Neue Materialien
Fürth

Plastic Metal Hybrid Technologies

NEW DESIGN POSSIBILITIES FOR LIGHTWEIGHT CONSTRUCTIONS

The development of load-bearing, multi-functional plastic metal hybrid structures leads to new design possibilities for light-weight constructions. With this technology, extensive metal profiles are combined with complex plastic structures in one shot in the injection moulding process. Contrary to the insert and outsert technique, in hybrid technology both materials are connected in one form with different functional features.

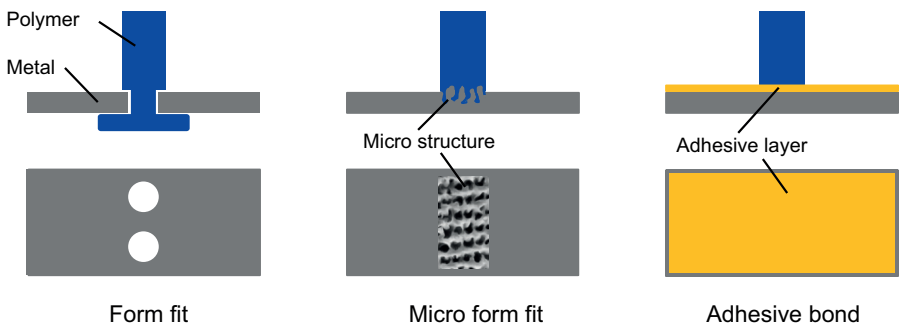
Thus, the synergy of hybrid structures offers a better lightweight potential as the individual materials would offer alone. Plastic metal hybrid parts are significantly lighter and more economic than the metal constructions of the same strength. The more additional functions are integrated into hybrid components, the more significant these advantages are.

LOAD ORIENTED CONSTRUCTION

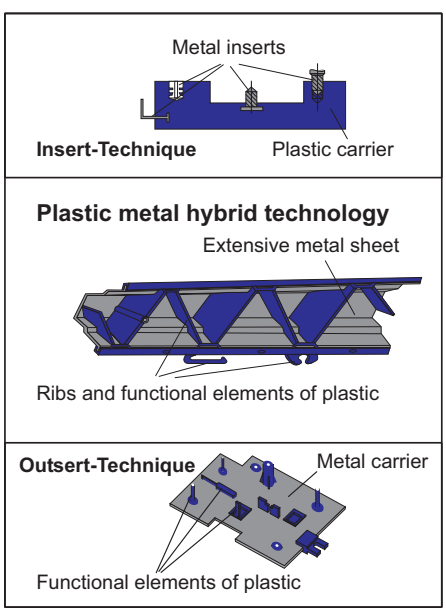
For testing different material combinations and different ribbing strategies of complex, three-dimensional hybrid structures with regard to their load capability, a test specimen, the so called "Erlanger test beam", was designed. A mould with different inserts allows the production of test beams with varying ribbing geometries. Longitudinal ribbings show significant advantages over diagonal ribbings for bending loads, yet for torsion loads the diagonal ribbing transmits the highest torques by far.

SYSTEMATIC USE OF SYNERGY EFFECTS

With metals and plastics often competing against each other in traditional design, the hybrid technology combines the advantages of both materials and their manufacturing and processing techniques. Economically manufactured sheet metal constructions are stabilized by moulding ribs and enhanced by further functional features.



Assembling of plastic metal hybrid structures through form fit, micro form fit or adhesive bond



In plastic metal hybrid technology plastic and metal components exist each in a continuous shape

Connection of 3 sheet metal profiles (grey) to a complex carrier by moulding with plastic in one step. Hybrid frontend for the Ford Focus, front view (Dynamit Nobel Kunststoff GmbH, Weißenburg)

Neue Materialien Fürth

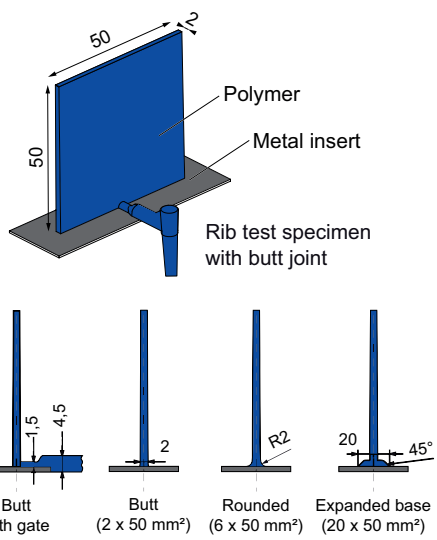
DEVELOPMENT POTENTIAL

- Higher stress resistance by a better adhesion between metal and plastic
- Higher lightweight potential by the use of thermoplastic composites („organo sheets“)
- Processing and weight advantages by foaming of the plastic component (MuCell® process)

Mould "Rib test specimen" with variable joint geometry an variable gate system. Integrated inductive heating for the middle cavity

WE OFFER

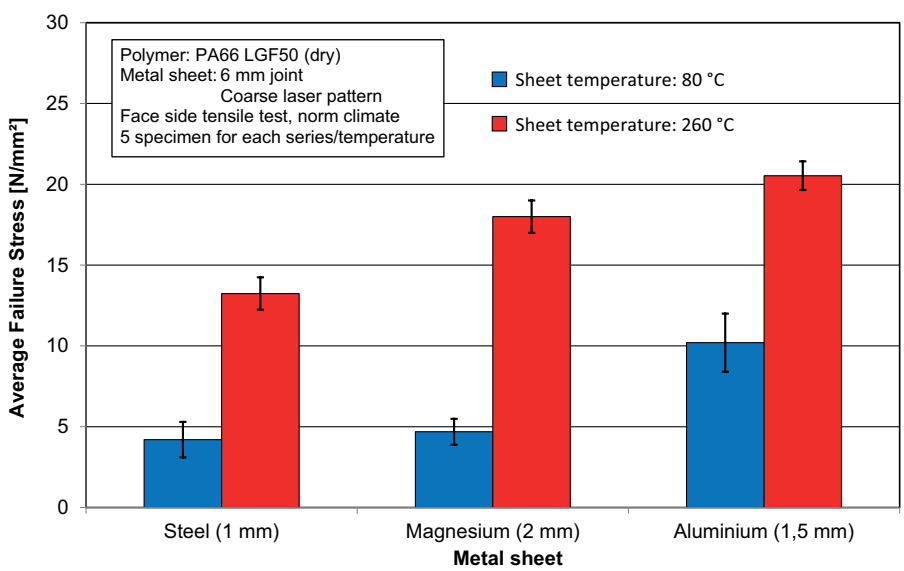
- Assistance in material selection and construction
- Fundamental research into plastic/plastic and plastic/metal adhesion
- Manufacturing of samples and prototypes
- Characterisation of the mechanical properties during static and dynamic load



Rib test specimen with different joint geometries. More geometries are easely adapted via modular mould inserts.

EQUIPMENT

- Multi component injection moulding machine with extensive measuring equipment for process control and documentation.
- Mould "Rib test specimen": 3 cavities with a variable gate system allowing variation of gate geometry and flow length. The middle cavity allows a precise heating of the metal sheet through inductive technology.
- Mould "Erlanger test beam", Mould inserts for the variation of the metal sheet thickness and the ribbing geometry.
- Mould "Torsion test beam" for testing of beams which are connected by means of micro form fit and adhesive bonds. Precise heating of the metal sheets through inductive technology.
- Test mounts for the characterisation of the mechanical properties of "Rib test specimen" under tensile and shear load at room temperature and at elevated temperatures.
- Test mounts for the characterisation of the mechanical properties of test beams under flexural and torsional load.



Average failure stresses of hybrids with micro structured metal sheets. The laser pattern used was optimized for each metal component.

Contact

www.nmfgmbh.de

Neue Materialien Fürth GmbH
Dr.-Mack-Straße 81
90762 Fürth

E-Mail: kunststoffe@nmfgmbh.de

Institutional funded by

Bayerisches Staatsministerium für Wirtschaft, Landesentwicklung und Energie

Europäische Union
Europäischer Fonds für regionale Entwicklung