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MONITORING AND ANALYSIS OF THE STRESSED-DEFORMED CONDITION OF THE SHELLS, IN THE PROCESS OF THEIR MANUFACTURE DURING 3D PRINTING AND WELDING WORKS

Abstract

Today, in rocket technology, along with welding technologies, 3D printing is actively used. The condition of printed and welded parts, shells, and structures is monitored by monitoring the geometry, state, and analysis of X-ray patterns. The structure is freed from residual stresses, if necessary, by classical metallurgy methods for welded structures and is not available for plastics in 3D printing. At the same time, the production does not control the actual presence of residual stresses, de-formations and local changes in geometry The author proposes to monitor the condition of shells and other structures made using 3D printing and welding using the "method halogena" described in [1]. The works considers a spherical shell and a box-like structure made using 3D printing, as well as conical and cylindrical structures at various stages of the welding process. The possibility of continuous visual monitoring of the stress-strain state of structures during 3D printing and welding is shown. In November 2019, when studying a hemispherical structure made by additive technologies "method perpendicular" was discovered, which indicates the places of re-sidual deformations and stress concentrators and allows you to choose a printing meth-od to eliminate them. In January 2020, in the study of the printed box construction "method directional" was discovered, which indicates the level and direction of physic -mechanical properties material in the printed structures, proves the presence of anisotropy in them and allows you to choose the print direction to eliminate them using additive technologies. The studies performed make it possible, using additive technologies and welding operations, to minimize deformations residual, concentrators stress, and anisotropy of structures. Carry out 3D - printing and welding work with visual monitoring of the state in real time. Monitoring the level of machining during manufacture.