

The physical foaming process MuCell®, a lightweight technology for thermoplastic injection molded parts, has hitherto been known mainly from applications in the automotive industry, office machines and the "white goods" sector.

In aerospace, however, high-performance plastics are used, often in combination with fiber reinforcement. An interesting approach is also the functionalization of continuous fiber reinforced components with thermoplastic materials, for example by overmolding. Here, the MuCell process offers some special process advantages.

At K2016, the discussion about Trexel's participation in the hyframe project began with the goal of developing a thermoplastic based primary structural component using the overmoulding process. Trexel then reviewed the possibilities of transferring the known benefits of MuCell technology to the aerospace industry. During the project application phase, the enormous potential of physical foaming for the aircraft industry became apparent.

The main reason why the project initiators initially thought of physical foaming was to minimize warpage and process-induced residual stresses. Furthermore the MuCell technology simplifies manufacturing large components, establishing overmoulding for a wider field of components. Of course, the weight reduction by MuCell in the aircraft industry is not insignificant, but in this particular case was not the main motive, but a welcome additional benefit.

Currently, aluminum structural members are fastened to the aluminum hull of the aircraft by rivets. In future generations of aircraft, however, these could no longer consist of aluminum, but rather of highly reinforced high-temperature thermoplastics.

The vastly different electrochemical potentials make combination of a carbon fiber reinforced hull and aluminum components susceptible to corrosion. Fiber-plastic composites made of high-performance thermoplastics avoid this problem.

Overall, the project has been running for 36 months since its inception in 2016 and is funded under the LuFo V-3 program of the Federal Ministry of Economics.

The project team consists of very different partners:

Textile manufacturers, as well as manufacturers of 3D reinforcement structures, manufacturers of 3D reinforcement structures, research institutes, injection molding companies, companies for induction welding, as well as production companies for the aerospace industry. This ensures a variety of core competencies, but also a diverse know-how from different areas.

Our goal is to work out a solution to the problem with the specialists in the individual fields in the consortium. But it's not just about the presentation and publications, but rather to bring the developed solutions in the coming generations of aircraft.

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