ABSTRACT

The mechanics of tube drawing has been investigated, with variable die friction in the deformation zone under conditions of full fluid film lubrication. A plastohydrodynamic model for tube sinking has been suggested which is capable of predicting the thickening and thinning of tube wall during the sinking process, depending upon the sinking parameters. The results of the theoretical analysis compare well with the published experimental trends. The plastohydrodynamic analysis provides for the calculation of lubricant film thickness in the deformation zone based on the principle of minimum energy dissipation. The model has been refined by developing the most appropriate tube thickness profile in the deformation zone for the sinking process and incorporating the effect of temperature on the lubricant film thickness. The optimisation of plastohydrodynamic sinking process parameters has been suggested, to exploit the benefit of hydrodynamic lubrication along with acceptable surface finish of the drawn product.

The plastohydrodynamic analysis of plug drawing, has been used to calculate the lubricant film thickness at the die-tube and plug-tube interfaces. The theoretical model of hydrodynamic plug drawing suggests that the cylindrical plug is the most appropriate for this process, which is in confirmation with the practical approach. The concept of critical modified Sommerfeld number has been used to ensure the condition of full fluid film lubrication in the deformation zone.