Ultra-lightweight milling head with bar lattice structure and optimized cooling system for tooth faces and flanks.

Development status

Final Phase

The technology is routinely used.

IP protection status

Patented in the Czech Republic, PCT patent pending.

Partnering strategy

Collaboration, licensing

Institution

University of West Bohemia

Vlastník

ZČU

Challenge

Ordinary large-diameter milling heads are characterized by higher weight and by insufficient intensity of cooling, which results in their limited usability. We have developed and are able to offer milling heads of new generation with dramatically-reduced weight (less than 50% of that of ordinary tools) but equal overall stiffness and strength and with optimized cooling for tooth faces and, most importantly, flank cooling capability. The efficiency of the flank cooling proved to be very high, improving the durability of the tool.

Description

The milling head was produced using an additive manufacturing process – 3D printing of metal. Significant material savings were achieved, while maintaining the overall stiffness and strength of the tool. The result is a unique tool design with optimized cooling performance. To accomplish this, strength analysis was conducted and key structural details of the tool were optimized. The product can be used as a general-purpose tool. It is now undergoing long-term verification in machining operation. Long-time tests were conducted on workpiece materials of ISO S, M and N classes, namely Inconel 718, AISI 1.2709 steel and 7075 aluminium alloy. Their purpose was to test the overall stiffness and, above all, ascertain the benefits of the tooth face and flank cooling.

Commercial opportunity

- construction of larger-diameter tools for increased machining productivity - improved performance of process fluid, spraying etc. - higher durability of the tool - reduced energy consumption in machining - better workpiece surface integrity (roughness, stress, precision) - enhanced safety and serviceability of the machine spindle - shorter cutting tool production time - reduced overall machining costs -

the tool is simple to rebuild