

Development Of Innovative Combustion Chamber Components For Large Marine Engines

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Abstract. The development of an innovative hybrid lightweight piston for marine engines is intended to help to reduce emissions and operating costs. The piston consists of a piston base and a top part. In the manufacture of the piston base, a preform is cast and the final geometry is produced by means of subsequent forming (forging). This significantly improves the mechanical properties of the material. As a result of the possible material advantages in the overall process chain, the piston base can be designed as a "lightweight component". By examining the entire "primary casting - forging" process chain, the use of materials is significantly reduced, especially in the "casting" production route, since even minor internal defects can be tolerated after the preform has been cast. For the subsequent forging process, this material pre-distribution thus represents an optimum initial forging shape. The upper part of the piston is made of a layered composite material. Here, the special material is already applied to the blank prior to the forging process by laser or PTA build-up welding. This means that the filler material is also formed together with the base material, which in turn has a positive effect on the mechanical properties. This is followed by a heat treatment, which further improves the high temperature resistance. Due to the higher strength and corrosion resistance of the piston head, the combustion chamber temperature and pressure can be increased, enabling the required reduction of emissions and fuel.