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Chapter 1 : A New Approach to the Evaluation of Forming Limits in Sheet Metal Forming

31 Geometrical evaluation models in sheet metal forming: A classification method for shape errors of free-form surfaces KiwamuKase Research Scientist.

Fiber reinforced composites are heterogeneous and anisotropic. The applicability of the stress analysis methods on such heterogeneous and anisotropic materials is not well known. In the present study, an attempt is made to apply the digital image correlation method and the intelligent hybrid method to a carbon fiber reinforced plastic CFRP laminate. Laminate configuration is unidirectional. Tensile load is applied in off-axis 45 degrees direction as well as longitudinal 0 degree and transverse 90 degrees directions on a CFRP laminate. Displacement, strain and stress fields due to the tensile loading in the CFRP unidirectional laminate are analyzed. The constitutive equation considering material anisotropy is built into the intelligent hybrid method used at the time of analyses. The validity of the algorithm is checked through comparison between results of the present method, experimental results from strain gauge method, and the analytical results from finite element method FEM. The researches of non-oriented silicon steel are mainly focused on the effect of main processing parameters on the microstructure and magnetic properties, but there have been few studied about its flow stress until now. In this paper, the non-oriented silicon steel 50A of hot forming is studied by thermal-mechanical simulation method. The hot deformation behavior of the steel is explored and the flow stress model of the steel is established based on the creep mechanism. The model has good accuracy and is feasible. One of the ways for determination of flow curves is the application of a ring test. Using this method, friction in the interface between the die and the specimen leads to a bulging of the sample and thereby to an inhomogeneous stress and strain state. The calculation of the flow stress from experimentally determined forceâ€”displacement curves implies a uniaxial stress state, but this will produce an error because of the above-mentioned bulging, when friction occurs. One method of avoiding these sources of error is to use the sigmoid curves, but the sigmoid curves are varied by the change of temperature and strain rate. Calculations of numerical sigmoid curves were done by the use of an iterative procedure, applying a corrective function. The paper presents a complete investigation of the AZ41 magnesium alloy sigmoid curves at temperature ranging between K and K and strain rates ranging between 0. Ring tests are used to determine the numerical sigmoid curves sensitivity to temperature and strain rate. This paper presents an investigation about the occurrence of the dynamic recrystallization DRX during hot forming. Two aluminum alloy samples in different initial states were examined by compression tests at temperatures between K and K and constant strain rates ranging from 0. The activation energies of the examined aluminium were calculated, being Based on the micrographs taken after the deformations it was revealed that in some cases only dinamyc recovery DRV whereas in others DRX occurred under the applied examination conditions. The critical stress which belongs to the onset of the DRX or the DRV depend on the temperature, the strain rate, and the initial grain size. The critical and maximal stresses and the corresponding strain values at different conditions were determined.

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Chapter 2 : Sheet Hydroforming â€“ Single Tool Technology

31 Geometrical Evaluation Models in Sheet Metal Forming: A Classification Method for Shape Errors of Free-Form Surfaces Kiwamu Kase, Norio Matsuki, Hiromasa Suzuki, Fumihiko Kimura and.

The numerical method like finite element method has been applied to design and to evaluate the material properties and behavior as the development of Computer Aided Engineering. In this paper, we have proposed a new approach method combined with M3 method and homogenized method to obtain the mechanical properties and to simulate the behavior of woven fabric composites. From the numerical results, it is revealed that it is very useful for the evaluation of mechanical properties of composite materials. Li, Gerhard Hirt Abstract: Nickel-base alloys are mostly used for high-temperature applications, many of which are heavily loaded safety components. The material properties highly depend on the microstructure, which, in turn, depends on the metal forming process and the heat treatment. FEM integrated microstructure models can satisfactorily describe the grain size development due to dynamic and static recrystallisation during a metal forming processes and the heat treatment. The simulation results obtained from modeled compression experiments are very promising so that consequently, simulations of more sophisticated processes, like multi-pass open die forging or radial forging, is the next reasonable goal. However, the computation times for the simulation of these processes are still unsatisfactorily long and thus, their application is deterred. This method uses a Finite-Element mesh that is fine in the deformation zone and coarse in the remaining areas of the workpiece. Due to the movement of the tools during the simulation, the deformation zone moves across the workpiece and thus, necessitates a remeshing with a transition of the finely meshed area. A second mesh, which is fine over the entire volume of the workpiece, is used to store the nodal data and simulation results, which get transferred to the simulation mesh every time a remeshing operation becomes necessary. In combination with an adopted data transfer algorithm, this second mesh is used to minimize the loss of accuracy, if a previously finely meshed area becomes a coarsely meshed area. This simulation model can be used to optimize forging process chains with respect to grain size distribution as well as cost effectiveness and energy consumption. Production of glass bottles requires blowing of the glass after entrance of a gob of molten glass in the blank mould. The final shape of the bottle is highly dependent on the viscosity of the glass, the blow-pressure and the temperature distribution in the glass and the mould and simulation of this complicated process enables optimization of the process conditions. During simulation of blowing of the glass, the mesh has to be adapted due to the extreme deformations of the mesh. Using the automated remeshing capability, simulations of the glass bottle forming process have successfully been performed, enabling for example optimization of process settings. Fen Li, Hu Tang Abstract: It was presented for the results of 3D finite difference analysis on the behavior of single pile in clay. And it was founded that the mesh size less than 0. In additions, when the soil was soft or the E soil elastic modulus was small, the effect E of on lateral capacity of pile was larger than the soil was stiff clay with soil elastic modulus increasing. Lastly, the results of the numerical simulation carried out in this study were compared with a published field lateral loading tests, a good correlation between the field test and the numerical simulation was obtained based on reasonable mesh size and material parameters. A Latent Solution Authors: Local damage models are known to produce pathological mesh dependence in finite element simulations. The solution is to either use a regularization technique or to adopt a non-local damage model. Viscoplasticity is one technique which can regularize the mesh dependence of local damage model by incorporating a physical phenomenon in the constitutive model i. A detailed numerical study of viscoplastic regularization is carried out in this work. Two case studies were considered i. It was found that the primary viscoplastic length scale is a function of hardening and softening parameters but does not depend upon the deformation rate. Mesh dependency appeared at higher damage values. This mesh dependence can be reduced by mesh refinement in the localized region and also by increasing the deformation rates. The viscoplastic regularization was successfully used with a local anisotropic

damage model to predict failure in a cross die drawing process with the actual physical process parameters.

Chapter 3 : Feasibility analysis: evaluation of part and process feasibility

Evaluation of ductile failure models in Sheet Metal Forming Rui Amaral 1,a, Pedro Teixeira 2, Erfan Azinpour 2, Abel D. Santos 2, J. Cesar de Sa 2 1 INEGI, Institute of Science and Innovation in Mechanical and Industrial Engineering, R. Dr. Roberto Frias , Porto, Portugal.

Chapter 4 : Assessment of Damage Models in Sheet Metal Forming for Industrial Applications

In the modern manufacturing industries the knowledge and proper control of the sheet metal springback after forming is a fundamental aspect in the achievement of near net shape stamped parts.

Chapter 5 : AutoForm - Wikipedia

The focus of this publication is a review of the state of the art in tolerance analysis, synthesis, and transfer for geometric and dimensional tolerances in sheet metal forming and the integration.