

Preface

Copper, gold and tin were the first metals which mankind learnt to use. Copper and gold are amongst a few metals that can be found in nature as solid metals. As copper can be worked easily the oldest known civilisations used it to make useful items as early as 10,000 years ago.

In spite of this people nowadays are less aware of copper than of other industrial metals. Many engineers in the automotive industry are surprised that copper is even used in automobiles. At best mechanical engineers think of copper in connection with the board circuit and starter and generator.

Indeed wire harness, generator, auxiliary motors and electric actuators make up the lion's share of the copper in a car. The implementation of hybrid drives and fuel cells will also see a further increase in the use of copper.

The hybrid drive saves fuel and leads to less harmful exhaust gas. The change from hydraulic to electric actuators and power functions benefits the car and the environment. Electric functions are better suited to consume energy only when there is an actual demand, can be better controlled intelligently, and operating liquids like hydraulic and brake fluids do not need to be disposed of at the end of the vehicle life.

Copper also serves for dissipating waste heat of the control units of power electronics or from engines. The above mentioned applications use copper as it's electrical or heat conductivity is higher when compared to other technical metals.

Most automotive and mechanical engineers are not aware of the many advantages which copper alloys can have for mechanical parts. Of great benefit is the precise hot and cold formability which enables the production of precision parts which, because of their shape, cannot be produced by machining.

The excellent machinability with long tool life and high precision often results in parts for instance in brass being less expensive than in other metals which may be considerably cheaper. Well known gliding properties of copper alloys and the high wear resistance of some special alloys can be combined with very satisfactory strength properties.

Copper is environmentally friendly. It is essential to man, even indispensable for maintenance of the body's defences. It is germ-killing, which may be highly desired in air conditioning units and water pipes. Copper and its alloys are corrosion resistant in various environments (see section "Corrosion"), as centuries

old copper roofs and Bronze Age artefacts show, which have lain for millennia in the soil. Copper is perfectly recyclable. Secondary copper has absolutely identical properties as primary copper. Therefore no particular specifications (see Annex) are needed for remelted copper and alloys.

The mission of this book is to spread this information primarily to the automotive industry, but also to other fields, and to support them with data and facts.

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