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Treasure Project H2020 - Recycling of automotive waste for the recovery of precious and critical metals: pilot plant tests

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Electronic waste from the automotive sector is a valuable secondary source of critical raw materials. However, the absence of strong regulation on the handling, collection, and recycling of electronic car components causes a low level of circularity, leading to the loss of valuable and critical materials. Treasure Horizon 2020 project wants to support the transition of the automotive sector towards a circular economy through the use of new technologies that are sustainable from an economic and environmental point of view. Dedicated pilot plants exploit advanced technologies to establish a new supply chain in the automotive sector. Plants are related to car electronics disassembly, car electronics recycling, and the reuse of secondary materials from car electronics in new applications.

The University of L'Aquila is involved in the current project to develop hydrometallurgical recycling processes for treating different types of components in the automotive sector. The study was conducted starting with UNIVAQ patents GoldREC-1 and GoldREC-2. Based on a supply risk analysis, the following critical materials were selected: printed circuit boards of car dashboards, in-mold electronics, and indium tin oxide (ITO) glass of LCD modules. Characterization tests allowed to determine the potential economic value of each material. The processes for recovering critical, precious, and base metals were optimized on a lab scale. Titration of the chemicals was carried out to determine their consumption; these results were exploited to recycle the solution within the process and for new cycles.

According to lab-scale tests, the pre-existing hydrometallurgical mobile pilot plant was reconfigured by automating all the piping lines controlled by PLC. The other main implementations were: two reactors with new technologies suitable for treating powders and components without any size reduction; filtration systems such as sack and cartridge filters. Pilot plant tests were performed on powders of printed circuit boards, back panels, in-mold electronics, and ITO glass supplied by dismantler partners. Training activities were conducted on the operators of a dismantler company. Taking into consideration the achievements, material and energy balances were described in order to validate the process at the pilot-scale. The economic and environmental sustainability of the different processes was also studied by simulation activities.