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TECHNOLOGY OF ADDITIVE SYNTHESIS OF MASSIVE PRODUCTS BY LAYER-BY-LAYER ARC SURFACING WITH HEAT INPUT POWER CONTROL

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In today's world, where innovative approaches to the production of complex and large-sized parts are in demand, additive fusion technology is increasingly attracting the attention of engineers and researchers. Among various additive synthesis methods, layer-by-layer arc surfacing technology stands out for its ability to create massive products with high productivity and relatively low cost. However, the synthesis of large-sized objects by layer-by-layer arc surfacing faces specific problems associated with accumulation of residual stresses and strains, non-uniformity of structure and mechanical properties, and high heat input, which negatively affects the geometric accuracy and performance of the products. To solve these problems, one of the promising directions is the use of the technology of heat input power control in the process of layer-by-layer arc surfacing.

Layer-by-layer arc surfacing, also known as Wire Arc Additive Manufacturing (WAAM), is an additive fusion process that uses a welding arc formed between a wire electrode and the workpiece to deposit a material. In the layer-by-layer arc surfacing process, welding wire is fed into the arc zone, then it is melted and deposited on the previous layer, forming a three-dimensional object. The technology of heat input power control implies dynamic change of welding parameters during the surfacing process in order to control the heat input into the workpiece. This helps optimise the temperature field, reduce the level of residual stresses and deformations, as well as improve the structure and mechanical properties of the material.

The application of this technology offers a number of significant advantages over traditional manufacturing methods and other additive technologies. The main advantages are as follows: reduction of residual stresses and deformations, improvement of the structure and mechanical properties of the material, increased accuracy of the product geometry, the possibility of creating large-sized products, the possibility of creating products with a functional gradient and many others.

Despite numerous advantages, the technology of additive synthesis of massive products has a number of problems that need to be solved.

Thus, this technology represents a promising direction for the development of additive technologies, making it possible to create large-size parts with improved performance and reduced costs. Despite some problems, active research and development in this area will foster a wide implementation of this technology in various industries in the near future.