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## INTEGRATED AND SUSTAINABLE SYSTEM FOR MULTI-WASTE VALORIZATION

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### Abstract

The general aim of this paper is to demonstrate the sustainable management of a broad spectrum of wastes (livestock, industrial, agri-food, agricultural and non-recyclable fraction proceeding from waste treatment plants) in an integrated plant. The technological development and practical application of the “Mixed Plant” concept is used to achieve this objective. In order to valorize in a joint form all the above-mentioned categories of waste, two different processes have been integrated. The first one is an anaerobic digestion system for the transformation of biodegradable organic waste into biogas. The second one is a low-temperature pyrolysis (chemical) treatment for the valorization of the non-recyclable plastic waste fraction and other non-organic waste streams. Biogas together with pyrolysis gas fraction (syngas) will be used as fuel in an adapted co-generation engine. So as to close the recycling cycle with a minimum environmental impact, and as an added value, the digestate obtained in the anaerobic reactor will be valorized as a slow-release fertilizer (struvite), the liquid fraction obtained during the pyrolysis gas distillation process will be valorized as second generation biofuels and the solid fraction generated in the pyrolysis process (ashes) will be transformed into carbon pellets (biofuel). The ultimate aim of this model is to reduce costs associated with waste treatment processes, thereby optimizing waste management, not only from the environmental perspective, but also from the financial point of view.

*Key words:* anaerobic digestion, energy optimization, mixed plant, pyrolysis, waste valorization

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