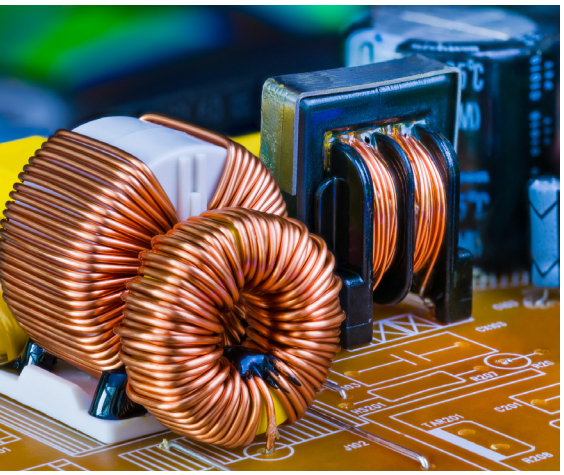
Leaded copper alloys are central to the EU circular economy



As Europe works toward a truly sustainable business environment with its Circular Economy Action Plan, the ability to efficiently recycle copper is becoming increasingly important. With copper alloys used prolifically in electrical products, engineering and the automotive as well as construction sectors, the metal has a broad range of cross-sector applications. The electrification of the European economy means a huge increase in demand for copper is predicted, commercial implications of which significantly impact wider economies. Lead has a critical part to play in this equation. Numerous copper alloys require its inclusion to support better engineering and machineability. Its use is especially critical in CEN standard leaded copper alloys - brasses and bronzes. Typically containing up to 4% lead, in these alloys it acts as a lubricant and chip breaker, and increases corrosion resistance, allowing high-performance machining.

Aside from these practical considerations, the use of lead also makes it easier to reclaim and recycle the copper at a later date. Lead in scrap brass and bronze can be separated easily from copper in the smelter, ensuring both the copper and lead are recovered and can be reused, helping to minimise waste and to return value to the product cycle for as long as possible.

With lead the key enabler for many technical alloy properties, in most instances it simply cannot be replaced. Any alternative would need to sustainably provide technical and economic feasibility during the product's operational lifetime, as well as ensure there is no increased detrimental impact at end-of-life. Silicon and bismuth are sometimes viable alternatives, although unable to command the same technical performance levels. Silicon-containing brasses, for instance, are more energy intensive and costly to produce, thereby limiting their application to premium niche products.

From a practical standpoint, bismuth it is not as suited to complex machining as it can lead to stress corrosion cracking. The economic case is also difficult to make – a critical rare earth element, it comes with high supply risk and price volatility. Moreover, the technical and commercial feasibility of recycling is difficult due to

the need to keep bismuth copper alloys separate from other materials during the reclamation process – something that is not required with leaded copper alloys. Using non-lead alternatives could negatively affect the economy of recycling by increasing processing costs for recyclers and penalties on the collectors.

There is a long-standing framework of legislation, developed to specifically address the occupational risk of working with lead. Covering the production, use, and end-of-life recovery from waste, these strict risk management processes are observed across a breadth of touchpoints when working with lead. Even more encouragingly, the copper alloy value chain has considerably reduced the use of lead as far as technically feasible – in fact, today's leaded copper alloys have an average lead content that is approximately one-third lower than ten years ago.

Lead is supporting sustainable copper recycling across the EU and is a key contributor to the EU's circular economy. It achieves this by maintaining the value of products, materials and resources for as long as possible, returning them into the product cycle at the end of their use, and minimising the generation of waste. With leaded copper alloys prevalent across so many industries, the overall impact of this is hugely significant.

Fact file

- Lead-containing copper alloys are 100% recyclable and are widely recycled because of the high value of the recovered metals
- Bismuth and lead production is inextricably linked - for every tonne of bismuth, between **30 and 200 tonnes** of lead must be produced
- Although a common alternative to use of lead, bismuth occurs in the earth's crust 300 times less frequently than lead and is even rarer than silver
- Using copper has enabled a reduction in the use of lead as far as technically feasible - today's leaded copper alloys have an average lead content that is approximately one-third lower than 10 years ago
- Bismuth is often used as an alternative to lead in copper which can sometimes lead to mechanical stress affecting production – pure copper used for wires and cables limits its use to 5 ppm

Developed in conjunction with Eurometaux and the European Copper Institute, this case study highlights just one of the many essential uses of lead that provide societal benefits and boost the EU's economy

For Europe's future, lead matters.

Lead Matters