

Design Of Vehicular Bulb Crusher

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Abstract: As per the Current status we want to design and developed technology which help us to reduce environmental and health risk from burnt electrical vehicular bulbs due to its unsystematic dumping by unauthorized as well as authorized garages, this allows to release of mercury to the atmosphere. This system involves crushing of bulbs under control condition to collect the mercury available in the bulbs and also study physical and chemical parameter of crushed material. The first step involved identification of garages in Parvati region of Pune city in Maharashtra to collect defused electrical vehicular bulbs. The collected bulbs are categorized according to shape and size. The objective of this paper is separation of crushed material coming from crushing unit like glass, gas, metal caps etc.

Key words: burnt electrical vehicular bulbs, crushed material, design and developed, mercury

1 INTRODUCTION

India is a fastest growing and developing country. The present scenario in India that number of vehicles are increasing with the increase in population. As per 2011 census of India, District census handbook Pune, shows PMC population is 31,24,458. The area selected for research Project work is Parvati region in Pune Maharashtra. The total area covered by Parvati region is 3.61 km². This total area is divided in four zones. The coordinators of zones are as follows.

Zone No.	Coordinator	Area(km ²)
Zone -I	18.493142 N 73.842443 E	0.98299066
Zone-II	18.490049 N 73.848665 E	0.7477768
Zone-III	18.485979 N 73.852056 E	0.8628606
Zone-IV	18.482235 N 73.854502 E	0.16794535

Category wise motor vehicle population of Pune region as on 31.03.2019 of two-wheeler is 2879461, four-wheeler 693300, also multi axial wheeler having population 3888690. Generally, each vehicle has 4 to 6 numbers of bulbs depending upon structure of vehicle for each two, three and four wheelers. The bulbs should be replaced once in the three months. At the end of useful life of bulb is over they must be replace by new one and discarded bulbs are to be disposed unscientific ways. This unscientific disposal of discarded bulbs will increase mercury level in the surrounding atmosphere. These bulbs contained toxic chemical mercury. Mercury is the most required element for energy efficient vehicular bulbs. Normally the bulb encloses with 5mg to 10mg mercury. As the useful life of bulb is over 1% mercury is still present in bulb. These bulbs are destroyed during the disposal activities like shipping, handling, transporting, collision a significant portion of mercury present in the bulb is discharge as a mercury vapor and if this elemental form of mercury is not controlled it could be easily breathe-in by anyone present in the area and it is proved to be hazardous to health of those exposed individually.

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At one extreme burnt bulb are crushed into trash can and it is transported by garbage truck to the landfill, all the bulbs from trash can are assumed to be crushed and the elemental form of mercury in the garbage truck find its way to the atmosphere. If the landfills are not designed for dumping the e-waste like bulbs, rain water washes the mercury to the water bed thus causes water pollution, due to consumption of polluted water and food toxic chemical mercury reaches to human body which leads to neurological disorder when mercury accumulates in kidney and brain.

2 LITERATURE REVIEW

1 This paper shows the current scenario about the effect of unscientific disposal of damaged electric lamp, on environment and on health of people. Due to air movement the mobility of mercury vapor increases. The objective of this paper is to design a lamp collection system using internet of things, and to design and develop semi-automatic electric bulb braking system. They add an image which shows the typical fluorescent lamp and different types of vehicular lamps which is collected during research work. They show the growth rate of manufacturing and use of CFL at Global and national level (Indian consumption) between the year 2001 to 2009. The graph of comparison between the use of conventional Lighting and LED Lighting from year 2010 to 2017 is also given, it shows that there is much increase in the use of LED Lighting. Another graph shows the category wise lighting quantity in India between the year 2009 to 2017. They give systematic methodology of collecting, crushing, and separating the electric lamps by giving schematic diagram. 2 In this paper a standard fluorescent tube is consider for experiment, one standard fluorescent tube contains 15-44 mg of mercury, though it is also depending on size. According to research paper commercial and industrial sectors use 90 % of fluorescent tubes about total usage. Burnt fluorescent tubes and lamps contains hazardous chemical mercury which pollute the underground water as well as agricultural land, it also shows that the tube use for experiment can deteriorate much amount of quality of water. The objective of this research paper is to design a plant which continuously recover the mercury from burnt fluorescent tubes which also prove to be an improvement in the present system. The crusher unit is design by considering expected total weight of all materials from broken tubes and dimensions of crusher unit is calculated by volume occupied by each material. The plant is design in such a way that 3000 burnt fluorescent tubes are used to extract and recover mercury

from tubes daily. 3 This paper shows that mercury is a bio-accumulative toxin. They study so many manmade sources of release of mercury to the atmosphere like combustion or incineration of wastes. They give some more sources from where mercury is release in the environment like, industrial processes, production of chlorine, manufacturing of iron and steel, switches and electrical apparatus. The new jersey mercury task force estimates that more mercury is contained in products which is released through fuel and coal combustion, it is expected that much of mercury in products eventually released to the environment. They give and study the example of discarded fluorescent bulbs which can release mercury to the environment. They give some types of bulbs which contains mercury and also the amount of mercury vapour's which is release after the breakage of bulbs. In their experiment, the burned out low-mercury fluorescent bulbs were broken in the 32-gal high density polyethylene cylindrical plastic barrel and Then sampling of this space is done at various interval to determine the release rate of mercury vapor. 4 This paper gives the information about CFL's, how CFL's are manufactured with phosphor powder which includes toxic chemical mercury and how this mercury helps to create visible light. Mercury is an essential element of each CFL because without it the bulb would not able to produce light. When this CFL are discarded in the trash much of the mercury is release in the atmosphere causes air and water pollution. So, because of mercury is poisonous this paper deals with the economically and efficiently extracting mercury from CFL waste. 5 In this paper the invention is related to automatic fluorescent lamp crushers, it is also related to improve the method of treating or removing crushed lamp waste which is coming from crusher without permitting any toxic mercury gases or vapor's mixing in the atmosphere. The crusher unit consist of replaceable filter cartridge for extracting or collecting the mercury vapour's which are released when fluorescent lamps are crushed. Replaceable Filter cartridge consist of activated carbon which gives very good result of separating mercury vapours from air during the crushing process. When this carbon particles get saturated with mercury it can be easily replace by new one.

3 NEED OF STUDY

As per the data of Regional transport office Pune region from the year 2016-2017 to 2017-2018 total no. of vehicles registered in Pune city increases by 10.7%. Generally, any vehicle used to change its vehicle bulbs once in a 3 to 4 months and each vehicle contains minimum 4 no. of bulbs depending upon the structure of vehicle (two, three, four-wheeler). At this rate yearly around 12 no. of bulbs comes in environment, which can be throw into the open spaces or mixed in a solid waste. Which leads to harmful effects on environment, living things as well as non-living things. This study will address the disposal issue and its consequences on surrounding.

4 ANALYSIS SETUPS



Fig. 1 Experimental setup installed for effect on water bodies

This experiment setup on 12th July 2019 to 11th January 2020. During the experiment it is observed that heavy solid particles from collected waste bulbs are settle down at the bottom of tank and the heavy corrosion is observed at metal caps of the soaked bulbs in experimental water. This water has initially PH around 6.5 to 7.5 before placing these bulbs and after 45 days PH value increases up to 7.5 to 9 it means that PH value increased by 83%, PH value in between 7.5 to 9 means it is acidic in nature. The average temperature of water in an experimental setup is around 22°C and average laboratory ambient temperature is around 24.5°C, also humidity observed is about 57%. The author is also involved and will address the contamination offered by toxic or any other harmful metals in an experimental setup.

5 CONCLUSION

The present scenario of India is, the number of vehicles is increasing with the increase in population. As per 2011 census of India, population of PMC is 31,24,458. And the vehicle population of Pune region as on 31.03.2019, two-wheeler is 2879461, four-wheeler is 693300, multi axial is 3888690. Each vehicle contains at least 4 to 6 number of bulbs, and each discarded bulb replaced by new one, at least once in three months. These discarded bulbs are disposed of by unscientific ways which relates to release of mercury. So, to reduce the disposal load on environment there is need to develop the economic and efficient solution for disposing the electric bulbs.

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