

Production II

Assignment 1: Questions taken from metal forming processes(chapter 1)

Work out

Instruction : For the following questions, calculate the required answer and show the necessary steps.

1.

A plate that is 250 mm wide and 25 mm thick is to be reduced in a single pass in a two-high rolling mill to a thickness of 20 mm. The roll has a radius = 500 mm, and its speed = 30 m/min. The work material has a strength coefficient = 240 MPa, a strain hardening exponent = 0.2 and the coefficient of friction between the rolls and the work is assumed to be 0.12. Determine (a) roll force, (b) roll torque, and (c) power required to accomplish this operation, (4pts)

2.

A cylindrical work piece is subjected to a cold upset forging operation. The starting piece is 84 mm in height and 54 mm in diameter. It is reduced in the operation to a height of 32 mm. The work material has a flow curve defined by $K = 250\text{MPa}$ and $n = 0.17$. Assume a coefficient of friction of 0.1 and strain at the start of the process = 0.003. Determine the forging force as the process begins, at half height of the work piece and at the final height of 32mm. **Show your steps clearly. (5points)**

3.

A cylindrical billet that is 100 mm long and 50 mm in diameter is reduced by direct extrusion to a 20 mm diameter. The die angle is 90° . The Johnson equation has $a = 0.8$ and $b = 1.4$, and the flow curve for the work metal has a strength coefficient of 800 MPa and strain hardening exponent of 0.13. Determine (a) extrusion ratio, (b) true strain, (c) extrusion strain, (d) shape factor, (e) ram pressure, and (f) ram force. (4pts)

4.

Wire is drawn through a draw die with entrance angle $= 20^\circ$. Starting diameter is 3.5 mm and final diameter = 3 mm. The coefficient of friction at the work-die interface = 0.07. The metal has a strength coefficient $K = 250\text{ MPa}$ and a strain-hardening exponent $n = 0.20$. Determine the draw stress and draw force in this operation. (5 points)