THE QUARTER AMPLITUDE RESPONSE METHOD

This method provides an alternative to the "ultimate cycle" method. Initially the procedure is as before but gain increase is only continued until a quarter amplitude response is achieved. FIGURE 4 illustrates a quarter amplitude response.

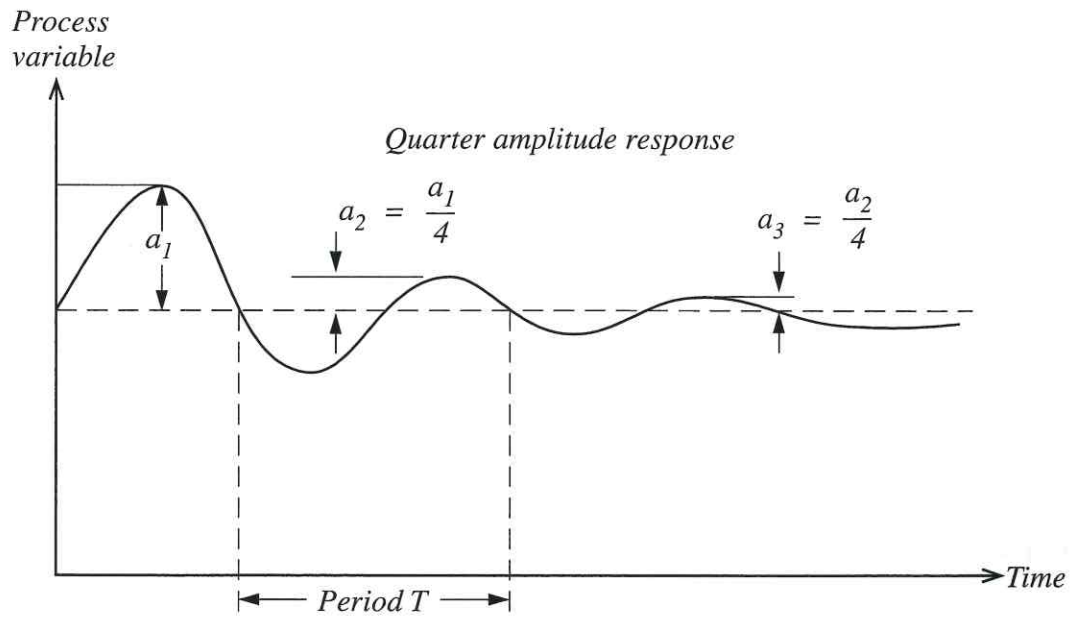

FIG. 4

At this setting the proportional band and the period of decaying oscillations are noted.

In FIGURE 4 the ratio of successive amplitudes is 1:4.

In general, a ratio of 1:4 need not be produced exactly because the formulae used to derive the controller settings are based on certain approximations.

If the amplitude ratio is 1:X and the period of the oscillation is T minutes, then controller settings are set initially according to the following formulae:

$$\%PB_p = \frac{\%PB_c}{(0.5 + 2.27\Delta)}$$

$$T_i = \frac{T_c}{1.2\sqrt{1 + \Delta^2}} \text{ minutes for a P + I controller}$$

$$\text{or} \quad T_i = \frac{T_c}{2\sqrt{1 + \Delta^2}} \text{ minutes for a P + I + D controller}$$

$$T_d = \frac{T_c}{8\sqrt{1 + \Delta^2}} \text{ minutes for a P + I + D controller}$$

where T_c = Period of oscillation in minutes
T_i = Integral Action Time in minutes
T_d = Derivative Action Time in minutes
$\Delta = \frac{\ln X}{2\pi}$ where X = ratio of amplitude expressed as 1:X

The advantage of this technique is that it can be repeated until the control settings are optimised even when the loop is in service.