선체외판부 3.2T 박판에 대한 SAW 용접 적용에 관한 연구

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A Study on the Application of SAW Process for Thin Plate of 3.2 Thickness in Ship Structure

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Abstract

Recently just as in the automobile industry, shipbuilders also try to reduce material consumption and weight in order to keep operating costs as low as possible and improve the speed of production. Naturally industry is ever searching for welding techniques offering higher power, higher productivity and a better quality. Therefore it is important to have a details research based on the various welding process applied to steel and other materials, and to have the ability both to counsel interested companies and to evaluate the feasibility of implementation of this process.

Submerged-arc welding (SAW) process is usually used about 20% of shipbuilding. Similar to gas metal arc welding(GMAW), SAW involves formation of an arc between a continuously-fed bare wire electrode and the work-piece. The process uses a flux to generate protective gases and slag, and to add alloying elements to the weld pool and a shielding gas is not required. Prior to welding, a thin layer of flux powder is placed on the work-piece surface. The arc moves along the joint line and as it does so, excess flux is recycled via a hopper. Remaining fused slag layers can be easily removed after welding. As the arc is completely covered by the flux layer, heat loss is extremely low. This produces a thermal efficiency as high as 60% (compared with 25% for manual metal arc). SAW process offers many advantages compared to conventional CO2 welding process. The main advantages of SAW are higher welding speed, facility of workers, less deformation and better than bead shape & strength of welded joint because there is no visible arc light, welding is spatter-free, fully-mechanized or automatic process, high travel speed, and depth of penetration and chemical composition of the deposited weld metal. However it is difficult to application of thin plate according to high heat input. So this paper has been focused on application of the field according to SAW process for thin plate in ship-structures.

For this purpose, It has been decided to optimized welding condition by experiments, relationship between welding parameters and bead shapes, mechanical test such as tensile and bending. Also finite element(FE) based numerical comparison of thermal history and welding residual stress in A-grade 3.2 thickness steel of SAW been made in this study. From the result of this study, It makes substantial saving of time and manufacturing cost and raises the quality of product.

Key Words : Submerged Arc Welding(SAW), Thin Plate of A-Grade 3.2 Thickness Steel, Optimized welding Condition, Mechanical Test, Finite Element