Recycling Strategies Development in Automotive Industry in Developing Countries

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Abstract—Rapid development and population growth in developing countries in the last two decades have left a legacy of widespread environmental problems. Environmental improvement, waste control and solid waste recycling can be a kind of fight to this problem. Today, according to U.S. Environmental Protection Agency (EPA) about 6 percent of the world’s waste are vehicles, and has estimated at about 14 million vehicles in Europe and 40 million worldwide become out of use each year. So recycle is one of the biggest challenges in the automotive industry. Wide section of the metal components of cars have the ability to be recycled, while among them only a small share of them recovered and the rest are dumped in landfills. This article tries noting basic concepts of recycling and its role in the automotive industry, and then recycling strategies methods such as design for recycle, formulating a database and Creation a recycling network in this industry is also discussed in Iran as a developing country.

Keywords—Automotive Industry, Clean Production, Pollution, Recycle, Strategy.

I. INTRODUCTION

Rapid development and population growth in developing countries in the last two decades have left a legacy of widespread environmental problems. Disposal of industrial solid wastes which include a wide range of hazardous pollutants is one of the main environmental issues especially in the developing countries [1]. A different approach is where reverse distribution is a continuous embedded process in which the organization (manufacturer or distributor) takes responsibility for the delivery of new products as well as their take-back [2]. Solid waste Recycle, which consists of waste collection and treatment to use them as raw materials in the same type of products or similar ones [3], is one of the approaches that can be responsive and provide an excellent framework to many current environmental problems [4]. During recent decades the automobile industry as one of the leading and progressive industry, has been posed in various fields of industry, economic, social and environment [5]. Although nowadays the continuation of urban and life without cars in different dimensions could not be imagine, given the presence of different aspects of technology and skilled manpower at different levels and experts associated with this industry and value added directly and indirectly from its performance in recent decades, automotive industry has also significant social and environmental impacts. According to U.S. Environmental Protection Agency (EPA) statistics about 14 million vehicles in Europe and 40 million worldwide become out of use each year, wide section of the metal components of cars have the ability to be recycled, while among them only a small share of them recovered and the rest are dumped in landfills. Therefore it is essential that automotive group develops its recycling strategies. Recycle strategy defines as a set of activities done by a group to determine rules and useful period for recycle after using cars in industry [6]. This could include developing new technologies to facilitate the use of recycled materials, designing cars with regard to the recovery time, increased use of recycled materials in building and designing cars and defined car parts by their ability to be recycled. This article tries noting basic concepts of recycling and its role in the automotive industry, then Development strategies recycling methods in this industry in developing countries is discussed.

II. COMPREHENSIVE RECYCLING POLICY

Comprehensive recycling policy is one of the best approaches [7] that can be used in automotive group to increase recycling rate and development recycling strategies. Minimum 3 cores could be considered for recycling strategy:

1- design for recycle
2- The role of raw materials
3- Securities and recycling centers.

Another point that that should be considered, is the effective application of valuable resources such as water, energy and raw materials by using intelligent recycle systems in all production lines.

III. DESIGN FOR RECYCLE

Product design considering recycle not only includes raw material selection and application of technology and time, but also upgrades single parts and components of cars. Therefore automotive group should try to build cars from different pieces of recycled materials which is economic and environmentally friends’ method. Specific processes can be used to build recyclable parts. It is necessary that recycling standard for designing explained from the first. The following standards must be observed in components and parts that are designed to recycle:

- Use of pure and recyclable plastic materials
- Reduce density of plastic material
- Using composite materials that are recycled easily
• Using appropriate connecting methods such as Plug in instead of screws
• Using good quality second-hand materials or recycled ones

By using specific process, waste production can be separated in to primary compound such as: plastic shell, foam rubber and plastic substrate. Considering the initial weight, about 60 percent of materials are from thermoplastic that can be recycled by about 99.5 percent purity.

IV. CHANGE IN MATERIAL CYCLE

Using second-hand materials or recycled ones can preserve resources and reduce wastes [1]. Hard plastic of the non-melting solid components are another topics in recycle that should be considered.

V. CONSIDERING ENVIRONMENTAL FACTORS IN MATERIALS LIFE CYCLE

To understand the environmental effects of automobile parts from the early stages of production, using life cycle assessment can help [8]. Take for example, the contradiction between the selected materials and applicability of components made of them, bring advantages for the group. Use of light weight materials can reduce fuel consumption in vehicles. Applying special materials or technology only by considering certain environmental conditions will be possible.

VI. EXPERIMENTAL STUDIES IN RECYCLING

Construction and operation of a recycling research center can play the role of a center for automobile recycling issues and a database management system for the whole automotive group to access suitable information. Such a central unit can act a completely controlled one for recycle and a laboratory for fundamental research as the primary issues, and in addition be a special education center. This center should provide good ideas for the full recovery cycle and also pay attention to modernize and logistic issues for recycle. It can be developed simultaneously with the automotive group, and defines appropriate standards for automobile industry, in national or international levels.

VII. FORMULATION A DATABASE

Product design by considering recyclability and life cycle analysis cannot be possible without taking adequate and appropriate knowledge and experience. All recycle data and information should be compiled in a database [7]. This information will help recycling different types of vehicles done in accordance with environmental standards. All recycle guidelines with charts, pictures, models, profiles, recovery time and weight of Auto parts should exist in database.

VIII. CREATE A RECYCLING NETWORK IN A COUNTRY

In developing countries, According to the environmental obligations based on maintaining natural resources, automotive group should create a recycling network. These centers not only recycle old cars, but also try to help other centers to reuse or recycle car parts.

A. Recycle process

Developing guidelines for recycling process is the main requirement for this system. Following steps are recommended as initial ones:

• Owner, gave vehicle into one of the confirmed recycling companies
• Each car that is delivered will identify and record, then all the cases during the immune recovery may be hazard (such as air bags) will investigate and their activities will be stopped.
• Vehicle recycle will begin by removal fluids such as oil, gas and ventilation system liquids.
• The engines are in compliance with the Securities Specialty points can be renovated or their parts without losing its original quality can be used again.
• Recycling car parts must be done as parts or row materials.
• Glass and plastic materials should be recycled separately and with specific methods.
• After initial recycle, the remaining auto parts (often the car bodies) should become in compact packages. This method reduces the cost of transport them to grinding places.
• In grinding workshop crushing machines convert car bodies to small pieces. The process for metal parts and non-metal should be done separately.
• As far as possible, even a small percentage of vehicle weight be discarded, during recycling cycle.

IX. CLEANER PRODUCTION IN COMPLIANCE WITH THE DURABILITY ISSUE AT ALL STAGES OF PRODUCTION

Alongside efficient recycling methods and processes, using valuable resources effectively in all stages of production is one of the important points that should be observed by Automotive Group in its strategy. Using "cleaner production strategy" from the beginning, will prevent of the negative effects on the environment.

A. Water use efficiency

In the automotive group laboratories each day several cubic meters of water goes to waste for car body Leak joints test. Using a cycle, without the need of external source, can be reduced the water level up to 80 percent.

B. Energy consumption

By using constant heat production facilities and new low power consumption technologies, car energy consumption can be reduced up to significant levels.
C. Powder painting technology

In this technology which is in accordance with environmental standards, the paint is placed in upper layers of a car body to protect its surface from harmful substances. In this method there is no need to liquids. Important benefits of this method are:

- There is no need to water consumption and consequently wastewater production will end.
- Chemical cleaning agents are not needed.
- By using 100 percent of materials and direct recycle in paint shop, waste production will reduce.

X. EXPLAINING RECYCLING STANDARDS

Materials recycle should be as one of the main officials concerns in automotive industry. Using recycling recommendations in all production stages, will help the group to produce a car that later easily be recycled by a very economical method.

XI. CONCLUSION

Despite the multiple crises around the world, environmental pollution and degradation had caused the environment become much more important than before. Look at the different types of pollution such as (air, water, soil and even sound) in industry; indicate environmental problems in this economic sector. Both industry and the automotive industry in particular, in all parts of their life cycle, from the exploitation of natural resources, manufacturing, production and consumption have direct and indirect interaction with the environment. Hence today, with the aim of environmental protection in the production process and economic development in communities, recycling solid waste that reuse them, could answer many of the environmental problems in automotive industry in developing countries. So recycling strategies development as one of the key elements in this section can be with regard to environmental considerations and achieve sustainable development objectives and reduce costs in automotive industry.

REFERENCES