Copper recycling in Europe: End-of-Life Vehicles (ELVs)

Copper is 100% recyclable and can be reused multiple times without losing its intrinsic physical and chemical properties. Recycling depends on many factors, ranging from:

- Consumers’ responsibility in returning discarded or obsolete products
- Consistent reporting of waste streams
- Products’ lifespan and their subsequent decommissioning
- Overall efficiency of the waste management system

From all copper produced globally, around 8% is used in vehicles. The same applies in Europe, and is expected to exponentially grow due to the electrification of the mobility and transport sector.

ELVs make up around 7% of the total EU End-of-Life copper in waste. Along with other metals in ELVs, copper recycling offers a great opportunity for value retention in the EU.

ELV recycling efficiencies primarily occur at collection, separation and shredding stages.

The 300kt* unrecovered copper from ELV separation and shredding results in losses of EUR 6bn (2018), making up nearly 2% of the total value losses from copper separation and shredding in Europe.

* Rough estimation because of different factors: 2018 POM copper still in use, market aspects (e.g., copper content per vehicle, actual and projected number of vehicles).

Copper content in ELVs varies from up to 3% for combustion engine vehicles, to up to 5% for new energy vehicles out of the whole supply of materials.

NEW ENERGY VEHICLES:
- Battery Electric / Fuel Cell
- Hybrid Electric
- Plug in Hybrid

COMBUSTION ENGINE VEHICLES:
- Diesel
- Liquified Petroleum Gas
- Natural Gas
- Petrol

Estimated mass and embodied value of copper contained in 2018 EU-28 vehicles flows

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<th>Total tonnes of copper content in EU28 ELVs 2018</th>
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- Copper Placed on the Market (POM)
- Copper in Discarded Waste
- Copper Recycled and Reused
- Copper Retained after Separation

- Approximately €5.8bn embodied economic value lost
- Approximately €375m embodied economic value lost

Number of vehicles Placed on the Market (POM) in 2018 and 2030

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<th>Million in Vehicles</th>
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- EV
- Hybrid
- Combustion Engine

Sources: 2018 POM from ACEA | 2030 POM extrapolated from ACEA & PWC figures
These projections, as a result of:
• the increase in the number of vehicles put on the market;
• the move towards alternative, lower carbon and higher copper content powertrains; and
• necessary charging infrastructure, suggest:
*Almost 200% increase in the amount of copper put on the market by 2030.*

Embodied economic value of copper POM in 2018 and 2030 in vehicles

It will increase from €2.4 billion in vehicles POM in 2018 to €6.8 billion. This projection takes into account only passenger vehicles. Other electric mobility devices (e.g., e-scooters, e-bikes) will also contribute to a copper demand increase.

Estimated value retention opportunities in vehicles by 2030

Market growth and improvements in ELV collection and separation can increase copper embodied value by €1.2 billion in 2030 compared to 2018 business as usual levels.

Challenges:
• Disappearing of vehicles at EoL from the internal market (unknown whereabouts: deregistered without a certificate of destruction)
• Dismantling at illegal sites or at sites with less advanced technology to secure high-quality yields
• Exports outside of Europe as used cars

Recommendations to improve copper recycling in ELVs:
• Strengthen national registration systems (e.g., register any road transport vehicle where the owner/user is resident/registered)
• Update the vehicle registration system upon change of ownership
• Require roadworthiness certification to allow a vehicle to be exported outside the EU as a used car
• Adapt Internal Combustion Engine (ICE) vehicle infrastructure and battery recycling infrastructure for use by ELVs
• Staff upskilling for improved EoL management
• Design-for-Sustainability (including disassembly and recycling) with a full life cycle perspective
• Optimize coordination of actors cross-industry and along the recycling chain to recover the multitude of different alloys
• Incentivize investments in sensor-based recovery technologies
• Proper implementation and enforcement of the EU Batteries Regulation for full recovery of batteries at EoL