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## PROCESSING OF END-OF-LIFE VEHICLES (ELVS)

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#### **ABSTARCT:**

Automotive Industry, globally, as well in India, is one of the key sectors of the economy. With the rapid and exponential growth of industrial production in India, the issue of disposal of automobiles at the end of useful life is becoming increasingly important. After a product's life cycle has ended, there are number of recovery options available such as reusing the parts, remanufacturing, and material recycling. A simple look at the processing of the end-of-life vehicles data reveals the fact that as compared to developed countries like US, the methodological advancements in India are fraction of their technology. Technological procedures that comprise of the standardized methodology for the processing of end-of-life vehicles have not attracted much attention and not much work has been done in this area. Thus, the prime concern of this research is to identify the benefits and limitations of the optimal processing methods for these vehicles that can no longer be run on the road.

*Keywords:* end-of-life vehicles; processing; drainage; recycling.

#### 1. INTRODUCTION

An End-of-Life Vehicle (ELV) is a vehicle that has reached the end of its life and which can be processed for recycling or remanufacturing its parts by the automotive recyclers. The end-of-life phase is seen in every product life cycle that is manufactured. The major concern lies in the recycling process to be optimized such that it's more time-efficient, environmentally safe and profitable. In the recycling industry, it has become an important part to preserve the environment and ensure that all reusable parts are removed from the ELVs and stored in a safe manner before the shredding process.

After a product's life cycle has ended, there are number of recovery options available such as reusing the parts, remanufacturing, material recycling etc. In order to choose one of these recovery methods it is entirely based upon the quality of the parts/ components and the economic benefits of choosing that part. The parts in the cars are sourced from many countries and after they have reached the end of their useful lives, the scrapped auto parts may be shipped globally depending upon the demand of the part.

The end-of-life vehicle process involves three major stages, which maximizes the amount of material that can be reused. The first step involves removal of all fluids from the vehicle i.e. petrol/diesel, engine oil, coolant, windshield washer fluid etc. After the fluids have been drained out parts such as gasoline tank, battery, tires and mercury switches are also removed from the vehicle. The second step involves removal of main parts from the car, which can be reused or remanufactured depending on their condition. Lastly, after all the parts and fluids have been removed from the vehicle it is crushed and stored in a yard. After a batch of vehicles are stacked in the yard they are sent to the shredder for further processing of the plastic and metal parts of the vehicle. Hence, the vehicle continues its life cycle process.

Furthermore, the two factors that tend to promote the optimal processing of ELVs are: bulk requirement of steel required for the production of cars and the countries producing cars on large scale without providing proper measures for their disposal. Recently, China has signed an agreement to purchase the scrap from US and promote vehicle recycling globally. The benefit of processing ELVs to china has been in the form of saving energy, money and pollutants as compared to producing new steel while meeting their steel requirements. The aim of this paper is to discuss the benefits and limitation for the processing of ELVs.

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### 2. METHODOLOGY

The vehicle production has been on an exponential growth in Indian since the last decade. However, on the other hand Government has not implemented strict regulations regarding the processing of ELVs. In India, cars are driven for 15-20 years until they can no longer be cajoled into life and finally end up in the hands of scrap dealers. In addition, a report by Capt. N.S. Mohan Ram, Chairman of Indian Automotive Recycling Group stated that India has no formal regulations regarding recyclability and disposal of ELVs. Furthermore, it lacks infrastructural and organized system for collection, dismantling, shredding and processing ELVs.

According to the data obtained from SIAM it illustrates that the vehicles produced in the eighties are certainly due for scrapping owing to low fuel efficiency and excessive pollution. But, these vehicles are still on the roads and are a major concern. Presently, only 1.5-2.5% of vehicle population is retired annually in India, mostly because of natural attrition, accidents or Government norms as per National Automotive Testing & R&D Infrastructure Project (NATRiP) statistics [1].

Moreover, there are approximately millions of vehicles taken off the road every year in India, there is a great danger for operating fluids and other hazardous components to be released into the environment. The manual fluid drainage process of petrol/diesel, engine oil, coolant and gear oil results have been studied to determine their step-to-step removal process. The drainage of petrol/diesel results in the development of fuel vapors that pose serious health issues.

On the contrary, the processing of ELVs is entirely different in Europe and U.S. The cars recyclers in U.S. buy ELVs from insurance company auctions or dealerships, charities and individuals in the price varying from \$50 to couple thousand dollars. Once a recycler has obtained some cars, this is how they should be handled, according to the Ontario Automotive Recyclers Association (OARA):

The vehicles in good condition which are often late model insurance write offs, their reusable parts are carefully removed, cleaned and tested for resale. In addition, the parts inventoried are computerized and are available online. Recyclers from all over the globe can access this database to search for the specific parts required and make an offer on it. By carefully keeping track of how well various parts sell, they are able to identify the parts that are valuable in the market and are maintained accordingly. For example, a company based in U.S. bought an ELV i.e. a 2002 Toyota Camry. After the vehicle arrived at their facility they were able to identify 14 parts that were likely to be bought. Those parts were removed right away while the rest of the car was stored for a few months in case someone called for a component – anything from an oil pan to a CD player and finally scrapped. On the contrary the vehicles that are old models or not in good condition are available for the backyard mechanics to pull off parts for themselves. Those in the worst shape go directly to the crusher. In the end, that's the destiny of almost every ELV.

The processing of an ELV usually follows the procedure as discussed after. First, batteries and gas tanks are removed. Good ones are resold. The rest go to companies that recycle or safely dispose of their components. Tires are also resold or sent to shredders for use as a fuel in incinerators or cement kilns. Secondly, remaining quantity of fuel, oil, antifreeze, windshield cleaner and other fluids on an average of 40 - 50 liters per car are drained out and cleaned for use. Lastly, the electrical parts, seat assemblies and other parts are removed and stored in the inventory. The remaining portion of the car known as 'fluff' is crushed and sent to the shredder.

As a result, about 90 per cent of ELVs end up with workers who strip off the most valuable parts, such as copper from radiators and precious metals from catalytic converters, and crush the rest, without draining the fluids or removing batteries and other hazardous parts. So toxic materials spill onto the ground, where they can seep into the sewer system, and many valuable parts and materials are wasted. Therefore, the system followed is inappropriate and hazardous to the environment. The next section discusses about the benefits of optimal processing of ELVs.

### 3. DISCUSSION

In-order to analyze the current processing techniques of ELVs in India information was gathered from the recyclers in Canada through OARA. It was enlightening to know that Government of Canada and OARA coordinately implement new auto recycling programs and promote them through advertisement, annual conventions etc. The programs currently being promoted in Canada for the processing of ELVs are: Go Green Parts and Retire Your Ride. Go Green Parts program are ultimate environmental choice for today's world. The program allows the dismantlers to save maximum amount of parts from an ELV, which saves an estimated 80

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million barrels of oil annually, required to produce new replacement parts. Not only does it keep a flood of dangerous toxins from being released into the ground and water, it also prevents unnecessary use of valuable landfill. On the other hand, Retire Your Ride program has been designed to enable people to get their high-polluting cars off the road and in return be rewarded for it. This program improves the air quality and keeps the environment safe. The rewards are in the form of cash back, rebate towards the purchase of a newer vehicle etc. These programs have proved to be beneficial both economically and environmentally. It brought awareness to the community about their ELVs and its environmental sequences if proper procedures are not followed.

The recycling of metals from ELVs has environmental benefits because the ecological footprint of recycled commodities (especially metals) is smaller than unused commodities. Metals such as lead from lead-acid batteries, tire weights and battery terminals, iron, copper in the wiring, aluminum from wheels and engine components and rare earth metals in the catalyst converter are the primary metals recovered from vehicles. The recycling of rubber from tires is also important. The recycling of rubber can be used to produce a variety of products such as athletic tracks, mats and asphalt. Plastic recycling from end-of-life vehicles is limited because of the low price of recycled plastic and the composite nature of plastics used in vehicles – composite plastics are harder to recycle because of the mixture of plastic types.

In addition, the research has also been able to reuse the steel obtained from ELVs. It could be used in appliances, construction material, or even in another car. Moreover, the other parts of the car that are collected by scrap yards and auto recyclers like starters or steering columns, are stripped out, salvaged, refurbished and sold as replacement parts for other vehicles.

Considering the present situation of recycling in India, there is a need for change in processing of recycling and recovering materials from the vehicles, which are at the end of their useful life. Due to the lack of strict recycling regulations to deal with old and non-usable automobiles these vehicles are sold as scrap where auto parts are dismantled and sold separately. As a result, due to the lack of modern techniques, the process is highly polluting and has low rate of recovery.

There is no escape from the reality that, organizations must continuously innovate in order to survive, especially in this era of rapidly changing market conditions. Innovative technique results in improving the current processes, services, products, production methods while meeting the present demands globally. The technology presently in use for processing of ELVs in India is lacking advancement and technology upgradation. If an innovative processing method is determined it would benefit the Indian Automobile Recycling by: minimize environmental pollution, saving excessive fuel usage, and improving the health and safety of workers.

#### 4. CONCLUSION

Successful innovation occurs when an invention, related to a product, service or a process in some part of the organization's value chain, is joined with a business design, which in turn is implemented with discipline and skills through innovation management. Successful innovation management requires developing a strategic approach to innovation.

The processing of ELVs especially the drainage of fluids like petrol/diesel, engine oil, transmission oil and coolant is an essential step and must be handled carefully which could otherwise result in hazardous effects on the environment, health of the worker and extinction of natural resources.

The parts inventoried properly and computerized could be used as refurbished parts for the damaged cars due to collision and saving the resources required for the production of the new part instead. Therefore, the above mentioned method enlightens us the necessity for the implementation of new techniques to be carried out in automotive recycling industry for attaining the best results. The improvement in processing of ELVs in India would also create more jobs if there is increased emphasis on recovering, reusing and recycling parts and materials.

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