



LIGHTWEIGHT POWER PACK

Task

As part of the Fraunhofer project »Fraunhofer System Research for Electromobility«, the Fraunhofer ILT is developing a »lightweight power pack«. The pack should be distinguished by the use of different lightweight technologies, new refrigeration and mounting technologies and the integration of the different components of the Fraunhofer Institutes ISE, IWM and UMSICHT. In addition to the development of battery systems, the production and construction techniques for the creation of a lightweight power pack housing are essential for the safe and cost-effective use in electro-mobile applications.

Method

To reduce the weight of the packs, the project partners have combined a high-strength steel (1.4034 press hardened), having a thickness of 1.5 mm, with low density organic sheet. Since the housing of the power pack has to be built in a modular fashion and has replaceable components, users need to be able to access the components easily. This is why a frame construction with integrated stiffening plates has been created. A complex welding device to position and fix the elements is not necessary due to a selected tooth system at the edges. Fraunhofer ILT has developed a positive hybrid connection, which bonds the organic sheet to the steel.

Result

The structure of the lightweight power pack housing was built as demonstrator model in a scale of 1:1 and 1:3. The steel elements were welded in a keyhole-welding process with CO₂ laser radiation at a process velocity of 6 m/min and a power of 2.4 kW. By arranging the connection joints, Fraunhofer ILT could minimize residual stress and distortion so that only a local annealing treatment after welding is required.

Applications

High-strength steels are commonly used in applications where both high strength and low weight are required – for example, in the automotive sector. When the elements are carefully interlocked together, complicated equipment can be omitted. This creates great potential, in particular, for small quantities within flexible manufacturing chains.

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- 3 Lightweight power pack housing (scale 1: 3).
4 Inner assembly of the lightweight power pack housing (scale 1: 1).