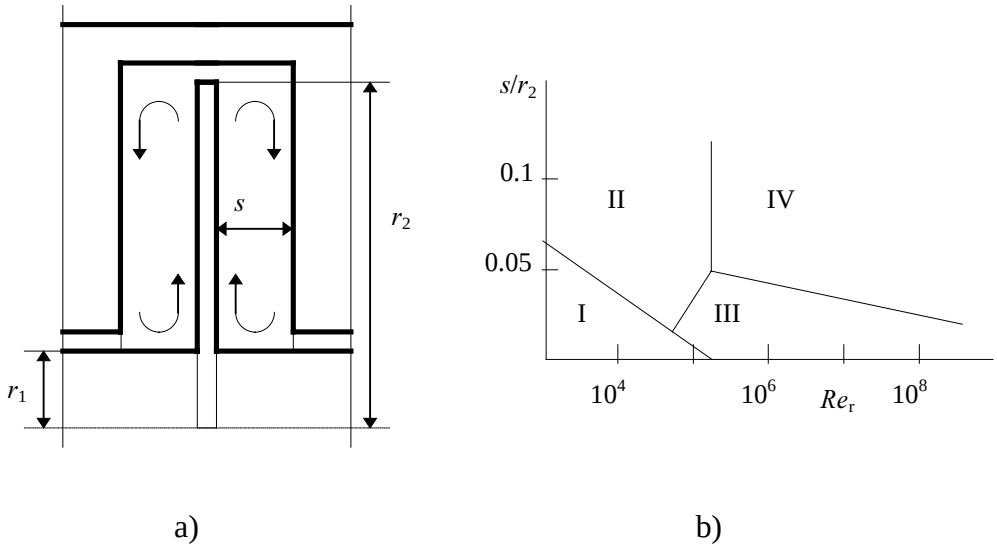

a) b)

Figure 4. a) Rotating disk in an enclosure. The disk acts like a centrifugal pump: fluid flows radially outward near the rotating disk, axially across the clearance and radially inward on the stationary wall. When the axial clearance is decreased, the boundary layers of the disk and wall merge, and only a tangential velocity component is left. The ratio s/r_2 is called the spacing ratio. b) The approximate flow regimes for enclosed rotating disks (Daily and Nece 1960). Regimes I and II represent laminar and III and IV turbulent flows. The radial pumping effect exists in regimes II and IV. The flows in Regimes I and III have only the tangential velocity component.

The friction coefficients for the different flow regimes shown in Fig. 4b have the equations

$$C_f = \frac{2\pi}{\left(\frac{s}{r_1}\right) Re_r} \qquad \text{(Regime I)} \qquad (16a)$$

$$C_f = \frac{3.7\left(\frac{s}{r_1}\right)^{0.1}}{Re_r^{0.5}} \qquad \text{(Regime II)} \qquad (16b)$$

$$C_f = \frac{0.08}{\left(\frac{s}{r_1}\right)^{0.167} Re_r^{0.25}} \qquad \text{(Regime III)} \qquad (16c)$$

$$C_f = \frac{0.0102\left(\frac{s}{r_1}\right)^{0.1}}{Re_r^{0.2}} \qquad \text{(Regime IV)} \qquad (16d)$$