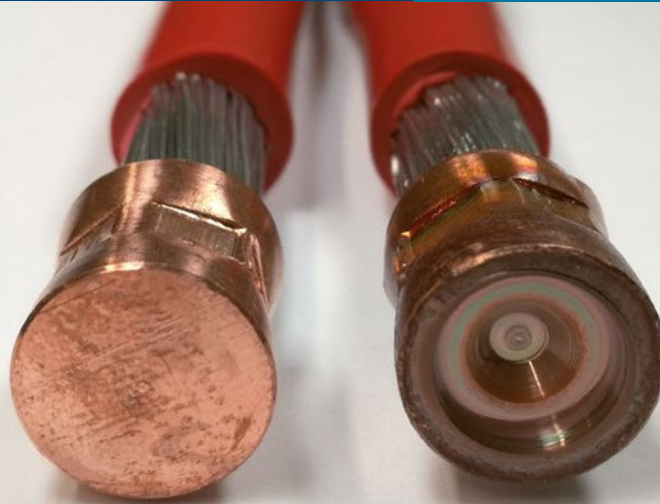




Best practice example

for lightweighting in Germany

Aluminium/copper composite



Friction stir spot welded stranded wire/arrester connection for on-board power supply applications

Friction-based joining processes for Al/Cu joints

Fields of application



Automotives



Energy
technology



Commercial
vehicle
manufacturing



Construction of
rolling stock



Aircraft
construction



Spacecraft
construction

In this example, lightweighting allowed for the following reductions compared to a conventional copper-based model:



Weight approx. -40%



Cost approx. -85%

Application

By improving on-board power supply applications in vehicle construction and the electrical cables used in energy technology to make them greener and more economic, the weight and cost of a vehicle can be reduced. One way to do this is by substituting copper, a material most commonly used for cables, with aluminium.

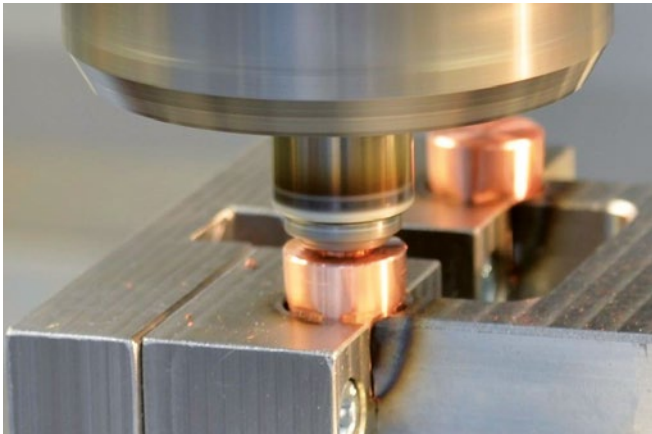
Challenge

Due to its various properties, aluminium is however not able to fully substitute copper. This is where a need for Al/Cu mixed composites comes in, which generates various challenges. These include preventing intermetallic compounds of aluminium and copper from being brittle.

Solution

By using pressure welding processes, such as friction stir spot welding, base materials can be joined below their melting temperature. This makes it possible to generate a compound with comparatively good electrical and mechanical properties.

Best-Practice-Beispiel | Aluminium/copper composite



Friction stir welding process for joining cable/arrester connections



Cross-section of the aluminium/copper composite

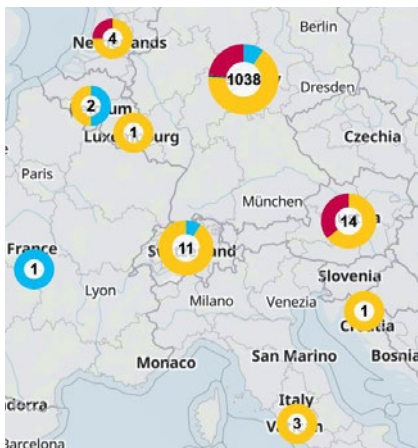
Other potential applications



In this application, a cap-shaped copper element is positioned on the end face of an aluminium cable. The copper element is then crimped onto the aluminium cable and welded using a friction stir welding process.

In this process, a rotating tool with a defined rotational speed and a defined feed rate plunges into the front side of the copper element. The input of friction-based heat leads to a pronounced plastic flow of the metals and thus creates a cohesive bond.

Compliance with all requirements relevant for the sector is ensured. Research activities are being conducted so as to further improve health and safety, environmental protection and recycling.



Der LIGHTWEIGHTING ATLAS

The LIGHTWEIGHTING ATLAS is an interactive web portal that pools information on those active in lightweighting and their skills across different industries and materials. The atlas is free to use and entries into the atlas are also free. You can find the LIGHTWEIGHTING ATLAS at www.leichtbauatlas.de

The Lightweighting Initiative

Modern lightweighting is of pivotal importance for German industry and its competitiveness. The Federal Ministry for Economic Affairs and Climate Action has established the Lightweighting Initiative to support lightweighting in Germany. The Lightweighting Initiative Coordination Office in Berlin, which is financed as part of the initiative, pools all activities relevant to lightweighting and supports German companies, especially SMEs, as they implement lightweighting.

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