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Hy-Tech Cleaning technology for Solid Waste Management by Using Micro-Controller Device.

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ABSTRACT
Solid waste management nowadays is an important environmental issue in country like India. Statistics show that there has been substantial increase in the solid waste generation especially in the urban areas. The impact assessment environment management tool makes a relationship between two factors- the amount of land required to dispose per capita generated waste. To give a brief description of the project , the sensors are placed in the common garbage bins placed at the public places. When the garbage reaches the level of the sensor, then that indication will\ be given to ARM 7 Controller. The controller will give indication to the driver of garbage collection truck as to\ which garbage bin is completely filled and needs urgent attention. ARM 7 will give indication by sending SMS sing GSM technology.

Keywords -Microcontroller, GSM/GPRS, IR sensor

I. INTRODUCTION

In India the amount of waste generated per capita is estimated to increase at a rate of 1%- 33% annually. It is estimated that the total waste quantity generated in by the year 2047 would be approximately about 260 million tonnes per year. The enormous increase in waste generation will have impacts in terms of the land required for waste disposal. It is estimated that if the waste is not disposed of in a more systematic manner, more than 1400 sq. km of land would be required in the country by the year 2047 for its disposal. At present the standard of solid waste management is far from being satisfactory. The and health hazards caused by the unsanitary conditions in the cities we are optimized by the episode of Plague in Surratt in 1994. That triggered public interest litigation in the Supreme Court of India. Based on the recommendations of the committee set up by the apex court in that Public Interest Litigation (PIL), the Government of India, has framed Municipal Solid Waste (Management and Handling) Rules 2000, under the Environmental Protection Act, 1986.

One of the major requisite of these rules is to establish door-to-door garbage collection system in the cities. Nagpur which is located in centre of India has taken initiative in implementing MSW Rules 2000 by introducing 100% door-to-door garbage collection.

In our daily life, we see the pictures of garbage bins being overfull and all the garbage spills out resulting in pollution. This also increases number of diseases as large number of insects and mosquitoes breed on it. A big Challenge in the urban cities is Solid waste management, Not only in India but for most of the countries in the world. The project gives us one of the most efficient ways to keep our environment clean and green

Depending on the physical state of waste, waste are categorized into solid, liquid and gases. Solid wastes are categorized into municipal wastes, hazardous wastes, medical wastes and radioactive wastes. Managing solid waste generally involves planning, financing, construction and operation of facilities for the collection, transportation, recycling and final disposition of the waste. This study focuses only on the disposal of municipal solid waste (MSW), as an element of overall municipal solid waste or just solid waste management (SWM).

In our city many times we see that the garbage bins or dustbins placed at public places are overflowing. It creates unhygienic conditions for people. Also it creates ugliness to that place. At the same time bad smell is also spread.

To avoid all such situations we are going to implement a project called Garbage collection bin overflow indicator using Bluetooth technology. In this project we are going to place a weight sensor under the dustbin. When the weight reaches to the threshold value, a alert will be sent to the respective Municipal / Government authority person's Android mobile. Then that person can send the collection vehicle to collect the full garbage bins or dustbins.

We have observed that the municipal officer or the government authorized person will monitor the status of dustbin. Or generally we see that they have a regular schedule of picking up these garbage bins or dustbins. This schedule varies as per the population of that place. It can be once in a day or twice in a day or

in some cases once in two days. However we see that in case there is some festival or some function, lots of garbage material is generated by people in that particular area. In such cases the garbage dustbin gets immediately full and then it overflows which creates many problems. So in situations, with help of our project the government authority person can get notification immediately. So they will get notification before their periodic interval visit of picking up the dustbin. Then they can go and pick up the dustbins.

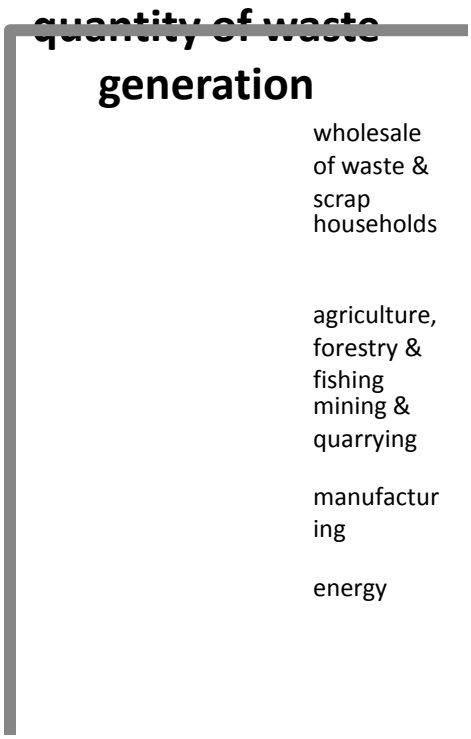
1.1 Present Status Of Solid Waste Management In India

I. Domestic waste is thrown on streets.
II. Trade waste on roads/streets.
III. Construction waste is left unattended.
IV. Biomedical wastes are disposed into municipal waste stream.
V. Industrial waste often disposed of in open areas.

In waste management, segregation of recyclable waste is not done properly at source. Initial waste collection is not done at the place of generation. Design & location of municipal waste storage depots are inappropriate resulting in littering of garbage. Street sweeping is not done every day. Waste transportation is done in open vehicles. The final disposal is done through crude dumping. Waste pickers collect recyclables from municipal bins & dumpsites & litter the waste causing insanitary conditions.

1.2 Quantities of waste generation

Per capita waste generation increasing bt 1.3% per annum. With urban population is increasing between 3-3.5% per annum. Annual increase in waste generation is around 5%. India produces 42.0 million tons of municipal solid waste annually at present. Per capita generation of waste varies from 200gm to 600 gm per capita per day. Average of waste generation rate is 0.4 kg per capita per day in 0.1 million plus towns. Collection efficiency is between 50% to 90 % of solid waste generated. Urban local bodies spend Rs.500/- to Rs.1500/- per ton on solid waste management of which, 60-70% of the amount is on collection alone 20%-30% on transportation. No fund is spent on treatment & disposal of waste. Crude dumping of this waste is practiced in most of the cities.



Quantity of waste generation

1.3 Reasons Of Improper Management Of Waste

Improper planning for waste management while planning the township.Impractical institutional setup for waste management & planning & designing in urban local bodies.Lack of technical & trained manpower.Incomplete community involvement.Less expertise & exposure to the city waste management using modern techniques.Partial awareness creation mechanism.Less fund with ULBs.Indifferent attitude of ULBs in user charges & sustainability.Out dated management information system.

II. AIMS OF SOLID WASTE MANAGEMENT

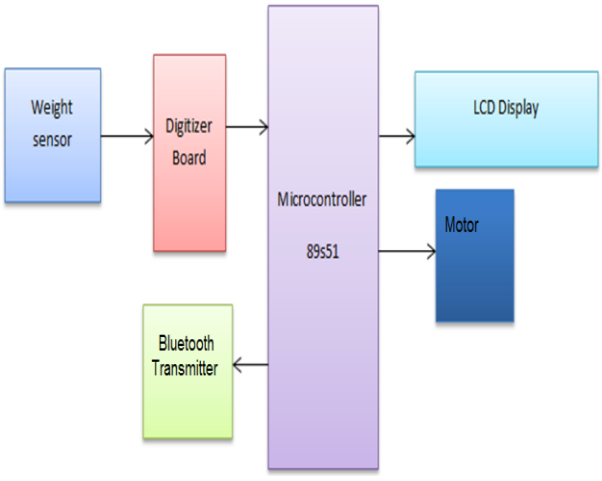
Waste management is all those activities and action required to manage waste from its inception to its final disposal. This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. The term usually relates to all kinds of waste, whether generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, or other human activities, including municipal (residential, institutional, commercial), agricultural, and special (health care, household hazardous wastes, sewage sludge). Waste management practices are not uniform among countries (developed and developing nations); regions (urban and rural area), and sectors (residential and industrial).

III. METHODOLOGY

EAGLE Software and KEIL software System for Mobile Communication (GSM) are the latest trends and are one of the best combinations to be used in the project. Hence, a combination of both of these technologies is used in the project. To give a brief description of the project, the sensors are placed in the common garbage bins placed at the public places. When the garbage reaches the level of the sensor, then that indication will be given to micro- Controller. The controller will give indication to the head of Municipal Corporation to collect garbage bin which is completely filled and needs urgent action.

City	Waste quantity generated (MT/d)	Waste generation rate (kg/c/d/)
Vadodara*	157.33	0.12
Kohima	12.48	0.16
Nashik	200	0.19
Lucknow	474.59	0.21
Guwahati	166.25	0.21
Gandhinagar	43.62	0.225
Jabalpur	216.19	0.23
Ranchi	208.27	0.246
Nagpur	503.85	0.25
Dehradun	131	0.29
Raipur	184.27	0.3
Indore	556.51	0.35
Bhubaneshwar	234.46	0.36
Patna	510.94	0.37
Ahmedabad	1302	0.37
Faridabad	448.01	0.38
Dhanbad	77.12	0.387
Bangalore	1669	0.39
Bhopal	574.07	0.4
Agartala	77.36	0.4
Asansol	206.65	0.425
Daman	15.2	0.43
Meerut	490	0.46
Agra	653.57	0.49
Allahabad	509.24	0.51
Ludhiana	734.37	0.53
Jamshedpur	387.98	0.59
Visakhapatanam	600	0.62

Waste Generation Rate



Block Diagram of Micro-Controller

IV. CASE STUDY : ANALYSIS AND WORKING OF SOLID WASTE MANAGEMENT IN LAXMI NAGAR, NAGPUR

Laxmi nagar zone generates approximately 85 tonnes of solid waste per day. This zone is a residential area with less number of shops or commercial market. Therefore the waste produce in this area comprises of mostly plastic, tins, papers, and other domestic waste materials.

Solid waste generated by the daily activities of the people needs to be properly managed in such a way that it minimizes the risk to the environment and human health. Inadequate collection and disposal of solid waste is a major factor in the spread of disease and environmental degradation. One of the most visible problems in the provision of solid waste management (SWM) is the collection route developed and save the cost of fuel and time of service of the solid waste, which is the subject of this paper. The routing optimization problem in waste management has been already explored with a number of algorithms. Moreover, the successful implementation of vehicle routing software has been aided by the exponential growth in computing power since 1950, the emergence of accurate and sophisticated Geographic Information Systems (GIS) technology induced multiple algorithmic solutions.

One of the simplest ways to bring innovations in any system is to document and study the existing system and bring the possible reforms by adopting appropriate measures at various levels through the introduction of innovative and cost effective solutions. Very few urban local bodies in the country have prepared long term plans for effective solid waste management in their respective cities. For obtaining a long term economic solution, planning of the system on long term sustainable basis is very essential.

Uncontrolled growth of the urban population in developing countries in recent years has made solid waste management an important issue, so the system for collection of solid waste thus constitutes an important component of an effective solid waste management system. In present study describes an attempt is made to design and develop an appropriate collection plan by Geographical Information System (GIS) software for the Laxmi Nagar at Nagpur, a Orange city in Maharashtra, India. A GIS optimal routing model was designed for efficient collection path for municipal solid waste to minimum time, labour, distance efficient collection paths for the solid wastes. A present study is also aimed to proposed location of community BIN. The total cost of the proposed collection systems is estimated to be around 3,52,225 rupees for the annual operating cost of municipal solid waste collection. A substantial amount 4,03,200 rupees is currently being spent by Nagpur

Municipal Corporation (NMC)on waste collection alone without any proper storage/collection system.

V. RESULT

Municipal solid waste management is one of the major environmental problems of Indian cities. Various studies reveal that about 90% of MSW is disposed of unscientifically in open dumps and landfills, which are effectively creating problems to public health and the environment. In the study recently , a sincere attempt has been made to provide a comprehensive and sincere review of the generation , characteristics, collection and transportation.

In our study project solid waste monitoring and management system has been successfully implemented with the integration of communication technologies such as KEIL, GSM and for truck monitoring system. This technique would provide solid waste collection in time and also overcome all the disadvantages which are as use of minimum route, low fuel use, clean and green environment and available vehicle The technologies which are used in the proposed system are good enough to ensure the practical and perfect for solid waste collection process monitoring and management for green environment.

5.1 Benefits to NMC :

1. Successfully implemented the Supreme Court guidelines.
2. Savings worth Rs. 5 crores in terms of lower costs for providing Door to Door garbage collection service to the citizens.

5.2 Benefits to Citizens

1. Regular Door to Door collection of garbage and active participation in the zero garbage drive.
2. Better and prompt service at minimum costs.

VI. CONCLUSION

Nagpur Municipal Corporation (NMC): Keeping the city clean has taken on a whole new meaning in the orange city i.e. Nagpur, the second capital of Maharashtra. Being innovative, clean and green has had a significant bearing on the city's future competitiveness and attractiveness as a business and traveling hub. Firm determination and hard administrative measures have contributed towards the success of the efforts of NMC. The innovative steps taken by NMC in MSW handling and disposal have led to visible changes in the city. Nagpur is recognized as one of the cleanest cities in the country.

The existing system of MSWM in the city is not proper in terms of collection, transportation, processing and disposal. Since the population of the city is increasing tremendously, the community bin system of collection is not adequate. So, it is suggested that the house to house collection can be followed for the entire city with the private sector participation. There is need to modify the collection and transportation vehicles by introducing trucks

Location	Quantity
Laxmi Nagar	85 tonnes per day
Dharampeth	65 tonnes per day
Hanuman Nagar	78 tonnes per day
Dhantoli	95 tonnes per day
Nehru Nagar	90 tonnes per day
Gandhibagh	125 tonnes per day
Shatranjipura	75 tonnes per day
Lakadganj	85 tonnes per day
Ashi Nagar	75 tonnes per day
Mangalwari	95 tonnes per day

with compactors as well as to adopt proper segregation of waste at source only.

Also recycling potential of the MSW could be explored. The processing of waste is not adequate though vermi-composting is being practiced. This should be done on large scale for the MSW of the entire city so that the load on disposal site can be reduced. The MSW collected from the entire city is dumped at a site near Bhandewadi.

Nagpur which is located in centre of India has taken initiative in implementing MSW Rules 2000 by introducing 100% door-to-door garbage collection.

It has enabled:

1) Livelihood creation for 1600 people from most deprived segment of the society.
2) Clean environment as 75% of the total waste generated is being collected from doorstep.
3) Successful Public Private Peoples Partnership
4) Use of appropriate technology for waste management, also creating entrepreneurship opportunities.
5) Effective recycling of waste for useful purposes.
6) Partnership of Waste Producers

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