

OSLO'S COLOURFUL SOLUTION TO WASTE MANAGEMENT

In Norway's capital city, Oslo, source separation has been introduced using bags that effectively colour-codes the waste by type before sending it through the waste handling system. Using optical identification, the coloured bags are separated for recycling and biogas production. Find out why other European nations are taking an interest in the system.

By Stefan Holmerz

Sky high thinking: the Klemetsrud plant houses sorting as well as waste to energy facilities

In 2008, the city of Oslo decided to reduce its CO2 emissions by 50% by the year 2030. One of the measures needed to achieve this ambitious target was the separate collection of food waste and plastic waste.

Initially, the city considered acquiring two more waste containers for households, adding to the two that were already there. This would have required the purchase of a further 500,000 waste containers, not to mention giving residents four bins to handle. It would also have introduced knock-on effects on the logistics of collection runs, the number of collection vehicles required and the design of vehicles. In addition, some properties in urban areas could not accommodate more waste containers due to space constraints.

Instead, the city decided to invest in a new handling system for waste separated at source. The investment cost for this solution was in the same region as for the alternative solution with additional waste containers. The project included waste treatment facilities with optical separation of household waste sorted into coloured bags; incineration of residual waste with energy recovery and a biofuel plant.

Residents are now required to recycle their food waste in green bags and plastic waste in blue bags. The coloured bags are distributed free of charge and can be picked up in supermarkets all over Oslo. The charges for waste collection are still in line with other large cities in the country.

VISION TECHNOLOGY

The separation system is supplied by Swedish company Optibag. It is based on industrial vision technology that detects the coloured bags as they travel through the separation plant, diverting each type into a separate stream for further treatment. All other bags, i.e. those without the specified colours, travel through the system and onto waste to energy. While only two colours are used for identification, green and blue, there is in principle no limit to the number of colours that can be used.

The city aims to recycle 50% of the household waste by the year 2018. Currently, the figure is 37%, so the goal is well within reach. A total of 85.5 kg of food waste per person was generated in 2014. And 40% of this was separated into green bags.

In addition, 21% of the plastic is recycled; 64% of glass and metal; and 76% of paper and cardboard. Glass, metal, paper and cardboard are handled outside of the Optibag system, as there were already established collection

systems in place for these materials. By making food waste visible, the system also appears to have made residents more aware of the volume of food that is wasted, as the total volume of food waste has reduced by 5% since collections started.

PERFORMANCE

"In general, we are happy with the recycling that takes place," says Kristin Bergersen, communications director of Renovasjonsetaten, the local company that handles waste management for the city.

"The food waste that ends up in the green bags is the right type of material. What we are less happy about, however, is the rate of recycling. Almost all residents are aware that the system is in operation and 80% are positive, but for various reasons, not all of them turn their good intentions into action. But recycling is increasing year on year, so getting to 50% is not impossible. The potential is much greater, I would estimate that 80-90% of the food waste can be recycled."

Bergersen adds: "We are also happy with the performance of the separation plant, which has operated reliably and accurately since installation."

With no changes needed to the existing logistical system, the city was able to implement the system rapidly. When adding more waste containers, routes for the collection vehicles are often altered to accommodate the extra runs. Such routes may have taken decades to establish and changing them is often a painstaking operation that needs to be implemented gradually. For example, the city of Gothenburg, comparable in size with Oslo, started recycling food waste using separate

waste containers over 20 years ago. Still, it only achieves 25% food waste recycling, to compare with Oslo's 40% just a few years into the project.



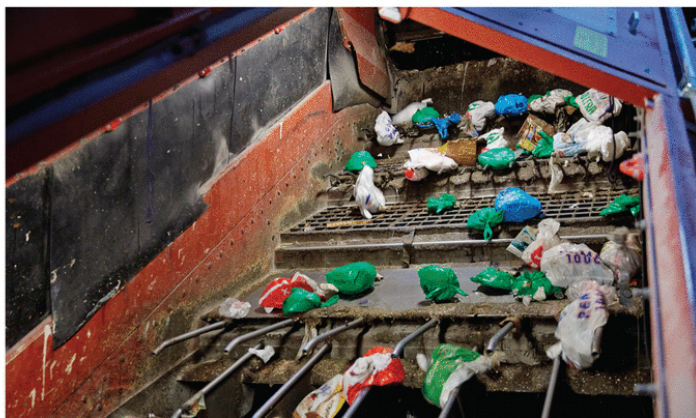
Several northern European cities now look to Oslo for inspiration. Stockholm has decided to introduce optical identification of food waste from 2018

TRANSPORTATION

Once filled by the householder, the bags are disposed of using the normal waste disposal system such as bins or waste chutes. Vacuum collection and waste compactors can also be used. The plastic bags keep materials clean and dry, ensuring that the plastics destined for recycling is not soiled by the food waste.

Waste is collected with standard waste collection vehicles and transported to the treatment plant. Inside the plant, the mixed refuse is sorted into different waste streams – food waste and household plastics for recycling and residual materials for energy recovery.

After the collection vehicle empties the load into the discharge area, a conveyor belt lifts the waste up to the sorting area, where the control room is also located. The control system features cameras that provide the operator with an overview of the process. The process can also be controlled remotely via substations on the production floor.



The mixed waste enters the sorting plant



Blue and green bags are identified using industrial vision technology and removed from the stream



After sorting, food waste collected in green bags is processed into biofuel



The biofuel is produced in this plant and used by refuse collection vehicles (RCVs)

PUT IT TO ONE SIDE

Industrial vision cameras pick out the green and blue coloured bags as they travel along the transporter and the bags are diverted into separate streams. The leftover bags, i.e. all other coloured bags, continue straight to incineration. Once separated out, the green and blue bags are opened. The empty bags can be recycled as plastic, or, as in this installation, be passed on to incineration.

The food waste is transported for further treatment and converted into biogas and biofertiliser. The biogas is used to fuel the refuse collection vehicles, with a plan to also run the local buses in the future.

Blue bags with plastics are compressed before storage and further treatment. One kg of recycled plastic can substitute approximately two kg of oil in plastics production. Material destined for energy recovery is transported directly to incineration and the energy is used for district heating. This enables Oslo's collection of source separated waste to be CO₂ neutral.

TESTING TIMES

Several northern European cities now look to Oslo for inspiration. For instance Stockholm, has decided to introduce optical identification of food waste from 2018. The city recently ran a test with bags that were handed out to 6000 households for a period of six months. The



Householders in Oslo are now required to sort their waste into coloured plastic bags

users were overwhelmingly positive and the test showed that the target of 50% recycling of food waste can be achieved.

The tests do not require any mechanical installation, but are merely a way to gauge acceptance by the local community. The participants in the study are kept informed and are generally happy to take part. The motivation of householders is key to success and this is an area where most people realise that their contribution, while small, can make a difference. During the test, the bags are weighed and

their contents analysed manually to establish whether the project is viable.

A SIMPLE SOLUTION

"Optical identification of waste materials is a simple solution that does not require an enormous commitment from users. It's an easy way to recover materials from the waste stream. Alternative solutions that may initially appear more straightforward, such as two collection containers and two compartments on the waste collection vehicle,

also require investment," says Olof Hjelm, professor of environmental management and environmental systems analysis at Linköping University in Sweden.

"This is a solution that works well with existing systems. Accurate separation is best achieved at the source, by the householder. Getting people to recycle is a matter of changing attitudes. If people see the benefit and have confidence in the system, they will recycle," says Hjelm.

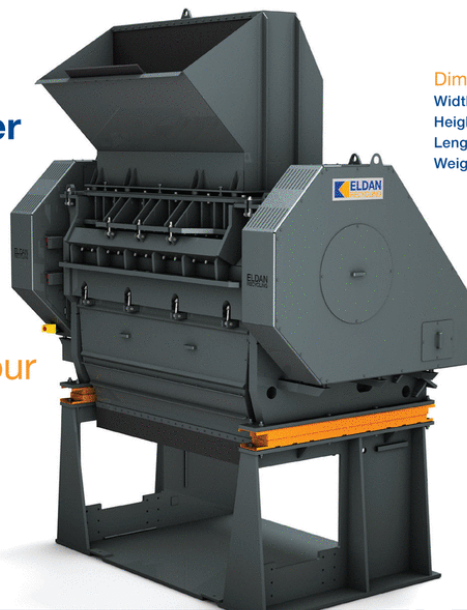
Concluding, Renovaşjonsetaten's Bergesen, says: "Compared to introducing more waste containers for source separation, the Optibag system has helped us reduce environmental impact, achieve higher recycling rates and saved space for property owners. It is a system that works well in an urban environment."

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