Copper Recycling and Sustainability (2)

Main Uses of Copper

Electrical applications

Approximately 65% of copper produced is used for electrical applications. Copper has the highest electrical conductivity of any metal, apart from silver, leading to applications in:

- Power generation and transmission - motors, generators and transformers provide and deliver electricity safely and efficiently to homes and businesses. New technologies for the generation of renewable energy from solar, wind and geothermal sources all rely on copper.
- Electrical equipment providing circuitry, wiring and contacts for PCs, TVs and mobile phones.

Construction

25% of all the copper produced is used in buildings, for plumbing, roofing and cladding. Copper provides light, durable maintenance-free structures that are naturally good looking, long lasting and fully recyclable.

Copper was first used by the ancient Egyptians for water piping; samples taken from a temple dated 2750 BC are still in good condition. Copper was also used by the Romans as water pipes and cisterns.

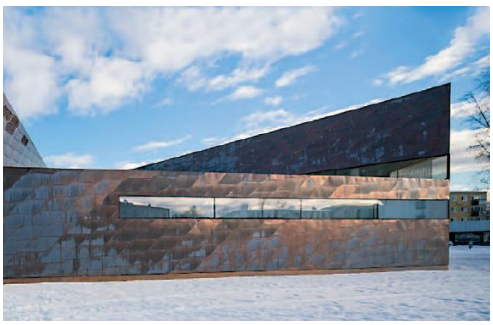
Transport

Trains, trams, cars and lorries all need copper and transport accounts for 7% of copper usage.

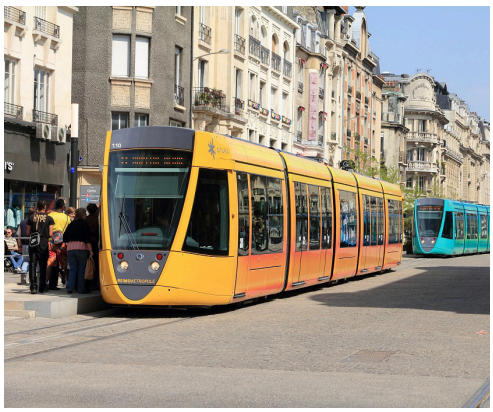
High purity copper wires carry electrical current from the battery throughout the vehicle to equipment such as lights, central locking, on-board computers and satellite navigation systems. Electric motors, which are wound with high conductivity wire,

Did You Know?

The recycling of copper requires up to 85% less energy than primary production. Around the world, this saves 40 million tonnes of CO_2 (the equivalent emissions of 16 million cars).



Copper cladding is attractive and 100% recyclable. (Courtesy of Aurubis.)



This tram line in Reims uses a central power track in the ground to avoid spoiling the city with overhead lines. Power is supplied to the track by copper cables. The track is only live beneath the tram. The tram is driven by copper wound induction motors. (Wikimedia Commons.)

are used in many of these devices. The average car contains about 1 km of wire.

Electric trams in cities such as Manchester, Sheffield, Croydon, Nottingham, Reims and Bordeaux provide clean, efficient transport powered by electric motors. The overhead contact wires are either copper-silver or copper-cadmium alloys.

Other

The remaining 3% of copper is used for coins, sculptures, musical instruments and cookware.

Recycled copper helps to meet the growing demand for copper. Of all the copper needed across the world, 34% comes from recycling. In Europe, this figure is even higher (41%). This is an example of the sustainable nature of copper.

Recycling

Copper recycling is not something that we do much as private individuals. It is almost all done by recycling businesses such as car breakers and plumbing companies.

We can play our part by making sure that all electrical and electronic products are sent to the right collection points. It is not just copper that can be recovered; thousands of tons of gold, silver and rare earth metals make the value of waste electrical and electronic equipment (WEEE) higher each year.

WEEE Directive

In an attempt to improve recycling of electrical goods, the WEEE Directive, which sets recycling targets for EU countries, was introduced in 2002, and implemented in the UK in January 2007. Electrical goods falling under this Directive bear the WEEE symbol.

The key points are:

- Producers and retailers are responsible for collecting, transporting and treating their discarded products.
- WEEE must be kept separate from other waste so that hazardous substances can be removed.

It is hoped that the cost of implementing the WEEE Directive will encourage manufacturers to design longer lasting products that use fewer resources and hazardous materials, generate less waste and are safer and easier to recycle. This is referred to as sustainable product design, part of which involves recovery of

valuable metals such as copper that can be melted and used to make other useful products.

Reuse schemes: it is environmentally more desirable to reuse equipment rather than recycle it. A number of schemes exist to facilitate this, for computers, mobile phones (15 million are discarded each year in the UK but only 4% are reused) and especially fridges, cookers and vacuum cleaners, for distribution to other users.

The Directive does not put any legal responsibility onto us, the consumers. It is not illegal to put the broken mobile or toaster into the bin; this may be regarded as a weakness of the WEEE Directive. Consumers have to use their own initiative such as returning goods to the suppliers, donating them to the reuse schemes and so correctly disposing of WEEE.

Benefits of Recycling

The economic and environmental benefits of recycling copper are given below and illustrate the sustainable nature of copper.

Environment

During mining and refining (purification) of copper, dust and waste gases such as sulfur dioxide are produced, which may have a harmful effect on the environment. Although these harmful effects are minimised by copper producers (sulfur dioxide is captured and used to make sulfuric acid), with recycling there are little, if any, harmful gases emitted.

Energy saving

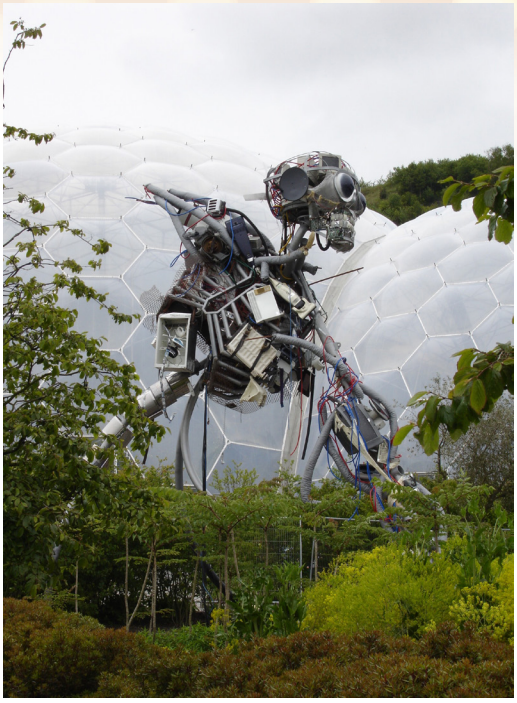
In order to extract copper from copper ore, the energy required is approximately 100 GJ/tonne. Recycling copper uses much less energy, about 10 GJ/tonne; that's only 10% of the energy needed for extraction. This energy saving leads to the conservation of valuable reserves of oil, gas or coal and reduces the amount of CO_2 released into the atmosphere.

Conservation of copper ore

To date only about 12% of known copper resources have been mined. However copper ore is a finite resource and it makes sense to conserve ore by recycling.

Economics

It is cheaper to recycle old copper than to mine and extract new copper. Recycled copper is worth up to 90% of the cost of the original copper. Recycling helps to keep the cost of copper products down.



The Eden Project is home to WEEE Man, a seven-metre high robotic figure made from the amount of waste electrical and electronic products that an average UK citizen will throw away in a lifetime. WEEE Man has computer mice for teeth, an old washing machine for a spine, and a neck made from vacuum cleaner tubes. (Courtesy of Eden Project.)

Landfill costs

Copper and copper alloy objects that are not recycled might otherwise be dumped in holes in the ground – this is called landfill. These holes are rapidly being filled up and, as they become scarcer, landfill becomes a more expensive option for waste disposal (of any material).

Continue to Copper Recycling and Sustainability 3

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Copper Development Association is a non-profit organisation that provides information on copper's properties and applications, its essentiality for health, quality of life and its role in technology. It supports education through a collection of resources spanning biology, chemistry and physics. These materials have been developed in conjunction with the Association for Science Education, and reviewed by teachers.

For more resources, visit www.copperalliance.org.uk/education.