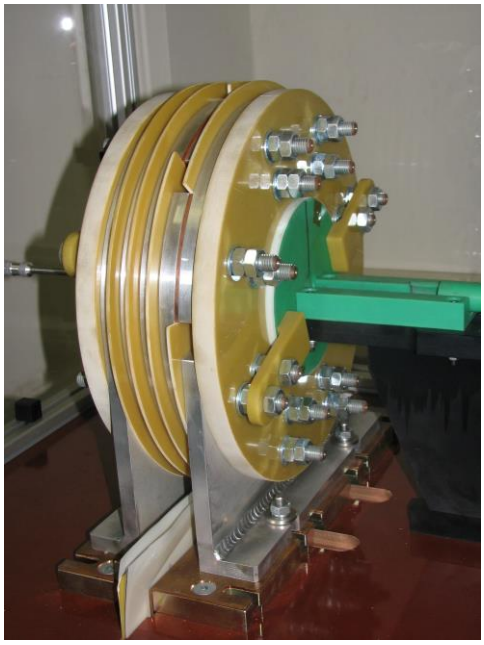
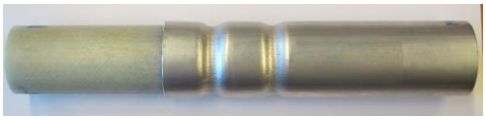
Co-funded by the European Union

METAL MORPHOSIS

Electromagnetic pulse joining



Tool coil used for electromagnetic joining



Electromagnetic pulse connection of aluminium and glass fibre reinforced composite

The Context

Conventional joining processes are frequently reaching their limits, when it comes to joining dissimilar materials. The most important problems are:

- The formation of undesired intermetallic phases. These are extremely brittle leading to a low joint quality and loading capacity.
- Thermally joining materials with different melting temperatures is difficult or even impossible.

Electromagnetic pulse joining or welding is a promising innovative technology, suitable to provide the solution. It is a high-speed forming and joining technology using pulsed magnetic fields for forming electrically-conductive tube or sheet metal workpieces without mechanical contact between tool and workpiece. It can be used for:

- interference and form-fit joining, resulting in mechanical connections,
- electromagnetic welding : impact welding of tubular and flat sheet metal workpieces. Here, a metallic bonding is created.

The electromagnetic pulse technology has already established its place in automotive manufacturing when it comes to welding dissimilar metals. The MetalMorphosis project team have adapted the high-throughput, cost-effective and eco-friendly technique for producing hybrid metal-composite parts.

Our Solution

Wthin the MetalMorphosis project, new joining processes for composites and metals has been developed, for sheet as well as for tubular applications based on the electromagnetic pulse technology.

Process and joint design concepts were investigated and validated for the specified material combinations, and leaded to design guidelines for obtaining joints with optimal quality or performance.

The developed joining methods and design strategies were validate at industrial level. MetalMorphosis had a strong demonstration component, comprising the implementation of 3 case-studies, addressing automotive products.

The MetalMorphosis project developed a new range of novel metal-composite hybrid products for the automotive industry, based on the electromagnetic pulse joining process and taking advantage of new developed composites.

MetalMorphosis opens a window of new opportunities for manufacturing hybrid components, by validating the proposed technologies for joining dissimilar materials.

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Hybrid brake pedal consisting of aluminium and glass fibre polyamide

Hybrid bumper consisting of aluminium and carbon fibre reinforced composites