

Novel Approach in Cold Forging for Efficient Manufacturing of Shaft-Hub-Assemblies

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Abstract.

In times of electric mobility, weight and costs of powertrain components continue to play an essential role. The volume of material used and the type of production have a significant influence in this regard. Thus, gears are essential elements in mobile powertrains. In the past few years, recent developments have shown the technological potential of shaft-hub connections produced by joining by forming. For this purpose, a two-piece design separated into gear ring and gear wheel body offers a wide variety of possibilities for individual design of the shaft-hub connection and a suitable material combination. Therefore, two process strategies have been investigated at the Institute for Metal Forming in Stuttgart. First, a shaft is formed into a hub by lateral extrusion. For the second manufacturing process, a blank is placed between a gear ring and a shaft and is then joined in one cold forming step. In order to manufacture two-piece shaft-hub-connections a gear ring needs to be produced prior joining. Thus, a new cold forming process has been developed to enhance the economic efficiency and material usage for manufacturing of radial gears. In this context, gear rings offering the required tolerances can be produced for this joining process described above without additional machining process for the teeth. In this process a sequential forming of the tooth geometry is performed and thus results in a reduction of the forming force and tool load. This contribution describes the combination of both processes. The novel manufacturing method for an exemplary gearwheel is presented and the required forming process steps are numerically examined with regard to their applicability.