Precious metal recovery from WEEE

Precious metals, such as gold and silver, constitute a small but valuable part of waste electrical and electronic equipment (WEEE). New research suggests that significant amounts of these precious metals are lost in the initial stage of the waste recovery process and makes recommendations for improvements in the recycling chain.

For 2005, it was estimated that around 9 million tonnes of electrical and electronic equipment (EEE) was discarded in the European Union (EU-27)\(^1\). The rapid development of new EEE products means that huge quantities of WEEE are produced, which contain complex components composed of a wide mix of materials. Many electronic goods, particularly IT and communication equipment, include the precious metals gold, silver and palladium (all typically found in printed circuit boards) as well as special metals, such as indium and tantalum. However, each unit only contains small concentrations of these metals.

The collection and proper treatment of WEEE is regulated in the EU through the WEEE Directive\(^2\), including targets for collection recovery and recycling. Recycling of WEEE prevents pollution, conserves natural resources and has commercial benefits for waste processing companies.

Management of WEEE consists of three steps: collection, pre-processing and end-processing, with each step typically carried out by specialised operators. Using substance flow analysis (SFA), a method which tracks the movement of substances through a process, this study investigated the pre-processing stage: that is the presorting, separation through manual dismantling and/or shredding, and further manual and/or mechanical separation of waste into different material categories that are then sold to the end-processing stage.

The SFA demonstrated that after the pre-processing stage, only about a quarter of the gold and palladium and a tenth of the silver that could potentially be recovered ends up in output streams from which they will actually be recovered. This implies that process operators lose the revenue for nearly three-quarters of the gold and palladium contained in the WEEE input.

Unselective fine shredding in the pre-processing stage disperses precious metals amongst other materials causing unwanted losses. For example, about 5 per cent of palladium ends up in filter dust because palladium is often found in the ceramics of circuit boards and is broken down to dust during shredding.

In order to recover greater quantities of precious metals from WEEE, the researchers suggest:

- more attention should be paid to separate materials rich in precious metals before shredding
- process operators need more detailed knowledge of where precious metals are located in WEEE
- sorting technologies could be adapted to recover higher proportions of precious metals

The researchers suggest that SFA can be used as a basis for better communication between parties involved in the entire life-cycle of a product. For instance, manufacturers could design EEE with printed circuit boards that are easy to remove during pre-processing to minimise the loss of precious metals in recycling.


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