

TITLE

Evaluation of Axial-Flow Impeller Fabrication Process by Wire Arc Additive Manufacturing and Machining

ABSTRACT

In order to realize an eco-friendly energy system for the purpose of a sustainable society, it is necessary to consider not only the energy balance during operation, but also the energy costs such as during the manufacturing of the components of the system. One of these components is a turbomachinery used in thermal and nuclear power generation. These turbomachines are often large machines with special specifications, and if they could be modified into eco-friendly manufacturing processes, the benefits would be significant and of industrial value. In recent years, studies have been conducted using additive manufacturing in various industrial applications. In particular, various research and development efforts have been active in wire arc additive manufacturing (WAAM) because of its compatibility with large and complex-shaped parts, although research results using real industrial parts as test pieces have been limited. In this study, firstly, the axial-flow impeller of an industrial pump was fabricated using a hybrid system of WAAM and machining to verify the feasibility of manufacturing by applying AM technology. Several axial-flow impellers were then designed based on the fabricated axial-flow impeller and based on the information obtained during the fabrication process using the hybrid system, a comparison was made with the application of the traditional fabrication process to clarify the advantages of using this hybrid system. Based on these results, it is expected that the application of WAAM will lead to an eco-friendly turbomachinery manufacturing process.

KEYWORD

WAAM; Additive Manufacturing; Turbomachinery; Fabrication Process; Eco-Friendly