



## Urban waste management and recycling system



## Generale features



ECOFIL is an innovative technological system for the management of urban waste and recycling of useful materials.

With our networks of Intelligent Collection Stations, citizens are actively involved in waste management operations control, while community authorities can push them to be more engaged in correct recycling, giving the appropriate rewards to the most virtuous ones.

## Better than other systems - Comparative Technical Report by UNIVPM - Università Politecnica delle Marche



ECOFIL demonstrated to be more eco-friendly than other collection systems as Door-to-Door and Street collection, according to a Comparative Technical Report by UNIVPM - Università Politecnica delle Marche, drafted following LCA "Life Cycle Assessment" (ISO 14044) parameters. This Report affirms that ECOFIL is the most effective and eco-friendly system, thanks to both an higher recycling rate and a better quality of the collected materials.

A comparison between the end life scenario of each system shows a remarkable gap in terms of environmental benefit:

ECOFIL: 173439.46 KgCO<sub>2</sub>eq

Door to Door: 71829.91KgCO<sub>2</sub>eq

Street Collection: 57375.04 KgCO<sub>2</sub>eq



1 - It is possible to add extra waste containers.

2 - Positioning of more cameras depends on the specific location.

## How it works: Intelligent Collection Station, weighing and recording operations.



The network of Intelligent Collection Stations, together with the database of collection records, is the core of the whole system.

Each user\* has an RFID Card linked to an online profile, to interact with the Stations every time he has to dispose of the waste.

The separation of different waste/materials is carried out by the user, who puts them in different waste bags for each category and performs the operations listed on the next page.

Every operation is recorded on the online profile of the user linked to the RFID Card, where he can check the results of all his station activities. The Community Authority responsible for waste management is allowed to reward (by tax cuts or other means) those users most engaged in correct recycling, pushing the whole community to adopt always more virtuous conducts.

Stations are also equipped with cameras to monitor users behavior and prevent possible acts of vandalism.

*\*USER: To be understood as the unit to which taxes for waste management apply.*

### **User Login - Ecofil Card**

Each family/user receives an RFID Card for the electronic identification at the Stations.

### **User Identification**

To dispose of the waste/materials, previously sorted by the user in different bags according to their category, it is necessary to reach one of the Intelligent Collection Stations and login with the RFID Card. In this phase waste containers are locked.

### **Selection of the waste/materials to dispose of and weight check**

User selects on the touch screen the kind of waste/material to dispose of, choosing among 7 categories: MSW, cans, plastic, paper, glass, diapers, biowaste. Subsequently, using the weighing scale of the station, user checks the weight of each different waste bag (punctual quantification expressed in Kg and fractions).

### **Recording and printign of the label to identify the operation**

The weight of each disposed waste/material is transmitted to the online database, where every user can monitor his results. The station prints an adhesive label with a barcode that user has to stick on each different waste bag. This label allows waste management operators, using a suitable device, to perform random controls and track user operations.

### **Disposal of the different waste/materials in the specific container**

The system unlocks the container of the specifically selected waste/material category. User puts the labelled bag in the container which then locks again. A system of three intelligent cameras verifies the correct performance of every operation, emitting an acoustic signal in case of mistakes.

*NOTE: Every single step is guided by both visual and vocal instructions.*

## Results: High recycling rate and direct collection of useful materials

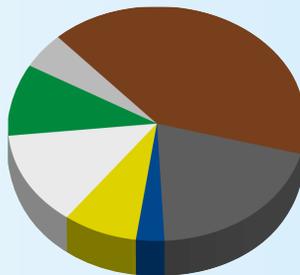


ECOFIL allows to obtain a general recycling rate of 75%, with a less than 2% impurity rate as directly verified in the current operational areas. The average per capita unsorted mix is around 60 Kg par year. Among the collected waste there is a relevant quantity of useful materials, according to the chart hereunder.

Biowaste in particular is qualitatively high and suitable for the production of biogas if the collection involves the right number of users.

*Referred to an average per capita waste production of 300 Kg in one year*

	Mixed solid waste	<b>20%</b>
	Cans	<b>3%</b>
	Plastic	<b>8%</b>
	Paper	<b>13%</b>
	Glass	<b>10%</b>
	Diapers	<b>5%</b>
	Biowaste	<b>41%</b>



These results allow a substantial reduction of further sorting and landfill operations and related risks for workers and environment. But most of all, it is possible to reuse and give new value to the collected materials as resources of new production processes, developing virtuous circuits of circular economy.



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