

Abstract of the Dissertation
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“Quality Improvements of Welding Process Based on Robotisation Involving
Socioeconomic Factors”

Dissertation addresses the issue of robotic welding implementation to welding processes taking into account economic, quality and social factors. The subject required a comprehensive approach that gave the work an interdisciplinary character. Issues related to robotisation in welding processes have been presented on the world markets for many years but social and economic factors, especially in Poland, are still the cause of a small number of this type implementations .

The research was conducted in three phases: preparatory, proper and complementary.

Based on preparatory research the state of innovation of welded products and structures manufacturers was determined. Additionally directions of welding development were specified. These selected companies were the adequate base to further analysis.

During research proper quality analysis, comparative analysis of the welding efficiency and costs were conducted and robotisation impact on employment was specified.

To determine welding quality of welded products selected for research for the purposes of this dissertation, following methods were chosen: non-destructive testing NDT, in particular the visual test (VT) and macroscopic, metallographic examination. Based on the research, quality of the products was specified. Additionally to determine process' quality FMEA analysis and process mapping were performed.

Under comparative analysis of the welding efficiency and cost a formula for determining cost-effectiveness degree of robotisation's implementation as well as a formula for payback period regarding to manual welding were developed. During research, measurements of working time were performed, consumption of materials and energy was specified and direct costs of welding were calculated.

As a next point of research the proper analysis of robotics impact on employment, industrial safety and qualifications of welding personnel was conducted. It was found that the welding method being used has a significant impact on a human and environment.

Complementary research consisted in selecting specialists in the robotics and welding field. Interviews were conducted with them on robotic-related issues in welding processes and about the benefits of such an implementation and robotisation impact on employment.

Based on preparatory research, proper research and interviews with specialists the model of improving welding processes while robotisation implementation has been developed.