LAMPIRAN B

Penurunan Rumus Performansi Pelumasan

Performansi *journal bearing* diukur melalui beberapa parameter antara lain kapasitas beban *bearing* dan rugi-rugi gesekan.

(1) Load support capacity

Load support capacity didefinisikan sebagai integral dari profil tekanan seluruh area *bearing* dan jumlah total beban yang dapat didukung oleh distribusi ketebalan *film*.

$$W = \int_0^l \int_0^B p(x,y)\,dxdz \tag{1}$$

(2) Friction force

Gaya gesek dihasilkan dari sistem pelumasan karena gaya viskos fluida dan dihitung dengan mengintegralkan tegangan geser pada permukaan sepanjang area *bearing*.

$$F = \int_0^l \int_0^B \tau(x,y)\,dxdz \tag{2}$$

dimana,

$$\tau(x,z) = \left(\mu \frac{\partial u}{\partial z}\right)_{z=h} \tag{3}$$

a. *Friction Force* untuk kondisi *Navier Slip*

$$\tau(x,z)=\left(\mu\frac{\partial u_x}{\partial z}\right)_{z=h}$$

dimana $\left(\mu\frac{\partial u_x}{\partial z}\right)=\frac{1}{\mu}\frac{\partial p}{\partial x}Z+C_1$

berdasarkan lampiran A, $C_1=-\left(\frac{h}{2\mu}\frac{\partial p}{\partial x}\frac{h+2\alpha_h\mu}{h+\mu(\alpha_h+\alpha_s)}+\frac{U}{h+\mu(\alpha_h+\alpha_s)}\right)$

$$\left(\mu\frac{\partial u_x}{\partial z}\right)=\frac{1}{\mu}\frac{\partial p}{\partial x}Z+\left(-\frac{h}{2\mu}\frac{\partial p}{\partial x}\frac{h+2\alpha_h\mu}{h+\mu(\alpha_h+\alpha_s)}-\frac{U}{h+\mu(\alpha_h+\alpha_s)}\right)$$

$$\tau(x,z)=\left(\mu\frac{\partial u_x}{\partial z}\right)_{z=h}$$

$$=\mu\left(\frac{1}{\mu}\frac{\partial p}{\partial x}h-\frac{h}{2\mu}\frac{\partial p}{\partial x}\frac{h+2\alpha_h\mu}{h+\mu(\alpha_h+\alpha_s)}-\frac{U}{h+\mu(\alpha_h+\alpha_s)}\right)$$

$$=h\frac{\partial p}{\partial x}-\frac{h}{2}\frac{\partial p}{\partial x}\frac{h+2\alpha_h\mu}{h+\mu(\alpha_h+\alpha_s)}-\frac{\mu U}{h+\mu(\alpha_h+\alpha_s)}$$

$$=\frac{2h\left(h+\mu(\alpha_h+\alpha_s)\right)-h(h+2\alpha_h\mu)}{h+\mu(\alpha_h+\alpha_s)}\frac{\partial p}{\partial x}-\frac{\mu U}{h+\mu(\alpha_h+\alpha_s)}$$

$$=\frac{h^2+2h\mu\alpha_s}{h+\mu(\alpha_h+\alpha_s)}\frac{\partial p}{\partial x}-\frac{\mu U}{h+\mu(\alpha_h+\alpha_s)}$$

$$=h\frac{\partial p}{\partial x}\frac{h+2\mu\alpha_s}{h+\mu(\alpha_h+\alpha_s)}-\frac{\mu U}{h+\mu(\alpha_h+\alpha_s)} \qquad (4)$$