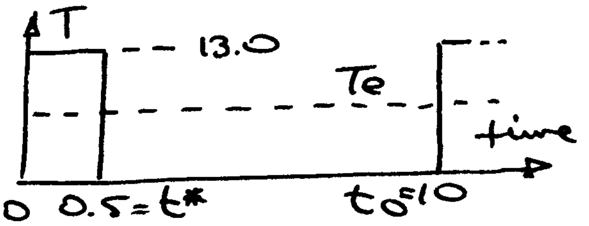
7 (cont'd) drum is accelerating. The equivalent continuous torque Te is given by (4) as

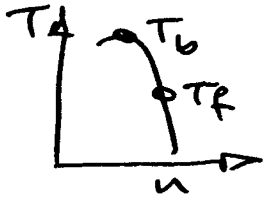


$T_e^m . t_o = \int_0^{t_o} T^m \, dt$ and with $m = 5$

$T_e^5 \times 10 = 13.0^5 \times 0.5 + 0 \Big|_{0.5}^{10}$

$\therefore \; T_e = 13.0 \, (0.05)^{1/5} = 7.14$ Nm

So we require a motor with $T_f \geq 7.14$ Nm, $T_b \geq 13.0$ Nm



Use a 90S motor.

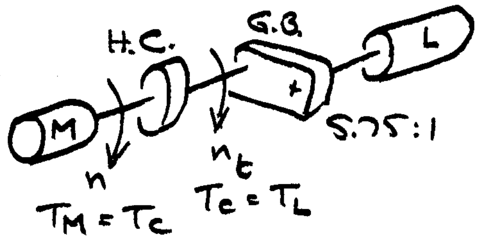
8 The power requirements for the drum are 6/0.92 = 6.5 kW.

Assuming a coupling slip of 4% and a motor/impeller speed of around 1440 rpm, from the coupling torque equation (5):–

$6.5 = 0.9 \, d^5 (1440/60)^2 \times 0.04 (1.5 - 0.04) \, 2\pi (1440/60)$

$\therefore \; d = 270$ mm.

Select a coupling size of 265 mm



From (2) for 132M motor:

$T_M = \dfrac{170}{1 + (0.321 - S)^2 (1.216/S - 0.9275^2)}$ (Nm)

where S = motor slip = $1 - n/n_S$

n = motor/impeller speed (rpm)

From (5) for 265 mm coupling:

$T_c = 900 \times 0.265^5 (n/60)^2 \, s \, (1.5 - s)$ (Nm)

where s = coupling slip = $1 - n_t/n$

n_t = turbine/gearbox input speed (rpm).

From (1) for load with R = 5.75, using example 4:–

$T_L = (125 + 125 (n_t / 5.75 \times 250)^2)/5.75$ (Nm).

Select trial values of motor/impeller speed, n, and coupling slip, s, until $T_M = T_c = T_L$.

The result is:–

n = 1450 rpm s = 4.23 % T = 42.0 Nm.

Hence load speed = 1450 (1 − 0.0423)/5.75

= 242 rpm.