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New Potentials for the Optimization and the Quality Assurance of the Hot Plate Welding Process

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Since the sixties the heated tool welding is successfully used in different ranges of the plastic welding engineering. In the year 1987 Potente et al. found the optimal machine settings in respect to the ratio between joining displacement to melt depth (s_f/L_0) and melt depth to wall thickness (L_0/d) for semi-crystalline and amorphous thermoplastic materials. Since then, this criteria were used to optimize the heated tool welding process. However this criteria are only considered as reference values, whereby the optimal operating point is not always found. Today new possibilities arise as a result of the employment of modern movement and control concepts for the heated tool welding: the free programming of all phases of the welding process in different steps makes it possible to integrate way-, force- or speed-regulated phases into the welding process. The direction of movement is freely selectable: therefore the welded part can be disrupted speed-regulated directly in the welding machine, i.e. the short time tensile test is included in the welding process to detect the optimal process parameters. The determined correlations between the short time tensile strength on the one hand and the weld strenght directly in the cooling phase on the other hand, can be used as basis for a self-optimization. So it is possible to use the weld strenght, determined directly in the cooling phase on the welding machine, for a process parameter identification and also for a quality assurance. In this paper the mechanical properties like the short time tensile strenght of the weld will be compared to the weld strenght, determined in the cooling phase, on the basis of the variation of the process parameters (s_f/L_0) and (L_0/d). The found correlations between these mechanical properties can be used for a process parameter identification and for a quality assurance without the implementation of the short time tensile test.