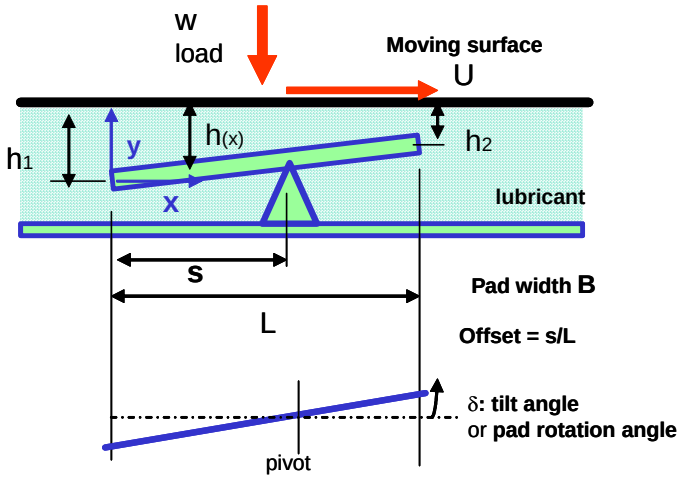
Performance of 1D-Tilting Pad Bearing

Luis San Andres (c) 2006, 2009



film thickess expression

$$h(x) := h_2 \cdot \left[\alpha + (1-\alpha)\cdot\frac{x}{L}\right] \qquad \alpha := \frac{h_1}{h_2}$$

$$\delta = \frac{(h_1 - h_2)}{L}$$

U: surface speed - varies

Bearing geometry:

$L := 0.06$ m length and width of bearing

$B := 0.180$

$offset := 0.59$ pad pivot location s/L

Fluid properties $\mu_{in} := 0.0597$ Pa-sec $\rho := 878$ kg/m3 $c_p := 1880$ J/kg-degC

$\alpha_v := 0.0414$ 1/degC viscosity temperature coefficient

Operating conditions:

$T_{inlet} := 40$ degC - inlet temperature

$W := 40000$ N external load

$\kappa_T := 0.80$ thermal convection parameter

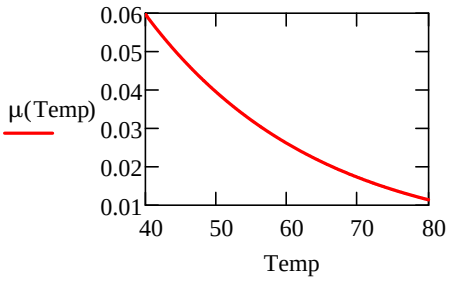
=0 isothermal

visc-Temperature relationship $\mu(T) := \mu_{in}\cdot e^{-\alpha_v\cdot(T - T_{inlet})}$

Convergence params in load (N), moment (Nm) & temp (degC):

$W_{eps} := 0.001$ (ratio) $M_{eps} := W\cdot\frac{offset\cdot L}{100000}$

$T_{eps} := 0.01$ $M_{eps} = 0.01$



visc-Temperature relationship

Calculated performance (Vary runner surface speed)

$U_{min} := 2$ $U_{max} := 15$ [m/s]

Number of cases: $N_{cases} := 6$

EXPAND regions below to display code

pad bearing parameters

iterative loop

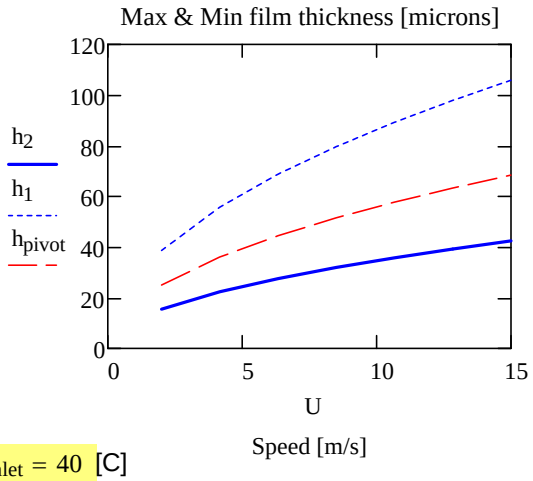
Guess values $imax := 199$ Max number of steps for convergence

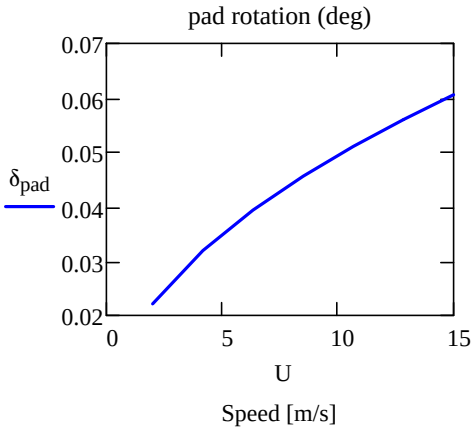
$h_2 := 20\cdot 10^{-6}$ $h_1 := 3\cdot h_2$ $T_{out} := 50$ based on experience

GRAPHS of Tilting Pad Bearing Performance versus runner speed.

$W = 4 \times 10^4$ [N] offset = 0.59

$\alpha_1 = 2.49$

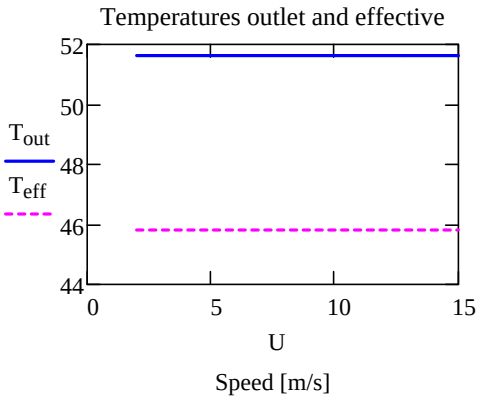


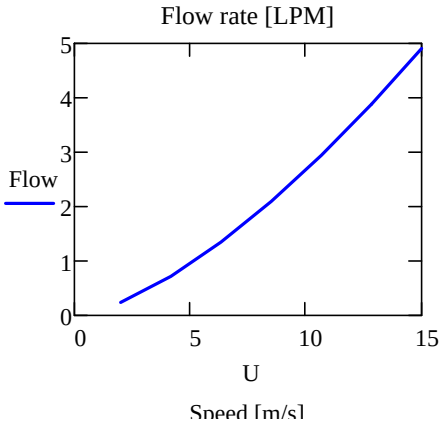


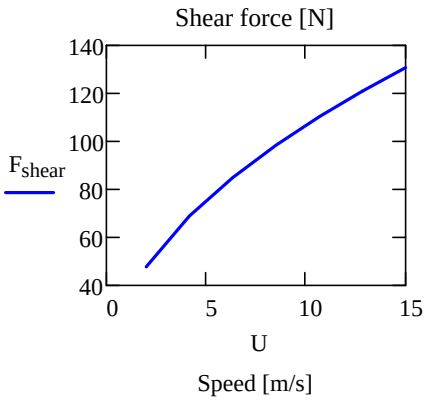
$\max(h_2) = 42.42$

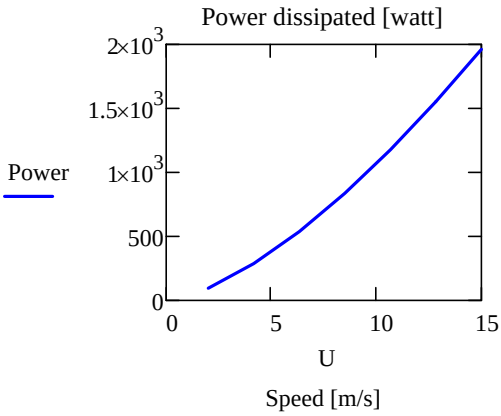
$\min(h_2) = 15.49$

$T_{inlet} = 40$ [C]

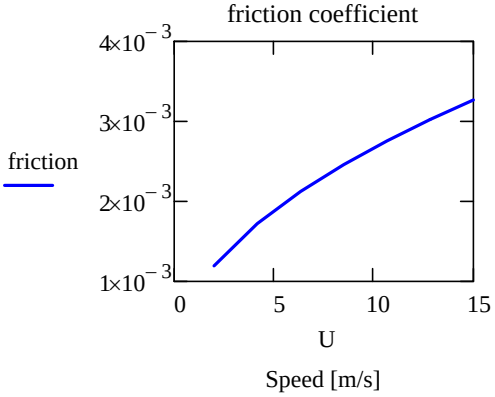




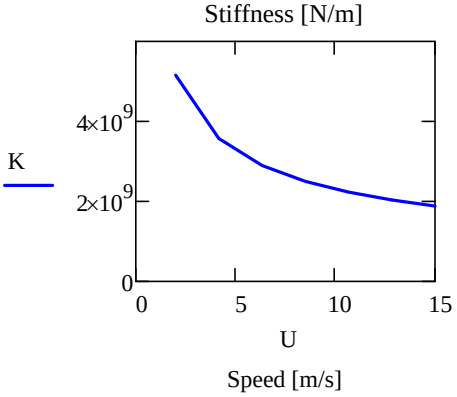




friction coefficient

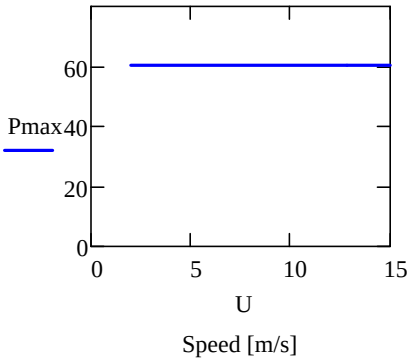


Stiffness [N/m]



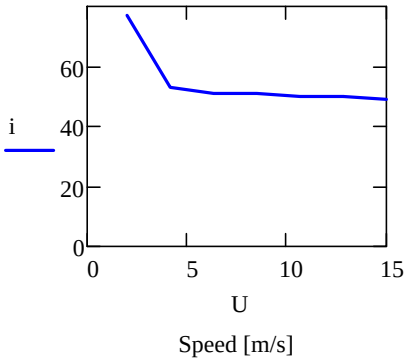
$P_{spec} = 37.04$ [bar] specific pressure = load/area

maximum pressure [bar]



imax = 199

iterations for convergence



force/load [check accuracy]