

- 连续性

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0 \rightarrow \frac{\partial u}{\partial x} = 0 \rightarrow u = \text{const in } x$$

x 轴 u 为常数

- 动量

$$\rho \left[\frac{\partial u}{\partial t} + u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} \right] = -\frac{\partial p}{\partial x} + \mu \left[\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right]$$

$$\rightarrow \frac{\partial^2 u}{\partial y^2} = \frac{1}{\mu} \frac{\Delta P}{\Delta L} \rightarrow \frac{du}{dy} = \frac{1}{\mu} \frac{\Delta P}{\Delta L} y + C_1 \rightarrow u = \frac{1}{2\mu} \frac{\Delta P}{\Delta L} y^2 + C_1 y + C_2$$

- 边界条件

$$y = 0, u = 0; y = H, u = V_{bz} = N\pi D \cos \theta$$

$$u(y) = V_{bz} \left(\frac{y}{H} \right) + \frac{1}{2\mu} \frac{\Delta P}{\Delta L} (y^2 - H y)$$

- 体积输出

$$Q = \int_A u dA = W \int_0^H u dy = AN - C \frac{\Delta P}{\mu}$$

$$A = \frac{1}{2} n \Pi D H \cos^2 \theta \cdot F_d, C = \frac{b H^3 \sin \theta \cos \theta}{RL} F_p$$

