

Study of Pneumatic Waste Collection System for Udaipur City

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Abstract— Waste collection is one of the life cycle phases that influence the environmental sustainability of waste management. At present we follow with door-to-door collection, recycling and land-filling disposal. This system is highly flexible, however it has several drawbacks giving rise to important environment impacts and difficulty. One of its weak spots is found in collection process of waste streams following a conventional door-to-door collection using a combination of trucks and waste bins. Hygiene issues, efficiency shortfalls in waste collection, traffic disturbances and environment burdens in urban areas relating to the increased noise and air-emissions are some of its major disadvantages. This paper focuses on the underground automated vacuum waste collection system. Pneumatic waste collection system represents a new way of arranging waste collection in densely populated urban areas. The development of underground infrastructures for the efficient management and collection of urban waste streams offers great advantages and solutions in tackling problems relating to these activities. In recent decades, hundreds of municipal-scale pneumatic collection systems have been installed in Europe and Asia are running successfully.

Key words: Pneumatic Waste Collection System (PWCS), Municipal solid waste management (MSWM)

I. INTRODUCTION

The utilization of subsurface space is nowadays a key issue towards attaining an environmental friendly and sustainable development, especially in urban areas. Thus, activities or infrastructures that are difficult, impossible, environmentally undesirable or even less profitable to be installed above ground, can be relocated underground releasing valuable surface space for other uses and enhancing urban living conditions. Until recently, the management of municipal waste was relied on traditional collection and disposal activities, mainly associated with door-to-door collection, recycling and land-filling disposal. This system is highly flexible; however it has several drawbacks giving rise to important environmental impacts and nuisances. One of its weak spots is found in the collection process of the waste streams following a conventional door-to-door collection using a combination of trucks and waste bins. Hygiene issues, efficiency shortfalls in the waste collection, traffic disturbances and environmental burdens in urban areas relating to the increased noise and air-emissions are some of its major disadvantages. Waste management is one of the big issue of urban engineering.

The paper presents the current municipal waste collection process (conventional vehicle-operated method) and furthermore, it introduces the design of the pneumatic waste collection system (PWCS) required in order to properly facilitate users needs. It analyses the characteristics the systems and focuses on the comparison of the two alternatives available emphasizing on both their financial and environmental characteristics. Thus, the assessment of the most promising scheme could be brought forward allowing stakeholders to decide whether they should pursue the transition of the waste collection system to the underground fixed infrastructure.

II. METHODOLOGY

Pneumatic Waste Collection System (PWCS) is a modern way of handling waste with the benefits of convenience, hygiene and environmental friendliness.

In high rise buildings and high density living conditions, Pneumatic Waste Collection system is desired waste management solution. The system will be based on a network of fixed collection stations by means either indoor and/or outdoor drop-off points that can be configured for different waste fractions. Connected via a piping network, the waste deposited within the drop-off points is transported to the collection centre when triggered by sensors or designated durations. At the collection centre, the system can be design to segregate according to the collected fractions into separate containers. As the system ensures that the waste upon entry to the drop-off points are contained, dust, odour and leaking leachate is minimised. Through its fully automated system, manpower input will be reduced while offering round the clock operations.



Efficient, low noise and odour controlled system for an excellent high class living standard.

Waste will be disposed off through hoppers installed in the residences, common hoppers or outdoor drop off points. The waste will be temporarily stored in the storage area above the discharge valve. Exhausters create a suction pressure and air flow in the pipeline. The discharge valve is opened and the waste drops to the main line. The air stream transports the waste to the collection station/bin center. The waste drops into refuse containers via cyclone, the air separator. Refuse containers will be transported by trucks to dumping grounds, incineration plants, etc. The exhaust air will pass through the Dust and Odor Filtration before being discharged into the atmosphere.

III. ADVANTAGES

- 1) PWCS system will minimized the operational cost of MSWM, therefore it provides long term savings.
- 2) This system has ability to collect efficiently all types of waste.
- 3) This system is flexible with the ability to easily adopts all types of changes.
- 4) This system minimizes the use of garbage collection trucks in urban areas.
- 5) This system minimizes air pollution, noise pollution, aesthetic pollution and odor nuisance from MSW.
- 6) This system releases the surface space for community needs or development.
- 7) This system is safe and hygiene for MSW collection workers.

The services of garbage trucks will no longer be required; in such a way several environmental issues are solved, if thinking about traffic congestions, especially in narrow old streets, less noise, pollution and greenhouse gas emissions; at the same time traditional containers will disappear together with unpleasant aspect, odours and insects in such a way largely improving health, sanitation and overall environmental conditions. The terms of safety are improved, the risk of fire is reduced also, as the pipe network acts as a self-cleaning mechanism, in such a way vacuum waste collection is more sanitary, while refuse waste is no longer impacted by weather conditions like rain, snow or wind. This system will make street cleaning considerably easier.

IV. DISADVANTAGES

The only inconvenience is the construction of piping system; under the time of construction certainly inhabitants and businesses will suffer temporary inconveniences. The systems cannot collect large items such as white goods, bulky waste and there are difficulties with glass as well. Nevertheless, residential and business area will benefit from pleasant environment and appeal both for trade and recreation.

V. CONCLUSION

The development of new approaches for the management of the urban waste is become a big issue for modern society.

The following are the conclusions draw by our present study:

- Utilization of subsurface space can be proved most beneficial in tackling the drawbacks of traditional waste management and collection systems.
- Surface space is released and made available for other use while on the same time, all process are taking place underground minimizing their effects in living environment.

- The establishment of permanent underground infrastructure for the collection and management of waste can provide efficient and cost effective solutions. Thus the following example already set by other utilities (e.g. water, sewerage, gas, electricity etc) that have developed over time into an underground infrastructure.
- Pneumatic systems would also offer local safety and public health benefits due to reduced particulates emissions, noise emissions, accidents, disease vectors.

Major benefit from the usage of PWCS system is minimized operating cost for the waste handling , 2 to 3 times lower than conventional collection methods.

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