하이브리드 방식 (CNC+Laser)을 이용한 폴리머용접공정

유종기*, 이춘우*, 김순동**, 최해운***, 신현명***
* 계명대학교 지능형자동차 대학원
** 계명대학교 대학원 기계자동차공학부
*** 계명대학교 기계자동차공학부

Hybrid (CNC+Laser) process for polymer welding

Jong Gi Yoo, Choon Woo Lee, Soon Dong Kim, Hae Woon Choi, Hyun Myung Shin
School of Mechanical and Automotive Engineering, Keimyung University

Abstract

Polycarbonate (PC) and Acrylonitrile Butadiene Styrene (ABS) was welded through a combination of a diode laser and CNC. Laser beam passed the transparent PC and was absorbed in an opaque ABS. Polymers were melted and welded by absorbed and conducted heat. Experiments were carried out by varying working distance from 44mm to 50mm for the focus spot diameter control, laser input power from 10W to 25W, and scanning speed from 100 to 400mm/min. The weld bead size and the specimen cross-section were analyzed, and tensile results were presented through the joint force measurement. With focus distance at 48mm, laser power with 20W, and welding speed at 300mm/min, experimental results showed the best welding quality which bead size was 3.75mm and the shear strength was 22.8N/mm^2. Considering tensile strength of ABS is 43N/mm^2, shear strength was sufficient to hold two materials. A single process was possible in CNC machining processes, surface processing, hole machining and welding. As a result, the process cycle time was reduced to 25%. Compared to a typical process, specimens were fabricated in a single process, with high precision. By combining two operations processes developed process gained 50% more efficiency.

Key Words : Hybrid process (하이브리드 공정), laser process (레이저 공정), polymer welding (폴리머 용접)