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Sheet metal forming optimization using finite element methods (FEM)

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In this study, the effects of spring back on sheet metal forming process are examined and investigated to develop optimum forming products strategies. Both the finite element analysis as well as the mathematical and numerical analysis and investigations were employed. For the analysis the effects of sheet metal thickness, tooling geometry, friction condition, sheet material property and sheet metal processing parameters were considered. According to this FEM analysis investigations during forming process of spring back on sheet metal bending process is done. Though using both mathematical and numerical methods the influence of sheet metal thickness, sheet metal type, friction condition, tool radius and tool shape on spring back to aluminium, copper, mild steel and the steel sheet metal have been considered for investigations. According to the investigation shows that increasing sheet metal thickness from 1.6mm to 9.0 mm the spring back is reduced 8% and 10.18 % analytical and numerical results respectively. While a thin sheet metal thickness highly affects the formation of spring back on metal forming products. Since to reduce the spring back it is better to use high strength sheet metal components for optimum quality product and performance improvements. Although, when increasing of sheet metal strength spring back

increases because spring back of the sheet should depend on the yield strength of the material. As the materials yield strength increase the spring back after un-loading also increases i.e. using Aluminium sheet metal instead of high strength sheet metals spring back is reduced by 56. %. For decreasing of the tool radius leads reducing spring back. Accordingly, the effects of sheet metal die on metal forming quality also instigated. Finally, the result validation and optimization on sheet metal forming process were done. Therefore, FEM analysis were often used to calculate materials deformation behavior and the spring back occurrence of formed sheet metals.

Speaker Biography

Alie Wube Dametew is currently a PhD student in the field of Mechanical and Industrial Engineering. His research interests include manufacturing process improvement, productivity, technology systems, modelling and analysis of manufacturing systems, automation and cloud computing technology, supply chain and industrial logistic improvement analysis, innovation and technology transfers, advanced and smart materials, sustainability and renewable energy improvements. So far, he has worked as lecturer and head of research and community service in Wollo University Kombolcha Institute of Technology. He has also worked as a continuous improvement expert and production supervisor in manufacturing companies and has sufficient experience on industrial plant project studies.

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