Ultrasonic evaluation of tailored forming bearing components

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Paper Title: Ultrasonic evaluation of tailored forming bearing components

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Abstract: A future trend for machine components like rolling-element bearings is the application of multi-materials for the component production. In order to manufacture such components with appropriate quality, a new process chain called Tailored Forming was set up. Within this process chain, joined semi-finished work pieces are utilized and formed, followed by a finishing process including heat treatment. Thus, a high strength steel with a fine crystalline structure is applied on a metallic base material like mild steel or aluminium. In the case of a Tailored Forming process, various process steps for joining different materials and a subsequent forming are studied. This requires a minimal production quality as the production steps build on each other and in particular, the joining process can significantly influence the component properties. This is dependent on the pores, blowholes or delamination of the different materials as well as the intermetallic phases existing between steel and aluminium during the joining process. Since the semi-finished workpieces go through further process steps, their testing must be non-destructive. Such a test methodology can be realized by scanning acoustic microscopy. The method allows for a tomographic representation of material defects in multi-material components with little effort.
Contemporary research shows that ultrasound image examinations are being used in the medical technology. The transfer of this technique to applications with inorganic and in particular metallic samples is still associated with great challenges. Metallic components exhibit high speeds and small differences which represent a challenge for the digital scanning of ultrasonic measurements of these components. The measurements were performed using a TVA-Tepla System with water as coupling medium. In the case of Tailored Formed bearings, it is possible to evaluate the joining zone regarding defects and pores. This article presents the findings of such evaluations for friction welding or co-extrusion.