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THEORETICAL AND EXPERIMENTAL ANALYSES OF TUBE SINKING PROCESS

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Abstract

Theoretical and experimental study are carried out to investigate and study the deformation in metallic tube in sinking process, by investigating the effect of several parameters such as (reduction of area ratio, friction factor , relative die length , thickness ratio and semi-die angle) on the forming energy and the required drawing stress to draw tubes through conical dies . The theoretical study includes two methods ; The first method uses the mathematical theory by using the upper bound theorem to analyses tube sinking process and estimate the forming energy and relative drawing stress by assuming the (spherical velocity field surface) to represent the velocity field of plasticity forming out with loss of originality of the law of incompressibility .The result were represented as a curve to show the relationship between the draw stress with a wide range of variables, and then get the optimum values which give minimum of drawing stress. The second theoretical method involves the numerical analysis of the manufacturing processes to improve The .these processes and provide products free of defects with controlled mechanical properties analysis by the finite element method (F.E.M) was carried out by using (ANSYS V.9) program for the tube sinking process by assume three reduction areas of (10% ,17.8%,23.4%) and four die angles of (5,8,10,15) and three coefficients friction of (0.05 , 0.08 ,0.1) to find the influence of several variables on drawn load. In the experimental study, the drawing system (die and the supplementary parts) were manufactured according to the optimum theoretical results Tubular aluminum specimens (Do=16, Di =13, t =1.5) were drawn at low speed (2 mm/ min) through) and then measuring the required drawing stress. A $_{8}^{\circ}$conical die with semi die angle (comparison between methods of analyses was carried out in order to determine correctly and