Manufacturing Engineering – Casting

Q1. Under uniform cooling, a spherical casting of 25 mm diameter undergoes volumetric solidification shrinkage and volumetric solid contraction of 2.5% and 6.2% respectively. Determine the diameter of the casting after solidification.

Ans: 22.86 mm

Q2. A sphere shaped casting solidifies in 10 min. What will be the solidification time in minutes for another sphere of the same material, which is 8 times heavier than the original casting?

Ans: 40 min

Q3. A spherical drop of molten metal of radius 5 mm was found to solidify in 12 s. In how much time will a similar drop of radius 10 mm would solidify?

Ans: 48

Q4. A down sprue having height h = 150 mm and a cross sectional area A = 450 mm^2 at inlet is fed at constant head from the pouring basin to maintain the flow rate of molten metal Q = $4.5 \times 10^5\ mm^3/s$. Its lower end is open to the atmosphere. Determine the area of the down end sprue in mm^2 at its end to avoiding aspiration effect. Take g = 9.8 m/s^s.

Ans: 226.62 mm^2

Q5. A cubical casting of molten metal of size 8 mm was found to solidify in 18 sec. Calculate the solidification time for a similar cube of radius 10 mm.

Ans: 18.125 sec

Q6. A cylindrical riser (height equal to diameter) is designed to feed as steel slab casting of 300 x 300 x 100 mm^3. Determine the diameter of the riser using Caine's equation:

$$x = \frac{a}{y - b} - c$$

Where x is the freezing ratio, y is the riser volume/ casting volume. For steels, a = 0.1, b = 0.03 and c = 1.0.

Ans: 5 cm

Q7. A molding of an aluminium alloy casting requires molten-metal flow rate of 180 cc/s through a sprue of height 300 mm and diameter of 25 mm at the top. The molten alloy has density of 2650 kg/m^3 and viscosity of 0.005 Pa.s. Calculate the sprue diameter at bottom in order to prevent aspiration.

Ans: 9.66 mm

Q8. A cylindrical casting, having length equal to diameter, solidifies in 15 min. Determine the solidification time for a 27-times heavier cylinder of the same aspect ratio and the same material.

Ans: 135 min.