

Indirect manufacturing of fiber-reinforced lattices

Reference No: Y20004

CHALLENGE

Sandwich plates are versatile structures commonly used for weight-optimized design in different industries where the mechanical performance-to-weight ratio should be high. The usual structure of a sandwich plate consists of two solid outer faces and a lightweight core. Conventional lattice structures for use in sandwich panels can be classified into three types: metal-based (alloys), polymer-based (thermoplastics), or fiber-reinforced polymer-based (cases of CFRP or similar). When high mechanical performance is required in weight-sensitive structures, lattice structures based on metal alloys without the use of supporting cores are standard.

INNOVATION

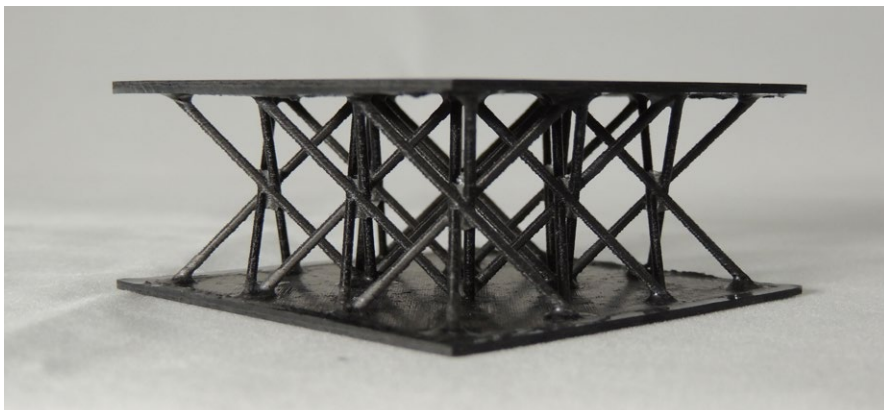
The present invention provides an innovative design and simplified manufacturing for lattice-type cores made from fiber-reinforced composite materials. It especially suits sandwich-panel applications which require an outstanding performance-to-weight ratio. The invention enables repeatability of manufactured parts by maintaining tight tolerances on angles and dimensions using standard elements.

The resulting lattice cores ensure a maximum-performance sandwich structure by using the least amount of material as possible.

Lattice cores belong to the family of periodical three-dimensional sandwich cores. Periodical cores consist of a unit-cell-design that is multiplied over the volume of the core to reduce manufacturing costs.

Employing CFRP as parent material for lattice cores enhances the overall mechanical performance and at the same time allows ultra-lightweight density. Due to the almost zero thermal expansion coefficient of the carbon fibres. The manufacturing process consists of three main steps:

- Fabrication of a supporting structure to position the lattices. (The supporting structure can be removed after the cure of the resin.)
- Positioning of the lattices and outer structures.
- Even distribution of the resin in all channels in a vacuum-assisted casting process to connect the load-carrying elements.



COMMERCIAL OPPORTUNITIES

- The invention caters to manufacturers of parts or components of lightweight high-performance parts, e.g. satellites, aircraft, large telescopes, building elements and many more.
- Especially for architecture and building design, the structure offers a technical look and universal application possibilities.

DEVELOPMENT STATUS

Prototype