FREQUENTLY ASKED QUESTIONS (FAQS)

MODULE 3: WEB BONDING PROCESSES

Q20: Define punch density.

A20: Punch density is defined by the number of needle penetrations per unit area of the resulting fabric. If ξ is punch density, n is the number of needles per unit width of needleboard, A is the fibre web advance per stroke, P is the rate of production, and m is the number of punches per unit time, then

$$\xi_{\left[\mathrm{m}^{-2}\right]} = \frac{n_{\left[\mathrm{m}^{-1}\right]}}{A_{\left[\mathrm{m}\right]}} = \frac{n_{\left[\mathrm{m}^{-1}\right]}}{P_{\left[\mathrm{m\cdot min}^{-1}\right]} \Big/ m_{\left[\mathrm{min}^{-1}\right]}}.$$

Q21: What is Clapeyron effect?

A21: Polymer molecules subjected to compression require more thermal energy to melt compared to when they are at atmospheric pressure. This indicates that, as the pressure is raised, the melting temperature will increase. This is known as Clapeyron effect. Mathematically,

$$\frac{\mathrm{d}P}{\mathrm{d}T} = \frac{\Delta H}{T\Delta V}$$

where P is pressure, T is temperature, ΔH is molar enthalpy of melting, and ΔV is molar volume change on melting. The slope is positive.

Q22. Calculate punch density if there are 5000 needles present per meter in a needle board of 200 mm width and the fibre web advances 10 mm per stroke.

A22. The expression for punch density is

$$\xi_{\left[\mathrm{m}^{-2}\right]} = \frac{n_{\left[\mathrm{m}^{-1}\right]}}{A_{\left[\mathrm{m}\right]}}$$

where ξ is punch density, n is the number of needles per unit width of needleboard, and A is the fibre web advance per stroke.

Then

$$\xi_{\left[\mathrm{m}^{-2}\right]} = \frac{n_{\left[\mathrm{m}^{-1}\right]}}{A_{[\mathrm{m}]}} = \frac{\frac{5000}{1000}}{\frac{10}{1000}} = 500$$