Legends

Fig 1.1 ~~Syste Oscilla~~ Mechanical system Moving in X axis ~~c~~ Mass-M, Spring-K, and Resistance-R.

1.2 A. (Left ~~side~~ ½) Undamped Natural Oscillation $R = 0$

1.2 B Damped Natural Oscillation $0 > R < 2\sqrt{KM}$

~~first 3 c~~ the First three cycles

1.3 Amplitude of oscillation plotted as a function of damping ratio

1.4 A Spring/Mass system attached to finite mass

B Spring/Mass " " "

infinite mass

Fig 2.1 Arrangement of ~~mass~~ system for ~~mea~~ measurement of mass. ~~legen~~ Parts legend is on P-10

Fig 2.2 ~~First~~ Second Order Mechanical Analog of ~~spare represent masses~~ Human Body - After Coermann

allows calculation of

Eq. 1.3 ~~gives~~, the effect

~~and from this and the knowledge of the max. allowable shaft~~ of R, & rearranging this

in terms of period and

will allow to to calculate the max. tolerable R for a given ΔT

damping ratio: $\frac{R}{2\sqrt{KM}} = K_d$

$$K_d = \sqrt{1 - \left(\frac{T_{ud}}{T_d}\right)^2} \qquad 1.4$$

R = Mech. Res. (#/in/sec)

K = Spring Constant = 10 #/in

$M = \frac{W}{g} = \text{Mass} = \frac{150\#}{g}$

$\approx .389$ # sec^2/in

T_{od} = Undamped period (secs) i.e. ideal case

= 1.2393291

T_d = damped period (secs) = 1.2397444

$$K_d = \sqrt{1 - \left(\frac{1.2397744}{1.2393297}\right)^2}$$

omit

$$\sqrt{1 - (1.0003346)^2}$$

$$1 - 1.0036$$

$$\sqrt{1 - (.9996654)^2}$$

$$\sqrt{1 - .9993309 + 2}$$

$$\sqrt{.0006691 \times 10^{-4}}$$

$$= \sqrt{6.6910 \times 10^{-2}}$$

$$= 2.585 \times 10^{-2}$$

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$$K_d = \frac{R}{2\sqrt{KM}}$$

$$R = 2 K_d \sqrt{KM}$$

$$= 2 \cdot 2.585 \sqrt{10 \cdot .389} \times 10^{-2}$$

$$= 5.170 \sqrt{3.89}$$

$$= 1.97 \cdot 5.17 \times 10^{-2}$$

$$= 10.18 \times 10^{-2}$$

$$\approx 0.1 \text{ lb./in./sec.}$$

$$\approx 1.2 \text{ \#/Ft/sec}$$

allowable resistance

$\frac{10^{-1}}{.5 \times 10^{-3}} = 2 \times 10^{2}$

This is two orders of magnitude greater than our calculated 'worst case' resistance