

Optical Sorting System for Municipal Waste in Practice

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***Abstract:** Municipal waste contributes to environmental problems including habitat destruction, surface and groundwater pollution, and other forms of air, soil, and water contamination. Incineration creates toxic substances, while landfills emit methane (which contributes to global warming) and other gases. Landfilling is still the most common way to dispose of waste in many countries, but also not very environmental friendly. Therefore it is necessary to focus on recycling of waste. Over 90 % of all household waste can be recycled. Recycling generally has less impact on the environment than manufacturing new materials into usable products. The first and very important step of recycling is separation of different commodities of waste. In the present are used a lot of ways how to effectively separate individual commodities of municipal waste. One of the ways is optical sorting system. Optical sorting system for municipal waste is a fully automatic and well proven source sorting system. The system is appropriate for households to commercial developments including restaurants and shops. The optical sorting system concept brings with it many benefits and a high level of adaptability, is a widely accepted collection system, you can fulfil all desired collection objectives and it is flexible for future changes and developments.*

***Keywords:** municipal waste; optical sorting system; separation*

1 Introduction

The volume of solid waste, particularly in urban areas, is increasing as a result of several factors including population growth, industrial expansion, technological advances in the manufacture of consumer products. Both public health and the environment are in jeopardy because disposal methods have not kept pace with the accumulation of solid waste. Studies on household waste show that over 90% of everything discarded can be recycled. In this article we focused on municipal waste (definitions of municipal solid waste do not include industrial wastes, agricultural wastes, medical waste, radioactive waste or sewage sludge). Municipal solid waste is the most complex solid waste stream, as opposed to more homogeneous waste streams resulting from industrial or agricultural activities. The composition of municipal solid waste varies greatly from municipality to

municipality (country to country) and changes significantly with time. Optical sorting system is ideal solution for this kind of waste. [1, 2, 5]

2 Principle of Optical Sorting System

Optical sorting system is a fully automated optical sorting system for municipal waste. The customers are municipalities, cities, local authorities as well as private contractors within the waste management sector. Users range from households to commercial developments including restaurants and shops. [6]

Users are provided with different coloured waste bags corresponding to the different waste streams that are collected by the municipality. For example, green could be used for food, red for paper and yellow for cardboard packaging. For example everyone can sort their waste into different bags at home and put them into the dustbin. [3, 4]

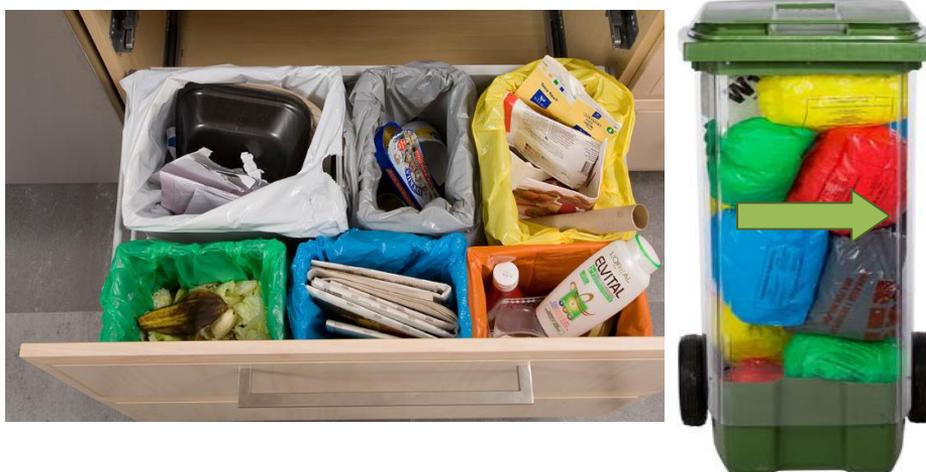


Figure 1

Separation of municipal waste at home [3]

The waste bags are placed in the designated chute, bin or container and then collected with a conventional waste truck and transported to the plant. Optical sorting involves the collection of only one container with all fractions. There is a general household waste collection every second week for detached houses and weekly for blocks of flats and apartments. Opportunities for logistical planning and efficiency are best with this type of system.

The model of the plant is presented on Figure 2. The plants sort the bags into the relevant colours for appropriate treatment. Upon arrival, the waste bags are

dumped into a receiving pit and transferred to a conveyor belt. At this point, no separation of the bags has taken place. [3, 4]

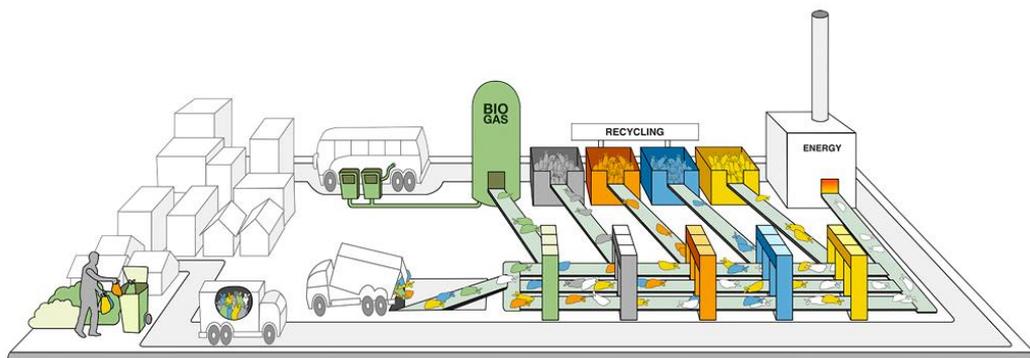


Figure 2

Principle of optical sorting system [4]

Once on the conveyor belt, the bags are sorted automatically using camera technology that recognises the colour of the bag. When a green bag (for example) is detected a signal is sent from the camera and the bag is pushed off the main conveyor belt, on to a second belt and directed to the appropriate container. [4]

The fully automated optical sorting procedure is managed and supervised by an operator from the plant control room.

The segregated materials are recycled, incinerated to be used for district heating/cooling or processed to biogas and biofertilizers.

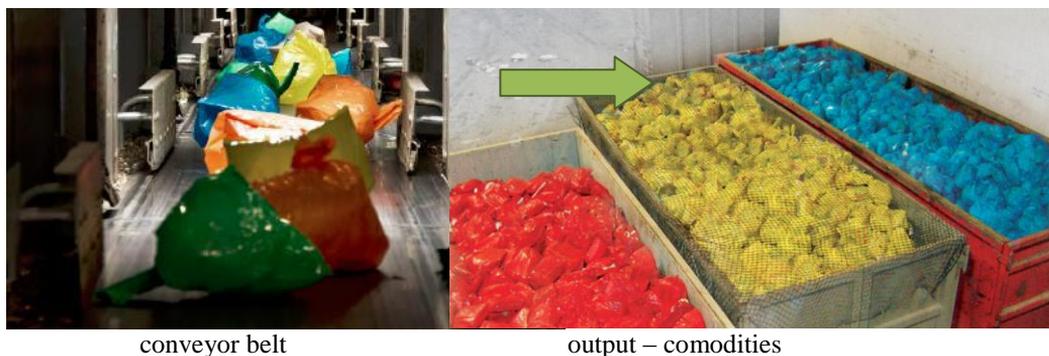


Figure 3

Separation line [4]

Optical sorting system plants can be built in many different forms and configurations to fulfil specific requirements. They can be built to facilitate future expansion in terms of increased capacity and/or the addition of fractions in an

efficient and financially viable manner. [3] The rule is that the number of fraction is higher, the annual cost is lower (Figure 4).

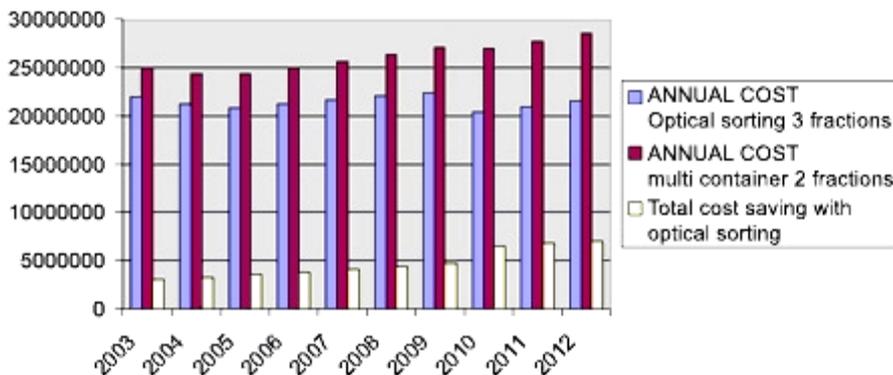


Figure 4
Costs for household waste collection [3]

2.1 Benefits

Optical sorting system offers a lot of benefits. Less space is required for waste storage and waste logistics are improved. All waste bags are collected in the same waste chute or bin so there is no need for a special recycling room or house to hold several bins for the different waste streams.

Lorry miles - and therefore carbon emissions - are reduced as a result of collecting every waste stream in one single batch.

More important, given the simplicity of the system, waste segregation is conducted at source and not at a recycling station. Evidence suggests that the easier it is to segregate and dispose off the waste, the more people tend to segregate. [4]

Other advantages include:

- simple and clean with plastic bag for food waste,
- no unpleasant aromas or maggots during the summer,
- cleaning of containers and receptacles minimized,
- no freezing solid of bags during the winter,
- efficient utilization of container space,
- same receptacle for different waste requirements,
- simple and effective collection logistics,

- simple and reliable collection vehicles,
- simple to increase or change the number of fractions in the future,
- optical sorting warrants well documented results. [3]

3 Results

Studies show that sorting at the source results in a much higher quality of the collected materials than if everything is put into the same container and sorted thereafter at a central plant. Evidence suggests that the easier it is to segregate and dispose off the waste, the more people tend to segregate. Optical sorting system is a safe, well proven system for the management of household waste. It is simple and cost-effective to install and use. When new or more extensive sorting needs and requirements are introduced, more bags in new colours can be simply added to the management system. Most important of all is the creation of a good source sorting system which means that the recycling companies can take advantage of quality assured materials. So long as it is financially and environmentally justifiable, one should sort into as many fractions as possible. It is important that the waste containers and other collection receptacles function well so that they facilitate the work.

The system has clear cut financial and environmental benefits as well as a unique development potential. The flexibility of this system means the optical sorting system is uniquely prepared for the future. Regardless of the demands which will be placed on waste management in the years ahead, the optical sorting system will be able to meet and comply with the highest demands. Over 25 different plants have already been built (France, Norway, Sweden, Finland).

Acknowledgments

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