

SE-9.5 A Contribution to the Reduction of Annealing Processes in the Manufacturing of Valve Solenoids by Using Inline Measuring Technology in the Caulking Process (A)

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At Robert Bosch GmbH, electromagnets are used in automotive and automation technology as valve solenoids for pneumatics and hydraulics, or as actuating and pressure solenoids. The Bosch Nuremberg produces large numbers of actuators for transmission control. During assembly of the subassemblies, press-in and caulking processes are used. The aim of this paper is to point out the potentials of an elimination of the annealing processes by investigating the interrelationships between individual components and their assembly process parameters. In addition, errors in the caulking process should be detected and prevented at an early stage. The solution is the magnetic characterization of the magnetic components and assemblies before and during their assembly and the establishment of a connection to the quality criteria. This requires the development and construction of measuring equipment and systems that can be used to assess the product quality at an early stage of assembly and adjust it in such a way that, on the one hand, batch fluctuations can be compensated and, on the other hand, new materials can be used, thus eliminating the mentioned complex annealing processes prior to assembly.

The paper is structured in the following order: First, the quantitative energy saving potentials regarding the reduction of the annealing processes for valve solenoids on the example of the Bosch plant Nuremberg are presented. The second section explains the setup of the inline measurement technique which allows an active process control to optimize the caulking process regarding the magnetic quality criteria of the actor. In the last section a finite elements analysis (FEA) to investigate the effects of various input factors to the caulking process outcomes is shown.