Increasing the recovery of materials from automobile shredder residues through a novel recovery process

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The proper management of end-of-life vehicles (ELVs) and of the residues that are generated from their shredding and metal separation (namely the automobile shredder residue, ASR) is still an urgent issue. More than 180,000 tons of ASRs are landfilled every year in Italy, thus being Italy one of the EC States non-compliant with the 95% target of recovery and reuse stated by EC 2000/53 and 2018/849 Directives.

This study reports the results of tests carried out on samples of the light ASR fraction separated, by means of an air separator, from the ELVs shredded in the main shredder of an authorized treatment facility. Specifically, we tested the efficiency of a novel recovery process that was intended to improve the recovery of materials, in the form of ferrous and non-ferrous metals, and fractions to be assimilated to a solid recovered fuel (SRF), from the light ASR. The recovery process included the phases of ferrous and non-ferrous metal separation, a subsequent sieving operation carried out at 30 mm, the milling of the fraction with sizes of more than 30 mm and further magnetic and density separation on the milled fraction. The tested treatment proved to be capable of increasing the recovery of both ferrous and non-ferrous metals and obtaining a quite pure product free of metals with a high caloric value. Further assessments were carried out in order to analyze the possibility of assimilating the above-mentioned separated fraction to a SRF, according to the criteria fixed by Italian Ministerial Decree D.M. 22/2013. The criteria for assimilation concerns the compliance of three parameters (heating value and chlorine and mercury content) and a number of heavy metals with the threshold values fixed by MD 22/2013. Finally, a cost-benefit analysis was carried out on the proposed recovery process.

The results of the tests and analyses demonstrated that the recovery process was sustainable from an economic point of view and was capable to increase the recovery of metals and high caloric fractions. Those fractions had the characteristics to be assimilated to a SRF and, furthermore, they were a promising candidate to integrate conventional fuels in cement factories, foundries or other thermal plants.