

PiezoBolts

Analysis technologies for multi-stage forming processes based on sensorial connection elements and data mining tools

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Abstract

Multi-stage processes are characterized by high workpiece-complexity, -functionality and -quality. The automatically linked processes are characterized by high productivity but also high investment costs. Process failures in chained stages often lead to unexplained failure generation and downstream failure mechanisms which lead to unexpected machine shutdown and delayed return on investments. Countermeasures are mostly based on domain knowledge and conservative design strategies. In order to achieve medium and long-term competitiveness, appropriate measurement technology for multi-stage processes are required. In this research project implementation strategies for automatic process monitoring based on data from sensorial connection elements were created.

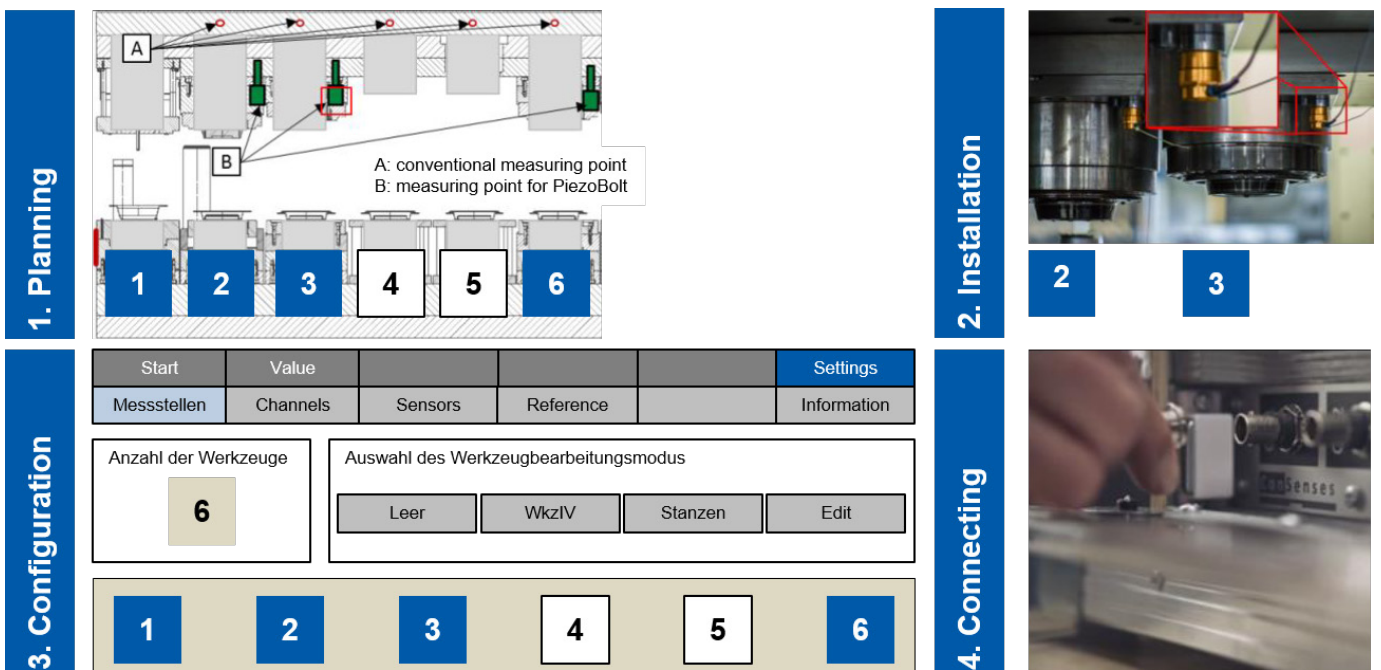
Project description

Figure 2 shows the procedure for the measurement setup for data evaluation on multi-stage tools with sensorial connection elements. After planning the sensor integration the analysis system is configured and the sensors are installed and connected to the measurement electronics. The advantage of sensorial connection elements as process sensors is the simple integra-

tion by using existing screw connections to generate high-quality data from the process. This data can be used for different implementation strategies for automatic process monitoring.

Results

As part of the research project, Werner Schmid GmbH, identified sensitive forming processes and worked out typical error patterns which were examined as examples. To classify the error patterns a Failure Mode and Effects Analysis (FMEA) was conducted. In a 2D FE model the downstream failure mechanisms within the tool were considered. Based on the simulation results, the creation and evaluation of realistic FE models and the targeted use of sensorial connection elements, in this case PiezoBolts, made it possible to assign the cause to the responsible forming step and thus to the corresponding forming stage. In series of measurements of good and bad parts force curves were determined which show good conformity with the expected values of the defect simulation.



[1] Procedure for the measurement setup for data acquisition on multistage tools with sensorial connection elements

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Project partners

