# ENVIRONMENTAL IMPACTS OF A MATERIAL RECOVERY FACILITY IN A LIFE CYCLE PERSPECTIVE

Filomena Ardolino, Department of Environmental, Biological, Pharmaceutical Sciences and Technologies – Second University of Naples, Via Vivaldi, 43, 81100 Caserta, ITALY
filomena.ardolino@unina2.it
Chiara Berto, Department of Environmental, Biological, Pharmaceutical Sciences and Technologies – Second University of Naples, Via Vivaldi, 43, 81100 Caserta, ITALY
Umberto Arena, Department of Environmental, Biological, Pharmaceutical Sciences and Technologies – Second University of Naples, Via Vivaldi, 43, 81100 Caserta, ITALY

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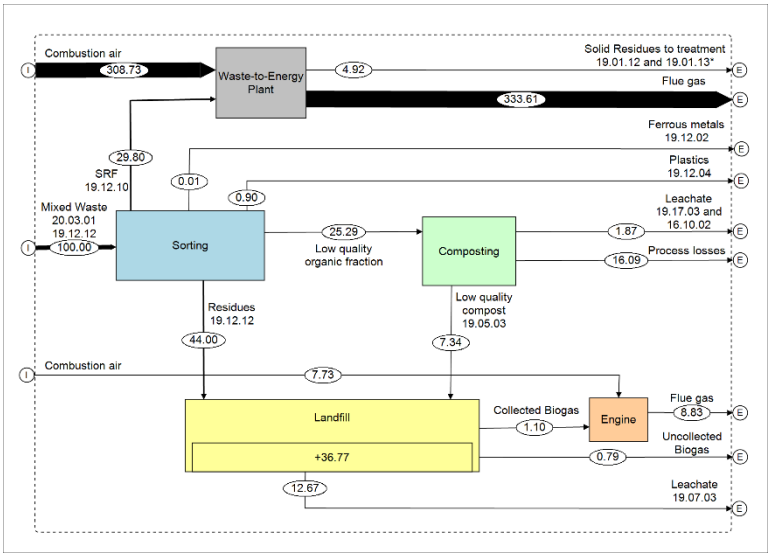
The study aims to evaluate the environmental performances of an integrated material recovery facility (MRF), which has a crucial role in the waste management plan of a region in the middle of Italy, characterized by a low level (less than 20%) of household source separation and separate collection [1].
The facility, which is able to treat about 30 kt/y of mixed waste, has three main units: a mechanical sorting platform, bio-cells for tunnel composting, and a landfill. The output streams of the sorting platform are the ferrous metals and mixed plastics, which are sent to the recycling processes, the solid recovered fuel (SRF), which is utilized in an external combustion-based waste-to-energy plant, and a low-quality organic fraction, which is treated in the on-site composting unit. The solid residues generated by these processes are about a half of the input stream, and are disposed in the annexed landfill. The bio-cells for tunnel composting are in operation since 2014, and so far produces just a low-quality compost, utilized for landfill capping, and a leachate, sent to an external wastewater treatment plant (WTP). The landfill produces a leachate, which is treated in the WTP, and a biogas, which is collected (with an efficiency of about 60%), and sent to a gas engine, having an electric energy conversion efficiency of 38%.




*QUANTIFIED FLOW SHEET OF THE MRF IN THE "STATUS QUO" SCENARIO, WITH THE INDICATION OF THE CODE OF EUROPEAN WASTE CATALOGUE (EWC). DATA ARE EXPRESSED IN T/D.*

The study analyzed the process units of the MRF in order to acquire reliable data of mass and energy flows, and then evaluate the environmental burdens necessary for a life cycle assessment (LCA) study. The LCA compares three scenarios, describing the technological evolution of the facility. A "past" scenario, including just mechanical sorting, landfilling and biogas combustion in the gas engine. A "status quo" scenario, to which the figure refers, where the composting unit has been added. A "future" scenario, which includes a fluidized bed gasifier, able to treat solid residues coming from the sorting platform, and minimize the landfill waste disposal [2]. The study investigated in depth this last configuration, to evaluate the effects of alternative fates of the produced SRF: the utilization in a cement plant, which is in operation close to the MRF [30 km], or in a larger gasification plant, which could be alternatively built inside the battery limits of the MRF. The functional unit is assumed to be the treatment of 100 t/d of mixed waste. The system boundaries include all the activities from the entry gate of the plant until to management of solid and liquid process residues.

REFERENCES

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