



Thruster gear casing on turntable of milling machine

Precise fabrication process for improved safety and efficiency of gear casings

KINKELE | Gear casings for outboard thrusters are typically designed as welded assemblies. Because of the enormous powers that are transferred and the power density of mechanical drives, the casings are highly stressed mechanical components. Fatigue strength and rigidity of the casing are paramount when operating safety and efficiency of the gear need to be improved.

Production specialist Kinkele has found a way to improve the rigidity and precision of bevel gear casings for marine applications, resulting in reduced weight and increased efficiency of the gear. The new manufacturing method increases the quality of both execution and subsequent non-destructive testing (NDT) of the full-

depth welds of a thruster gear casing, Kinkele says. A semi-automatic, submerged arc welding machine with turntable is used to weld the circular seams, whereas the complex three-dimensional geometry of the intersection between oval shaft and cylindrical bevel casing demands a MAG hand-welding process. As Kinkele employs its own certified NDT personnel, a process has been designed that allows intermediate in-line non-destructive testing that has significantly improved the detection of potential welding defects early in the process. This leads to a significantly higher welding quality at the end of the process, allowing structural engineers to increase their safety factors on required nominal loads without

increasing material thickness or the size of the welding seam.

For the efficiency of a bevel gear, the adjustment of the gear play is a key factor. The main influence apart from the quality of the gears is the position and shape tolerances of the axis for the shafts in the gear casing. Kinkele has now introduced a machining process whereby the whole gear casing can be machined on a large machine tool sitting on a turntable, eliminating reclamping for different machining operations. In combination with a hydrostatically supported carrier beam of the machine spindle, tolerances of less than 0.03mm can be achieved repeatedly. With these close tolerances, the adjustment of the play in the gear is very precise, resulting in increased overall efficiency of the whole gear, Kinkele says. Not only net power output increases by 1–2%, but also heat rejection to the cooling oil is significantly decreased.



Non-destructive testing (ultrasonic) of a full-depth weld seam

> ABOUT KINKELE

The 130-year-old, family-run company excels in building highly stressed, custom-designed weldments, focusing on applications that require precision, complex project management and stringent control and documentation of the manufacturing processes. Kinkele employs 350 highly skilled people in its state-of-the-art factory near Würzburg. www.kinkele.de