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MariClad - Repair of ship propellers using additive manufacturing methods

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The aim of this project was to develop reliable and reproducible technologies for the repair of large-volume maritime components using the additive manufacturing processes Wire Electric Arc Energy Deposition (WEAED), Wire Laser Beam Energy Deposition (WLBED) and Powder Laser Energy Deposition (PLED). With the help of these additive manufacturing processes, defective maritime components were to be reconditioned by applying material directly to the intact part. The WEAED was carried out with similar welding filler material $CuAl_8Ni_4Fe_2Mn_2$. The large-volume structure of components demonstrated a process free of irregularities and no need for any subsequent heat treatment. With the same filler material, welding carpets free of irregularities were generated using WLBED. Heat treatment was found to be necessary to reduce residual stresses. For the PLED, the powder alloy $CuAl_{10}Fe_5Ni_5$ was produced in-house in a metal powder production plant. The aim was to produce a metal powder that was as spherical and free-flowing as possible. The parts produced using PLED were free of internal irregularities and did not require heat treatment. Following the successful completion of the research project, corresponding parameter sets are available for all three additive manufacturing processes, which enable the repair of defective maritime components made from multi-material aluminum bronze.