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The Study of Stress State in Indentation of a Flat Punch with Rounded Edge in Axisymmetric Backward Extrusion

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ABSTRACT

Analytical resolution ought to obtained of contact drawback for indentation of flat punch with rounded edges in axi parallel extrusion to each surface pressure and interior stress fields for a given die form at totally different speed field. each slippery friction and partial slip condition should be finished within the equation of metal flow for extruded material taking into thought vonmises yield criterion and also the sophisticated high elastic contact stress within the flat and rounded edges dies . Associate in Nursing scientific method mistreatment model sample of exposure elastic material for configuration the result of rounded edges on the strain distribution within the contact zone . A numerical methodology used programming for determination the analytical equations of metal flow mistreatment fast basic and scrutiny the theoretical with the experimental results .A kinematic ally admittable metal flow cylindrical speed mistreatment strain rate of plastic flow has been projected to get the load of contact on the elastic punch face throughout the axi-symmetric backward extrusion. The theoretical results predict the forming force , rule of friction , space reduction and also the metal flow quite satisfactorily compared with the experimental results.

1. INTRODUCTION

IN cold forming of axi- parallel backward extrusion , the cold forming additional and additional parts square measure improved in quality by product an acceptable loading for pressing the die against the plastic metal . in these issues contacts arise that characteristically have a flat base with some quite radius at the sting that is either pre – existing or generated by wear. The complexness of this drawback is that the contact pressure between Associate in Nursing elastic face with slippery friction and also the surface of plastic metal , in order that the look procedure for these contacts is sometimes one derived from expertise because it is hotoriously troublesome to work out the contact pressure in distinction to the hertizian contact wherever straightforward closed kind solutions exist between 2 elastic bodies .Often the perimeters of the punch square measure straight and traditional to the free finish and a deduction of the contact stress state iatrogenic is hot as height forward matter .[5] Timoshenko and goodier [8] assumed that the punch itself is rigid and is ironed into a compliant 0.5 – plane .

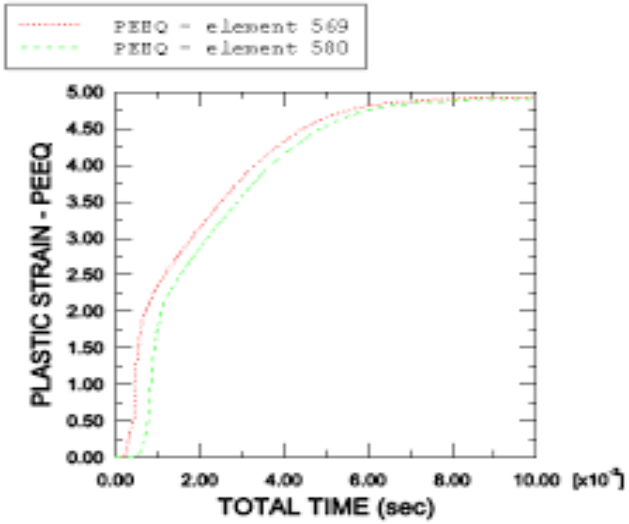

Fig. 1 Geometry of the punch in axi symmetric extrusion

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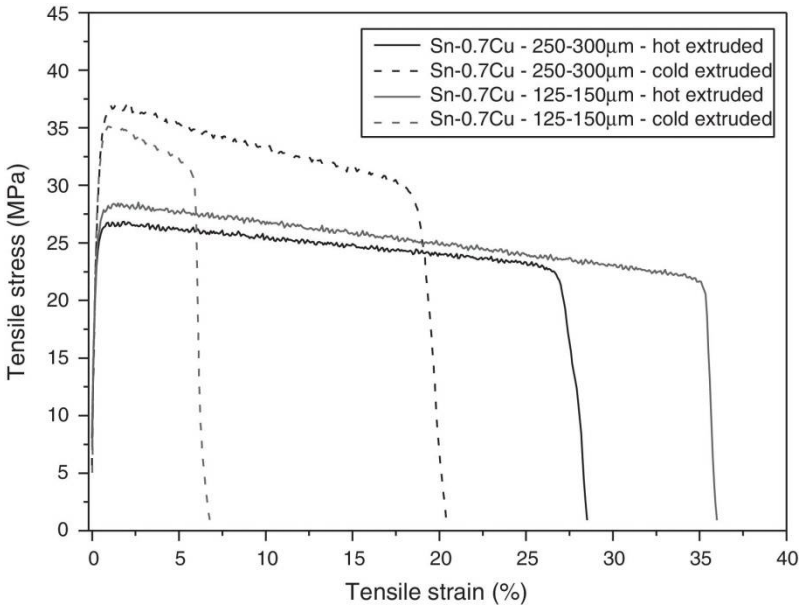

Fig. 2 Velocity field for the early stage of axi symmetric backward extrusion or piercing (transformed velocity field

Khdem etal [1] analyzed the contact pressure mistreatment Associate in Nursing elastic formulations that square measure applicable to an oblong domain wherever the pure mathematics of the punch includes a vital result on the contact pressure distribution that determined by experimentation .M.M. Moshksar etal [2] , [3] have conferred Associate in Nursing bound resolution for the first and final stages of backward extrusion shaping of hollow parts . S.B.Biner [6] has projected Associate in Nursing analytical resolution of axi-symmetric backward extrusion for the study of metal flow during this method mistreatment finite part methodology (FEM) and model material techniques . conjointly Sackfiled etal [7] have projected a speed field for the backward forward combined extrusion of two-dimensional figure cup – bar form parts mistreatment bound theorem and visio physical property methodology for experimental verification. during this study, the result of the circular elements of the pure mathematics and also the radius of the corners of the punch on the contact stresses distribution between the elastic surface of the punch, the plastic material flow and totally different strain rates ἐ and also the speed of the axi-symmetric extrusion that should be analyzed by mistreatment metal flow theory with contact pressure laws and also the experimental results for verification of the theoretical results.

2. EXPERIMENTAL ANALYSIS

The scientific method used is exposure snap and also the profile and external dimension of the joint is tall specifically a pair of ½ times the dimensions of the external of facilitate handling and knowledge assortment. This model was a 2 dimensional illustration of a 3 – dimensional structure , with the profiles being taken within the axial radial plane of the 3 dimensional part .As the loading needed for these models was strictly axial no special loading frame was needed [9] .

The fringe pattern are often shown Fig (3) for various masses. The properties of the exposure elastic material is given by the fabric square measure Cr – thirty-nine that has : once mistreatment die with elastic metal with pattern with absolutely plastic metal it will simple best-known the sort of the load applied that cause acquire the yield stress of the die metal and might then scrutiny it with the yield stress for elastic material as a result of the strain applied on patterns can still constant when yield stress.

3.RESULTS AND DISCUSION

Strain flow was obtained from equation (a pair of), (3), wherever we have a tendency to contemplate the metal as shortly as access to the pressure ensuing from compress metal, the metal can deform plastically as a result of it's rigid absolutely plastic . Fig. (10) shows the result of the dimension of the punch a/b and also the contact pressure p for a relentless seventieth backward reduction in space. It are often shown that the grievous bodily harm price of p was obtained close to the rounded fringe of the punch and was exaggerated with increasing the flatness of the punch a with relevancy total contact b and a few decreasing within the center of the punch owing to metal flow increasing during this purpose [6]. once punch exceed throughout extrusion method ,the first drawback that facing the extrusion was

transformation through the ultimate finish of the die wherever space of dead zone was generated and afterward the metal flow become with low load from the primary . Fig. (11) illustrate the result of accelerating strain rate and relationship with the rate of advances of the punch for various ratios of a/b = zero.1 and 0.5 .It are often shown that by decreasing the flatness of the punch the rate of the metal flow will increase that causes a rise within the price of the slip forces alphabetic character causes additional exaggerated within the extrusion force. Fig. (12) and Fig. (13) shown the increasing of flow stresses with the rate of the punch for share reduction of 4 wheel drive and eight . This relation illustrate that with increasing the magnitude relation of contact a/b the grievous bodily harm flow stress are going to be exaggerated in order that the pressure needed for the extrusion force is attenuated because the punch advances however the smaller the backward space reduction , the additional gradual is that the decrease of extrusion force . this may be seen terribly clearly once increasing the reduction of space from 4 wheel drive to eight .

When scrutiny the theoretical stress distribution on the contact length x/b with the experimental values that obtained from exposure elastic analysis it are often seen from Fig. 14(.A) and Fig. fourteen (B) the share error is between V-day to 100 percent for grievous bodily harm reduction in space that can be found that the strain distributed on the punch contact are full of the strain rate of the fabric from 4 wheel drive to eight and on the contact magnitude relation a/b that can be obtained by appropriate rounded of the punch edge .

4.CONCLUSION

The tactic of research projected during this paper offers a technique of getting the strain on the punch and also the resolution for the result of strain rate and make contact with magnitude relation on the strain flow of the metal in axi parallel backward extrusion. totally different speed fields and strain rates are accustomed acquire the result of the misreckoning of the punch edges on the distribution of grievous bodily harm principle stress . This relation depends on the s.venant metal flow and Mushkelishivs equation.The results shown that with increasing the contact magnitude relation a/b the conventional applied load are going to be exaggerated and this may exaggerated with increasing the share of reduction.

REFERENCES

[1]. Khadem,R and O, Conner J.J, " resistance Compression of Associate in Nursing elastic parallelogram between 2 identical elastic 0.5 areas ",int.J .Eng. sci., vol seven page 153-163, 1996.
[2]. M.M. Moshksar and R.Ebrahimi " Associate in Nursing analytical approach for backward Extrusion shaping of normal hollow parts " In. J. mech. sci vol40, No12, pp1247-1263 ,2004.-
[3]. M.M.Moshksar and R.Ebrahimi " Backward Extrusion of axi-symmetric components" process and fabricasion of adv.Master,sigaphare ,pp89- one hundred Nov, 2006.
[4]. M.M.Moshksar, M.H.shariut and M.Bhrami"Upper certain resolution for backward –forward extrusion combined Extrusion of the rods and tubes continuing of IMEC 2004,international engineering science conference p508-520 ,2007.
[5]. Musukelishvili,N.I." Singular Equation (translated by J.R.M.Radok),Noordhoff international publication, 1980. [6] Rao " " principle of metal operating "
[6]. S.B.Biner ":A procedure for determination of the strain model techniques " ASME. Trans J.of Evg.indus vol 114,pp90-98 ,2006.
[7]. Sackfield, A and hills, D.A."Sliding contact between dissmillar bodies, J.Tribology,vol 110 ,p 592-598,1998.