

OP 053

Microstructural and mechanical characterization of a 16MND5 low alloy steel manufactured by innovative WAAM SAW process

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Wire Arc Additive Manufacturing (WAAM) allows the rapid production of large, homogeneous parts with complex geometry. However, in the nuclear field, parts can reach dimensions of ten to a hundred tons. In this case, the usual WAAM TIG or CMT processes do not have sufficient deposition rates to consider the manufacture of parts of such dimensions within a reasonable time. The submerged arc welding process (SAW, Submerged Arc Welding) allows much higher deposition rates. Although there are very few references to this process for additive manufacturing in the literature, it has been used for a long time for the welding and coating of nuclear power plant vessels, so this process is well known and mastered as a welding process. This study proposes to evaluate the SAW process as an additive manufacturing technique with the example a low-alloy steel of type 16MND5.

Several big parts were fabricated with WAAM SAW, heat treated and characterized by metallography and mechanical tests (tensile and impact toughness). Thermal ageing behaviour is also assessed through a step cooling heat treatment followed by mechanical tests.