and reverse goods flows. There are numerous motives for the reverse flow of goods. The recovery and disposition options are also diversified needing rational judgment. The recoveries could be in the form of tangible material or even energy. Organizations have begun to focus on multiple recovery alternatives in the reverse supply chains for monetary, social, and ecological reasons. One of the strategic opportunities is the recovery of energy from waste by using incineration. This research paper is an endeavor to study the incineration procedures adopted and implemented by organizations. This study would help understand the incineration practices for getting energy from waste. The arguments on the benefits and concerns aboutincineration practices will give insights into the area of recovery and disposition management under reverse logistics.

Key-Words: Reverse Logistics (RL); Recovery Alternatives; Disposition; Incineration; Energy from Waste.

INTRODUCTION

Dr. Dale S. Rogers and Dr. Ronald S. Tibben-Lembke (1998) have explained Reverse logistics (RL) in their unique book “Going Backwards: Reverse Logistics Trends & Practices”. Reverse logistics or reverse supply chain is the procedure of planning, execution, and control of the efficient and cost-effective movement of various materials such as starting materials, in-process inventory, finished goods, and relevant information from the end-user to the point of origin. The ultimate objective is the recapturing of value or right disposal. More specifically RL is the reverse flow of various goods from their final destinations for re-capturing the value or correct disposition. The definition may also incorporate the remanufacture and refurbishment activities. The growing concern for greener supply chains makes it more appropriate to focus on reverse supply chains.

The returns can be largely categorized into three types:

A) Manufacturing Returns: raw materials, excess materials, rejections, leftovers, and byproducts.
B) Distribution Returns: product recalls, stock returns, commercial returns, and reproducts.
C) Customer Returns: Guarantee/warranty returns,service returns, end-of-use / end-of-life returns.

The RL process begins with the collection of products, inspection, separation, and grouping till final disposal. The various alternatives in RL could be return to the seller, use again, sell back, redistribution, salvage, repairs, reconditioning, refurbishment, remanufacturing, recycling, donation, disposition through incineration or sending to landfills. There are numerous disposition alternatives available in RL for fulfillment of the economic, statutory, and social commitments. The practice of incineration is one of the options. Incineration is the controlled burning of waste resulting in a reduction of the mass and volume of the waste and yielding energy output. One key reason is to cut down on the landfill costs. The final outcome is cost compliance and cost-effectiveness. This research paper presents the study of disposal of waste for recovering energy by incineration.

OBJECTIVES:

i. To understand reverse logistics and its drivers.
ii. To study the recovery hierarchy of reverse logistics.
iii. To explore incineration as a recovery alternative and its benefits and concerns.

RESEARCH METHODOLOGY

The findings presented in this paper are the outcome of the study conducted by the researcher. An evaluation of the secondary data related to recovery and disposition management under Reverse Logistics was done. Several research papers, journals, books, and articles on Reverse Logistics and Incineration for energy recovery were referred. Websites of practicing companies were studied to get insights into the different incineration practices adopted and followed. The outcome of the review of the Incineration practices and their benefits and concerns are presented in this paper.

REVERSE LOGISTICSDEFINITIONS

Reverse Logistics (RL) is the flow of the products or materials in the inverse direction with the objective of value creation or value recapturing or for 'right disposal.' Reverse logistics is essentially the procedure of planning, execution, and control of the efficient, cost-effective flow of raw materials, work-in-process inventory, finished goods, and relevant information from the consumption point to the origin point with the objective to recapture value or create value or for 'right disposal.'

The definitions and meanings of Reverse Logistics by some of the authors/organizations are given in this section. In his article in Material Handling Management James R Stock (2001) writes that Reverselogistics is a broad concept, covering many activities within and outside of logistics. This refers to the role of logistics in product returns, reduction of sources, material substitution, reuse of material, recycling, 'waste disposal,' and overhauling, repair, and remanufacturing. James R Stock (1998) at the Council of Logistics Managementputs forth the term Reverse Logistics as the role of logistics in the return of goods, source reduction, material substitution, recycling of materials, and disposition of waste. It also covers repairs, refurbishing and remanufacturing. Sople (2007) RL is the process of moving goods from their place of usage, back to their place of manufacturing for refilling, reprocessing repairs or 'waste disposition'. It is a planned flow of goods in the reverse direction, done in a cost-efficient and effective manner, through an organized channel network. Hugo, et al (2004) RL is a concept targeted at 'waste and cost reduction' of the distribution channel by developing procedures of the reverse distribution process. Steven (2004) RL comprises all activities for managing, processing, reduction, and disposition of hazardous and / or nonhazardous 'waste' from production, packaging and the usage of products which also includes process of redistribution. Vogt et al. (2002) RL is the management of all activities involved in flow of goods, demand information and money in the direction opposite of the primary forward logistics flow. It involves reduction in the 'waste generated,' as well as the management of collection, transportation, disposition, and recycling of both types of hazardous and nonhazardous 'waste' in a way that increases the long-term profitability of the organisation. A review of the above definitions points out that these authors have included '*waste disposition*' under the scope of RL. The collection, processing and further 'disposition of the waste' are an important part of the RL cycle. Some products which cannot be recovered for technical, obsolescence or cost reasons are left to be finally disposed as solid waste. These end up in the landfills where they are buried. Sometimes the organisations adopt Incineration as a process of disposition for varied reasons. Under this the waste products are destroyed by controlled burning at higher temperatures. The resulting ash is disposed in landfills or water bodies. The energy released may be captured for other purposes.

REVERSE LOGISTICS DRIVERS

There are several rationales for Reverse Logistics. Products come back as they were not functioning correctly or had stopped performing. They could move in the reverse way from any of their channel locations in the respective supply chains. Carter and Ellram (1998) demonstrated a model showing the forces stimulating and restraining RL. They identified four different environmental forces:

1) Government (in terms of statutory regulations).
2) Buyers.

3) Suppliers.
4) Competitors.

Few RL movements are either imposed or done proactively for economic reasons. Generally, businesses get involved in RL because they earn profit from it or/and they have to do it or/ and they feel socially inspired to do it.

Brito and Dekker (2003) have mentioned these three drivers of RL.

1) Economic (Both Direct & Indirect).
2) Legislative.
3) Corporate Citizenship.

Economic: The benefits resulting on account of direct reduction in material consumed, additional value due to recovery, and reduction in the disposition costs.

Legislative: Referring to the different laws of the land relating to product manufacturing, consumption, reclamation, and disposition. This also includes the different laws on packaging and their disposition. Various countries have passed legislation to protect the rights of consumers and the environment. It involves Producers Extended Responsibility.

Corporate Citizenship: It addresses environmental responsibility. It incorporates the values and beliefs adopted by the RL organization for being an accountable corporate entity. It indicates their responsibility for society and the environment. It is about their feelings of undertaking something good for society and the environment but without any obligation.

These three drivers indicated in the Figure No. 1 :

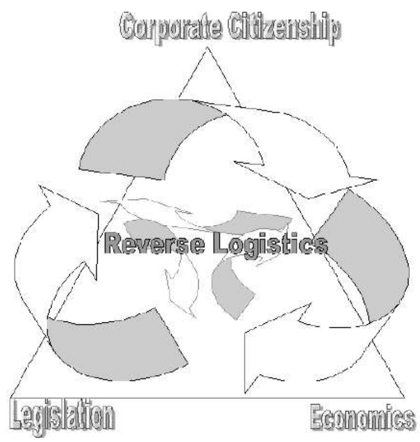

Figure No. 1 Reverse Logistics Drivers Triangle.
Source: Adapted from Brito and Dekker (2003:8)

The arrows in the figure indicate that these three drivers are not equally exclusive. All of them overlap and play their roles as RL drivers. Various circumstances and materials would have different pulls from these drivers. Also, these are nation dependent as different nations have their own set of social and ecological legislations.

REVERSE LOGISTICS RECOVERY ALTERNATIVES.

This section explains the Recovery alternatives as to how the recovery is done in the RL process and how the value is recaptured. Actually, the method of recovery is a midway phase of the total RL chain. The four phases are explained below:

1) Collection: involves taking the material from the customer.
2) Inspection, Selection, and Sorting: It is the stage of assessment of quality. Here the decision to send through appropriate channels is taken depending on the results of inspection. If the

quality is acceptable, it can be used again, sold back, or redistributed to suitable channel members. Else other suitable recovery alternatives are explored.

3) Recovery Process: involving some minor / major work as required for capturing the highest value. Can select any of the recovery alternatives as per the distinct levels as given in Figure No. 2. Alternative of repairs (at Product level), or refurbishing (at Module level), or remanufacturing (at Component level), or retrieval (at Selective part level), or recycling (at material level), or Incineration (at Energy level).
4) Redistribution: The last phase is redistributing to the appropriate channel members as per needs. If none of the above recovery options are possible for either technical or economic reasons, then the material is sent to landfill.

The Recovery Alternatives at different levels as explained above are shown in Figure No. 2.

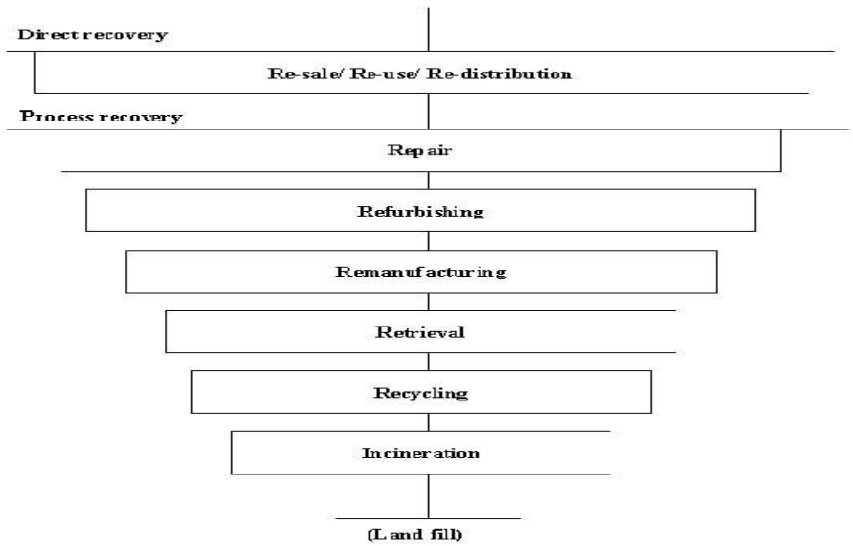

Figure No. 2 Inverted Pyramid of Recovery Alternatives
Source: Adapted from Brito and Dekker (2003)

The recovery alternatives at the top of the pyramid do not need to be of high value or are more environmentally friendly as compared to the lower end alternatives. It depends on the monetary value of the recovery alternative selected which would vary from product to product. The presence of the corresponding market moreover decides the value in the RL chain,

INCINERATION

AS examined in the preceding section the Recovery Process can include some major or minor work as required to capture maximum value. Organizations can adopt any of the recovery alternatives as per the different levels Brito and Dekker (2003):

- Product level.
- Module level.
- Component level.
- Selective part level.
- Material level.
- Energy level.

Refer to the Inverted Pyramid of Recovery given in Figure No.2. In a few situations the materials can go through theIncineration stage before going to the landfill. The reasons for choosing this Incineration could be economic, legislative, or social. The above levels are known as 'Recovery Hierarchy.' Recovery of some value at the energy level is producing energy by using the material which was not recovered in the upper stages of this hierarchy from the Product level to the Material level. This recovery process is called as Incineration in which the material is burnt and converted to ashes and releases energy which is captured. Ecoants (2016) There is a dilemma for what to do with waste. We all hate the enormous quantity of waste ending up in landfills as it is just unsustainable in the short and long run. Landfills lead to land, water, and air pollution. Recycling rates have improved but not to the levels so as to take care of all the unwanted surplus materials. One way is to incinerate the waste to ash which calls for burning of the waste to reduce it to ash and release heat energy. Some of these incineration plants use the heat energy to warm up heating systems or to create electricity. Dr. Yuan (2014) Incineration or mass burning is the common waste disposal method globally after landfill. It is one of the most expensive waste treatment options especially when it is equipped with energy recovery & advanced emission control technology. ECOCYCLE (2011)While burning waste has been considered as an alternative to landfilling , the industry in US received a big jumpstart in early 2000 when President Bush and EPA (Environmental Protection Agency) classified burning waste as a renewable energy source making incineration projects eligible for tax breaks and allowing them perks intended for solar and wind industries. Incineration known as mass burn is the most common Waste to Energy Technology (WTE).The process creates heat used for boiling water and producing steam which drives a turbine to generate electricity.

DEFINITION OF INCINERATION

Business Dictionary[2] states incineration as destroying waste in a furnace utilizing controlled burning at elevated temperatures. This removes water from hazardous sludge, reducing its mass and /or volume converting it to non-burnable ash. This residual ash could be safely disposed of either on land, in waters or in underground pits. Zaffar (2008) Energy recovery as an attractive technological option is a matter of intense debate around the world. One method of Energy recovery is Incineration. Incineration technology is the controlled combustion of waste with recovery of heat. The waste is pretreated and fed to the boiler for burning and releasing heat. This heat produces steam which is used for generating power by use of steam turbines.

The next two methods are Pyrolysis &Gasification also calledconversion technologies.

Pyrolysis method is adopted in the petrochemical industry where natural waste is changed into combustible gases and residual remains.

Gasification usually operates at greater temperatures than pyrolysis in a controlled quantity of air.

Department for Environment Food Rural Affairs (2014).Energy from waste is about transforming wasteinto an operational form of energy. This could be electricity, heat, and transportation fuels. This can be achieved by a range of techniques. Incineration is the most well-known process for energy recovery. The primary purpose or driver is to divert waste from the landfills.

The basic process:Capturing of Energy from waste plants is complicated and has existence in many different configurations. However, they can usually be broken into four basic components:

- Reception area for accepting the waste and getting it prepared for combustion.
- A thermal treatment – releasing of the energy from the waste.
- Transformation to a transferable form of energy – electricity, heat, fuels.
- Cleanup of emissions – making sure that the waste gases are safe.

Department for Environment Food Rural Affairs (2014). Waste to Energy and Incineration are evolving. There are several components of an Incineration project : the waste which is the fuel, sources and volume of waste, its availability, pretreatment process, plant, location, basic technology, scale of operations, by-products, social and environmental impacts, emission levels, regulations, health issues, operational issues, life of the plant , Government support, Financingand Commercial viability.

Reasons for Incineration

Greentumble (2015) Utilizing landfills to dispose ofwaste has primarily assisted society to solve the problem of where to discard it. Conversely, landfills are associated with many troubles, including the need to use big areas of land, and the creation of leachate, which leaks from landfills and contaminates groundwater. Landfills also generateplenty of methane, a potent greenhouse gas. For conserving land and reducing thelandfill space, many communities have now adopted incinerating their waste. However, this waste management technique is not a straightforward solution, and does come with certain advantages and disadvantages.

Benefits of Incineration

Green Tumble (2015). There are a number of benefits of using incineration as a Waste to Energy method. The two major benefits of incineration are that the volumes of waste are condensed by an estimate80% to 95%, and the landfill requirement is significantly reduced. Forurban regions, this is significant, as urban land is frequently at a premium.Waste incineration factories can be sited near where waste is created, which drops the costs and energy required for transporting the waste. Incineration can be used to produce electricity and heat that can be used to power and heat nearby buildings, and the remaining ash is used by the building industry. Incineration also eliminates the problem of leachate that is produced by landfills. (A *leachate* is any liquid that flows through matter and extracts the soluble or suspended solids. It is the precipitation percolating through the waste and taking in dissolved and suspended components from the biodegrading waste, through physical and chemical reactions) Partridge (2010 January) Pharmaceutical companies too are aiding green reverse logistics actions. GENCO, a 3PL based in Pittsburgh offers RL services forwarding huge volumes of pharmaceutical company's returns to an incineration plant that converts the waste to energy thereby limiting the environmental impact of the process. The plant generates two million kilowatt hours of electricity annually from this process, enough to light 220 homes for one year. Ecoants (2016) The primary benefit is the positive impact on reducing the quantum of waste going to landfill. It can be up to 85 % of the input mass. This results in less land pollution from landfills and decreased landfill requirements. Also, reduced water and air pollution resulting from seepage and harmful releases from landfills. The higher temperatures destroy the harmful chemicals and pathogens (a pathogen is anything that can produce disease, typically the term is used to describe an infectious agent such as a virus, bacterium, prion, a fungus, or even another micro-organism) which is the driving reason for incineration to be used for dealing clinical waste. Incineration of domestic and industrial waste can be used for producing heat or electrical energy.

Modern incineration technology is efficient for filtering most of the harmful emissions given out during the process resulting in cleaner and safer emissions. Pulakkat (2015) Incineration reduces pollution in comparison to the long-term effects of landfills. It provides partly renewal energy. It destroys most of the waste safely if sound technology and regulations are followed. Incineration is an effective way of using waste that cannot be disposed of in other ways. Dr. Yuan (2014) As compared to landfills the advantages of Incineration are lower carbon emission, avoidance of land contamination, higher energy recovery potential. The residual ash has the potential for reuse. Savings in transportation costs as incineration plants are located nearer to the city as compared to landfill. The long-term upkeeping cost of incineration is lower thanmaintaining a landfill. The energy recovery per ton of waste incinerated is higher than landfill with landfill gas recovery. Incineration reduces the degradation of urban land which has a high development value. If the future environmental and economic benefits are included the incinerator project has more benefits than disadvantages.

CONCERNS OF INCINERATION

Green Tumble (2015). Incineration facilities are expensive to build, operate, and maintain. The excessive costs related to this method of waste disposal may encourage waste generators to seek other options for dealing with their waste. These services also require competent personnel for running and maintaining them. Smoke and ash emitted by the chimneys of incinerators include acidic gases, nitrogen oxide, particulates, heavy metals, and dioxin, which are carcinogens. While incineration pollution control technology is evolving to reduce these pollutants, it has been observed thatsome amount of residual dioxin still enters the atmosphere.

Financial Impacts: The incineration techniques require large funds. Nearly half of these funds are for control systems for lowering toxic emissions. Most of the expense is devoted to the control equipment neededfor trapping the discarded damaging metals and gases. Another concern is the accessibility of waste of adequate calorific value. Some critics of incineration argue that incineration eventually increases waste creation because incinerators needlarge capacities of waste to keep the flames burning, and local administration may decide for incineration instead of recycling and other waste-cutting programs. It isestimated that recycling conserves 3 to 5 times more energy than Waste-to-Energy generates because the energy required to produce products derived from recycled materials is considerably less than the energy for producing from virgin raw materials.

In developing countries, waste incineration is likely not as practical as in developed countries, since a high proportion of their waste isfrom kitchen scraps. Such organic waste has greater moisture content (40-70%) than the waste in industrialized nations (20-40%), making it tougher to burn. Zaffar (2008). Incineration too is having certain set of problems and has been of intense debate in environmental, social, and political circles. Three parameters discussed below:

1) **Environmental Issues:** Incineration process produces two types of ash. Bottom ash from furnace bottom and fly ash from the exhausts coming out from the stack / chimney which contents more hazardous components. Bottom ash is approximately 10% by volume and 20 to 35 % by weight of input. Fly ash is only a few percent of input weight. The harmful emissions may be present in waste gases, water, or ash. The calorific value comes from plastics and metals in the waste. The combustion of plastics gives rise to toxic pollutants. The toxins are created during separate phases of incineration process. These cannot be avoided completely but can be trapped in filters at prohibitive costs. Even after trapping these still are hazardous wastes in themselves needing special landfills for disposal. The ash gets dispersed in the environment subsequently entering the food chain.

2) **Human Health Concerns:** Incineration produces a variety of pollutants detrimental to human health. The systems, though expensive, do not completely eliminate toxic emissions. The process releases harmful toxic metals, dioxins, and acid gases. The leftover toxic ash needs special landfills which are more costly. Some of the pollutants have irreparable health consequences. The effected population is from immediate and nearby region.

The health problems could be due to:

- The workforce and the neighboring people inhaling the polluted air.
- Drinking water and consuming locally cultivated food tainted by air and water from the incinerator.
- Consuming fish or wildlife affected by polluted air and water from incinerators.

  A few of these pollutants may lead to cancer, neurological impairment, disrupted procreative systems, respiratory disorders, and numerous other health concerns.

3) Economic concerns : Initial and operating costs of Incineration are high. Also, the volumes of waste required to make these plants economically viable are remarkably high. The ash from incineration requires a special landfill as this ash has a lot of toxic substances. A special hazardous waste landfill is almost ten times costlier than a regular municipal landfill.

Incineration distorts effective waste management indirectly promoting waste generation as they need volumes to be economically viable. This deters waste control, reusing alternatives, recycling, and composting alternatives. Zaffar (2008) In absence of effective controls harmful pollutants may be emitted into the air, water and land having detrimental influence on environment and human health. Strict controls are required to prevent the negative impacts. Ecoants (2016) Incineration results in permanent loss of valuable and limited natural materials as they become extinct in smoke or ash.This results in more mining for replacing the exhausted resources and extra energy expenditure for processing new resources. Increased mining leads to land pollution and degradation. Additional energy resulting in more fossil fuel consumption and increased greenhouse gas emissions.

Incinerators destroy materials which could be recycled and hence discourage recycling and composting programs. Most residential communities do not prefer incineration units to be in their vicinity for the reasons of risen traffic, objectionable smells, unfavorable effects on local lands, and declining real estate prices.Emissions from incineration plants worsen the air quality and are harmful to the health of the locals. The pollutants released into the surroundings resulting in degradation of land, water, and air. These could lead to cancer and other harmful effects on human health.The resulting ash from emissions and the furnaceshasa substantial proportion of toxins which are unsafe to people and the ecology. These further needs special and costly disposition. Pulakkat (2015) Incineration cuts down hundreds of jobs related to collecting and sorting of waste for recycling. The issues of pollution, bad odor, and lower calorific value of the waste required for incineration are major concerns in Incineration. Higher lock periods of capital and inadequate return on investment are significant issues in incineration. ECOCYCLE (2011) 25% of processed waste by weight exits the facility as ash indicating that incineration does noteliminate the need for a landfill. Again, this ash is toxic which demands further specific and costly disposition. To make these plants financially feasible they need to operate at higher capacities. Waste to energy cannot co-exist with zero waste as it takes waste as its input and produces energy. It is not climate friendly. Also, it cannot be termed as renewable energy. Waste to Energy is Waste of Energy. It cannot generate significant electricity. Incineration facilities create far fewer jobs than reuse, recycling, and composting.

CONCLUSION

The area of Reverse logistics is growing in scope and so also the number of recovery options available for recovery of materials and energy. The issue of recovery of energy from waste is a complex one needing a sound comparative analysis. Organizations are adopting the path of energy recovery either for economic, social, or environmental reasons. Incineration is one such method resulting in energy recovery and playing a significant role in Waste to Energy programs.

There are no easy answers to dealing with the huge amount of waste generated from domestic households and commercial businesses. Is energy from waste the right answer? We must adopt the best option in the interest of environment, people, and economy. The incineration practice has its own environmental liability. The benefits of incineration are reduced landfill costs as the weight and volumes of waste are considerably reduced leading to savings in costly urban space. It releases energy as heat or electricity for further use. Destroys waste effectively as compared to landfills. Reduced transportation costs as most of the sites are located near the source of waste. Less long-term maintenance costs as compared to landfill maintenance. Energy recovery per ton higher than landfill gas recovery. Reduction in degradation of land, reduced emissions from landfills and less water and air pollution. The residual ash can be used by the construction industry. It is the best option for clinical waste as it destroys harmful chemicals and pathogens. There are some concerns in adopting incineration as a recovery option. The incineration facilities are expensive to build, operate and maintain. Skilled staff required to operate and maintain these plants. The emissions are harmful to human beings and nature. It encourages more waste production as plants need high volumes of waste to be viable. It discourages recycling which actually saves 3-5 times energy as compared to incineration. There is a permanent loss of natural resources as these are burnt up and end up in smoke and ash.This leads to more mining and additional energy consumption for producing new metals. There is a problem with the smell of the waste and increased traffic in the vicinity of plants.This leads to a drop in real estate prices of the surrounding land. Incineration reduces the employment potential as compared to the recycling option of recovery. The process to be environmental compliant needs costly filtration equipment to control and trap harmful emissions. The process still gives harmful gases and toxic ash which are a disposal problem. This ash needs costly disposition in special landfills. The required quality of waste is not always available hampering the efficiency of the plant.

The incineration option in RL should be decided after all the other material recovery options from Product recovery till material recovery are not feasible. Once Incineration has been decided we need to find the appropriate technology for doing this process. There are Economical and Environmental benefits of Incineration as compared to landfill. Also, the public image of the organization is enhanced by following a cleaner recovery process. The ideal waste management solution is to avoid its generation in the first place. Otherwise, it is important to push the recovery option to the higher end of Recovery Hierarchy i.e., towards recycling, reuse, and prevention. This hierarchy of Prevention, Reuse, Recycle, Energy Recovery and disposal is flexible and needs to be planned for the long term. While evaluation weightage to be given to long term environmental and social impact.
Government to support for Incineration projects and give other tax benefits to make it more viable with minimum adverse environmental impact. Reduction/reuse/ recycling to be encouraged so that there is no need for incineration and landfill as both these options have their own sets of Environmental Issues, Human Health Concerns and Adverse Financial Impacts. Recycling rates need to increase to prevent unnecessary waste of natural resources in Incineration and landfills. Incineration can never be fully acceptable to society and business due to reasons of costs, health, and environmental factors. It could be a short-term solution but not a long-term answer to the problem of recovery of materials and energy.

REFERENCES

1. Amy Roach Partridge. (2010 January). "Green Reverse Logistics Brings Many Happy Returns." Inbound Logistics, January 2010.
Retrieved from: http://www.inboundlogistics.com/cms/article/green-reverse-logistics-brings-many-happy-returns/
2. http://www.businessdictionary.com/definition/incineration.html
3. Carter, C.R and Ellram, L.M. (1998),"Reverse Logistics: a review of literature and framework for future investigation", Journal of Business Logistics, Vol. 19, No. 1.
4. Department for Environment Food Rural Affairs. "Energy from waste A guide to the debate." February 2014 (revised edition)
Retrieved from:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/284612/pb14130-energy-waste-201402.pdf
5. Dr Wong Ruen Yuan (2014). "Incineration has more benefits than drawbacks." Malaysiakini, August 2014.
Retrieved from: http://www.malaysiakini.com/letters/272751
6. Ecoants (2016). "Incinerate and Obliterate!"
Retrieved from: http://www.ecoants.com/wasteincineration.html
7. ECO–CYCLE. "Why Incineration is Bad for our Economy, Environment and Community ". September 2011.
Retrieved from:
https://www.ecocycle.org/files/pdfs/WTE_wrong_for_environment_economy_community_by_Eco-Cycle.pdf
8. Green Tumble (2015 September). "Waste Incineration : Advantages and Disadvantages." Written by Greentumble Editorial Team. SEPTEMBER 18, 2015
Retrieved from: http://greentumble.com/waste-incineration-advantages-and-disadvantages/
9. Hari Pulakkat, (2015). Can Incinerators help manage India's growing waste management problem? The Economic Times, ET Bureau .Updated September 09, 2015.
http://articles.economictimes.indiatimes.com/2015-04-28/news/61616161_1_waste-incineration-waste-land-municipal-solid-waste
10. Hugo, W.M.J., Badenhorst-Weiss, J.A. & Van Biljon, E.H.B. (2004). *Supply chain management: logistics perspective.* Pretoria: Van Schaik.

11. James R Stock (1998), Development and Implementation of Reverse Logistics Programs, Oak Brook, Illinois, Council of Logistics Management.
12. Marisa P de Brito and Rommert Dekker (2003). A Framework for Reverse Logistics. ERIM Report Series Research in Management. ERS-2003-045-LIS.April 2003.
Retrieved from https://ideas.repec.org/p/ems/eureri/354.html
13. Rogers, D.S., Tibben-Lembke, R.S. (1998),"Going Backwards: Reverse Logistics Trends & Practices, Reverse Logistics Executive Council", Pittsburgh, PA.
14. Sople, V.V. (2007). *Logistics management: the supply chain imperative.* Dorling Kindersley, India: Pearson Education.
15. Steven, M. (2004). Networks in reverse logistics. In: Dyckhoff, H., Lackes, R. & Reese, J. Supply *chain management and reverse logistics.* Heidelberg: Springer.
16. Stock, James R (2001 March). "The 7 Deadly Sins of Reverse Logistics". Material Handling Management, 15294897, Vol. 56, Issue 3
17. Vogt, J.J. Pienaar, W.J. & De Wit, P.W.C. (2002). *Business logistics management: theory and practices*. Cape Town: Oxford University Press.
18. Salman Zaffar (2008). Negative Impacts of Incineration–Based Waste-To-Energy Technology. Alternative Energy News.
Retrieved from: http://www.alternative-energy-n3ews.info/negative-impacts-waste-to-energy/

