

1. Consider the cold rolling of an aluminium sheet ($\rho = 2700 \text{ kg/m}^3$), with an initial thickness of 6 mm and an initial width of 1600 mm, to a final thickness of 3 mm. Given that the K and n values in Hollomon's law are 160 MPa and 0.16, respectively, the roll diameter is 400 mm, the roll peripheral speed is 120 m/min, the coefficient of friction μ is 0.15, and the precession is 1.1, calculate the force acting on the rolls and the hourly material production.
2. Consider the hot rolling of an aluminium alloy plate with an initial thickness of 20 mm and an initial width of 300 mm, using rolls with a diameter of 1000 mm rotating at 100 rpm. The coefficient of friction between the plate and the rolls is 0.1, and the material's flow stress at the processing temperature is 91 MPa. Calculate the power required to perform the operation, assuming the maximum possible thickness reduction.
3. A rolling operation takes place under the conditions shown in the accompanying figure. What is the position x_n of the neutral point? Note that there are a front and back tension that have not been specified. Additional data are as follows: Material is 5052-O aluminum; hardened steel rolls; surface roughness of the rolls = 0.02 μm ; rolling temperature = 210°C.

