

Copper, ally of the automotive industry

Copper is a strong contributor to the goals of sustainable development. Take the example of Saab and Mazda, imported in Belgium by Beherman: Pioneers in the design of safe, high performance and environmentally friendly vehicles, these brands have recognised that copper is a key material in their ongoing innovation strategies. With a single goal in mind: improve the performance of the car while making it cleaner, safer and more enjoyable to drive. This is why some 16 kg of copper are used in the production of the Mazda 3, 17 kg in the Mazda 6 and between 28 and 31 kg in the Saab 9-3 and 9-5.

Copper everywhere, copper for everything Copper is a multi-purpose material, whose high-performance properties have made it a key component in vehicles since the dawn of the car industry. As a strong driver of technological innovation, it helps to improve the car's features, efficiency, comfort, safety, energy consumption and environmental friendliness on a daily basis.

While copper was already used, though to a lesser extent, in the famous 1916 Model T Ford, it now plays a critical role in modern cars: even the most basic model contains some 2 km of wiring, mostly used to carry data, send control signals and supply electrical power.

No electronics without copper. In the 1960s, the first electronically controlled automatic transmission, followed a few years later by the fully electronic ignition, would certainly have seemed revolutionary. So what about the current generation of vehicles, equipped as they are with electronic brains, every component of which makes use of copper? It was copper's outstanding electrical conductivity properties that led to the advent of digital controls, equipping cars with sensors (pressure, temperature, speed, rain, obstacles), technical self-diagnosis systems, assisted braking systems (ABS, *Electronic Brake-force Distribution*, *Electronic Stability Control*), driving controls (such as *Autonomous Intelligent Cruise Control* which automatically keeps the car at the speed set the driver), central locking, etc...

The car is now much more than a pure means of transportation. It is designed to be comfortable and equipped with work and leisure spaces. Thanks to an ever increasing number of applications that exploit copper's benefits, the seats are able to remember and automatically adjust to the passenger thanks to an array of small motors, automatic temperature controls keep the interior at a comfortable level and telecommunications are accessible from even the most modest cockpits (hands free mobile phones, navigation assistance, security trackers, DVD players and even Internet connectivity). Copper has opened up a new window onto the world.

Copper, naturally environmentally friendly. Developing cleaner cars is one of the key challenges of this century. Copper is a major asset in combating the greenhouse gas effect and in new processes designed to reduce petrol consumption and CO₂ emissions. Using direct injection systems (largely due to copper's properties), the air petrol ratio is more precise, thereby cutting both fuel consumption and gas emissions. Traditional camshafts are also slowly being replaced with electronic valves that further improve engine efficiency.

The future is one with copper. We spend six years of our lives and 16% of our income travelling. Given that 20% of all energy consumption is used in transportation, and that non-renewable energy reserves are finite, researchers are actively looking at new propulsion systems. Firstly, hybrids which combine conventional combustion engines with electric motors can provide an interim solution. Conventional fuels are used for long journeys and the electric motor for the urban environment. Secondly, work is being done to develop fuel cell driven engines, a solution that creates almost no pollution! These two different systems, both with their powerful electric motors, can contain up to 12 kg of copper.

Copper striving for excellence. In the future, we'll likely have an autopilot system driven by accelerometers, combined with actuators that will control driving, speed and braking. 360° radar and cameras will keep a constant eye on traffic and the vehicle's position.

Connecting the myriad of connectors, sensors, mini-computers and advanced telecommunications systems, nestling under the bonnet of our smart cars, it will be copper wires that will carry the key power and data signals that will deliver all of the above benefits.

More with less. However, designers won't stop there. They have already developed a new heat exchanger using the CuproBraze® technology. Compact heat exchangers, designed from copper and brass, remove the maximum amount of heat from as small a unit as possible. Apart from radiators and charge air cooling systems, CuproBraze® is also being used in engine oil cooling and air conditioning systems.

Given its high pressure resistance, plus its ability to resist both high and low temperatures, this technology is becoming increasingly chosen in market segments that demand absolute reliability in extreme conditions: long distance trucks, farm and construction equipment, generators and all terrain vehicles. Not surprisingly, CuproBraze® technology is found in heating and air cooling components in some trucks entered in the Paris-Dakar rally. Within a short space of time, the CuproBraze® technology has moved out of the lab to win its spurs on the road. Without doubt, we'll find it in our little city run-arounds in no time at all.

Key Facts & Figures

Copper is a metal that is naturally present in the Earth's crust and it is essential for the development of life. It is the most ancient metal known to mankind: the first copper coins date back to 8700 BC.

Natural copper reserves across the planet are currently estimated at 2.3 billion tonnes.

Different Uses of Copper

- **Electricity and energy:** 65% (incl. copper wire in the building industry)
- **Construction:** 25% (architecture and pipework systems)
- **Transport:** 7%
- **Other:** 3% (coins, sculpture, etc.)

The annual usage of copper throughout the world has doubled since the 70's, to reach over 20 million tonnes in 2004, of which 70% was produced by mining (14 million tonnes) and 30% by recycling (6 million tonnes). In 2004, the world market grew by 5.4%.

Over the past 10 years, the use of copper has increased by 14% in Europe. The European copper recycling industry is extremely well-organised and highly efficient, supplying 41% of European annual needs in copper (i.e. over 2 million tonnes).

China has become the leading global copper consumer, i.e. almost 23% of global use against only 9% in 1995.

Profile of copper

On the galvanic scale, copper is located amongst the most noble metals, just behind platinum, gold and silver.

- Symbol: Cu
- Density: 8930 kg/m³
- Melting point: 1083°C
- Available in all forms including sheet and strip
- Durability: over 700 years
- 100% recyclable with no loss of properties

THE EUROPEAN COPPER INSTITUTE

The European Copper Institute is a joint venture between the world's mining companies (represented by the International Copper Association, Ltd.) and the European copper industry. Its mission is to communicate copper's benefits to modern society across Europe through its Brussels office and a network of eleven Copper Development Associations

ECI is active in 4 key areas in Europe:

1. Electricity & Electronics
2. Building Construction & Automotive
3. Environment
4. Health

1) ECI Electricity and Electronics Programme

The ECI Electricity and Electronics Programme is aimed at promoting the rational use of energy, in the context of sustainable development, in three areas:

- **Energy efficiency:** in increasing research, awareness and market development activities, in particular by participating in community action programmes, like the 'European Union's Motor Challenge Programme', which encourage industry to use energy efficient motor driven systems.
- **Quality of electrical energy:** ECI is the founder of a community action programme for professional training (LEONARDO Power Quality Initiative) to improve the quality and reliability of electrical energy by reducing electrical interference. Present in 12 countries, this programme, involving more than 80 organisations, including renowned universities, companies and professional bodies, aims to save European industry 10 billion euro per year through reducing electrical interference.
- **Electrical safety and convenience:** ECI brought together the main players in the field to focus efforts on enhancing electrical safety and convenience in the home (the FEEDS partnership - Forum for Enhanced Electrical Domestic Safety).

2) ECI Construction and Automotive Programme

Construction and automotive are key sectors of activity for ECI. Promotional activities in these fields are centred on 3 main areas:

- **Architecture and piping systems:** to promote copper's aesthetic properties, its durability as well as its natural antibacterial properties, in particular in systems distributing drinking water, heating and gas.
- **The role of copper in solar energy:** to raise awareness of copper's outstanding electrical and thermal conductivity as key factors in efficiently exploiting solar energy.
- **The advantages of copper in modern vehicles:** to communicate copper's essential role in improving the safety and comfort of modern cars and to make possible the electric cars of the future.

3) ECI Environmental Programme

The ECI environmental programme is mainly aimed at understanding copper's role in soil and water. The results are used in discussions on regulations both at a European Union and national level. All research is undertaken with the assistance of eminent scientists.

4) ECI Health Programme

The ECI health programme is primarily aimed at understanding the role of copper as an essential element in health. The results are used to improve health by contributing to the discussions on regulations both at a European Union and national level.

Further information:	
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