GESAMTVERBAND DER ALUMINIUMINDUSTRIE e.V.

Cylinder head reconstruction for Porsche legends

These days, anyone who owns a legendary Porsche 550 Spider, 904 or 356 Carrera can count himself lucky. The value of these vehicles has increased tremendously in recent years. However, special parts such as cylinder heads are unfortunately not available anymore. In the event of damage, the only option is to reconstruct it, and 3D printing is an economical possibility here.

Reconstructing the sophisticated parts represents a challenge for every design engineer, because in most cases the drawings aren't available and the OEMs don't provide them. In a specific case, the reconstruction of an aluminium cylinder head for a Carrera began with the measuring and scanning of the defective head.

With meticulous care to detail the valve guides, seat rings, camshaft bearing, intake and outlet ports, cylinder head screws, etc. had to be created as basic 3D bodies. Then they had to be imported into overarching functional models and given design features for casting, such as measurements, bevels and fillets.

After the geometric reconstruction stage, the next thing to do was to produce the sand cores. For cost reasons alone, completing the project with conventional cores using core-making tools was not an option. The only remaining alternative was to produce the cores using 3D printing. The mould-making work was handled by a foundry in Schwäbisch Gmünd called Rauleder & Rudolf, which specializes in special components. A HIP (hot isostatic pressing) treatment led to a drastic improvement in the mechanical properties and a reduction in porosity. After that, a concluding T6 heat treatment provided the final strength of the cylinder head. The parts were finished in a 5-axis machining centre, based on the 3D CAD data. After completion, the aluminium cylinder head was ready for installation.

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