

## Simulation: A Tool for Stabilization of Welding Processes in Lean Production Concepts

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**Abstract :** Stabilization of critical processes in order to have the right quality of the products, more efficient production and smoother flow is a key issue in lean production. This paper presents how simulation of key welding processes can stabilize complicated welding processes in small scale production, and how simulation can impact the entire production concept seen from the perspective of lean production. First, a field study was made to learn the production processes in the factory, and subsequently the field study was transformed into a value stream map to get insight into each operation, the quality issues, operation times, lead times and flow of materials. Valuable practical knowledge of how the welding operations were done by operators, appropriate tools and jigs, and type of robots that could be used, was collected. All available information was then implemented into a simulation environment for further elaboration and development. Three researchers, the management of the company and skilled operators at the work floor where working on the project over a period of eight months, and a detailed description of the process was made by the researchers. The simulation showed that simulation could solve a number of technical challenges, the robot program can be tuned in off line mode, and the design and testing of the robot cell could be made in the simulator. Further on the design of the product could be optimized for robot welding and the jigs could be designed and tested in simulation environment. This means that a key issue of lean production can be solved; the welding operation will work with almost 100% performance when it is put into real production. Stabilizing of one key process is critical to gain control of the entire value chain, then a Takt Time can be established and the focus can be directed towards the next process in the production which should be stabilized. Results show that industrial parameters like welding time, welding cost and welding quality can be defined on the simulation stage. Further on, this gives valuable information for calculation of the factories business performance, like manufacturing volume and manufacturing efficiency. Industrial impact from simulation is more efficient implementation of lean manufacturing, since the welding process can be stabilized. More research should be done to gain more knowledge about simulation as a tool for implementation of lean, especially where there complex processes.

**Keywords :** simulation, lean, stabilization, welding process

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