

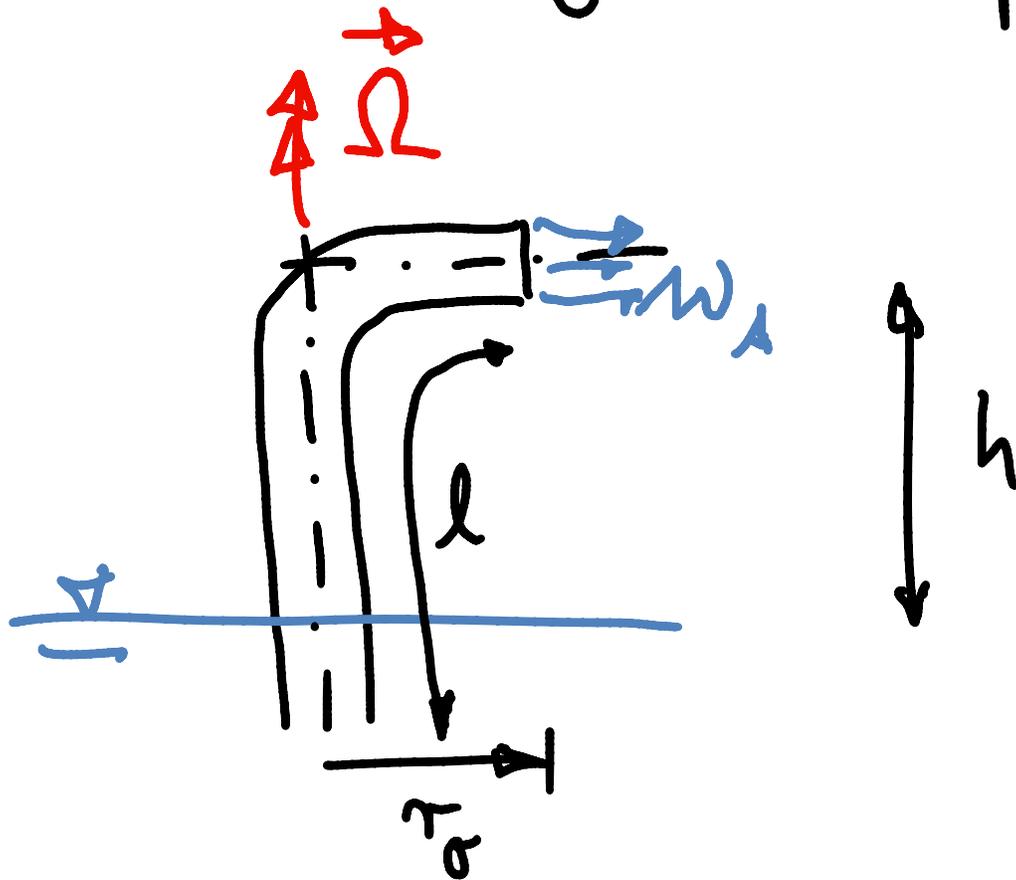
5 Übung Rohrpumpe



TECHNISCHE
UNIVERSITÄT
DARMSTADT



Einführung in die
Hydrodynamik
Vorrechenübung



$$\Omega_{\max}?$$

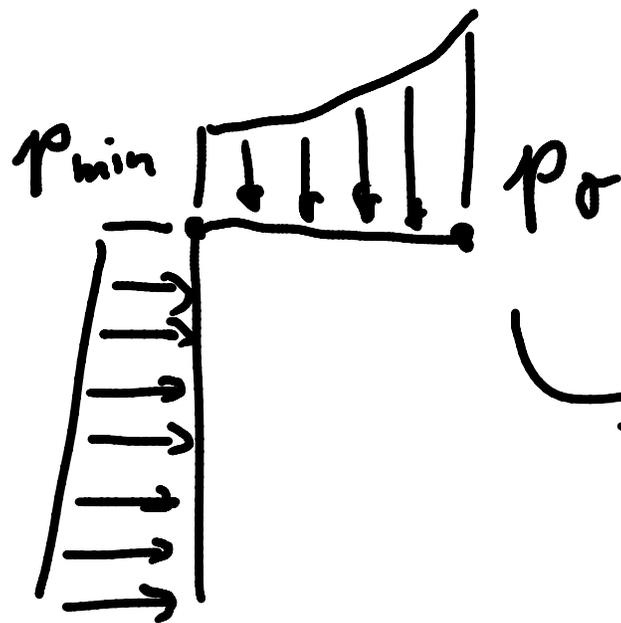
$$\Omega_{\max} = f_{ch}(p_D)$$

$$\int \frac{dw}{dt} ds + \frac{w^2}{2} + \frac{p}{\rho} + gh - \frac{1}{2}(\Omega r)^2 = \text{const}$$

Spurbk 4.81

rotierende Bernoulli-Gleichung

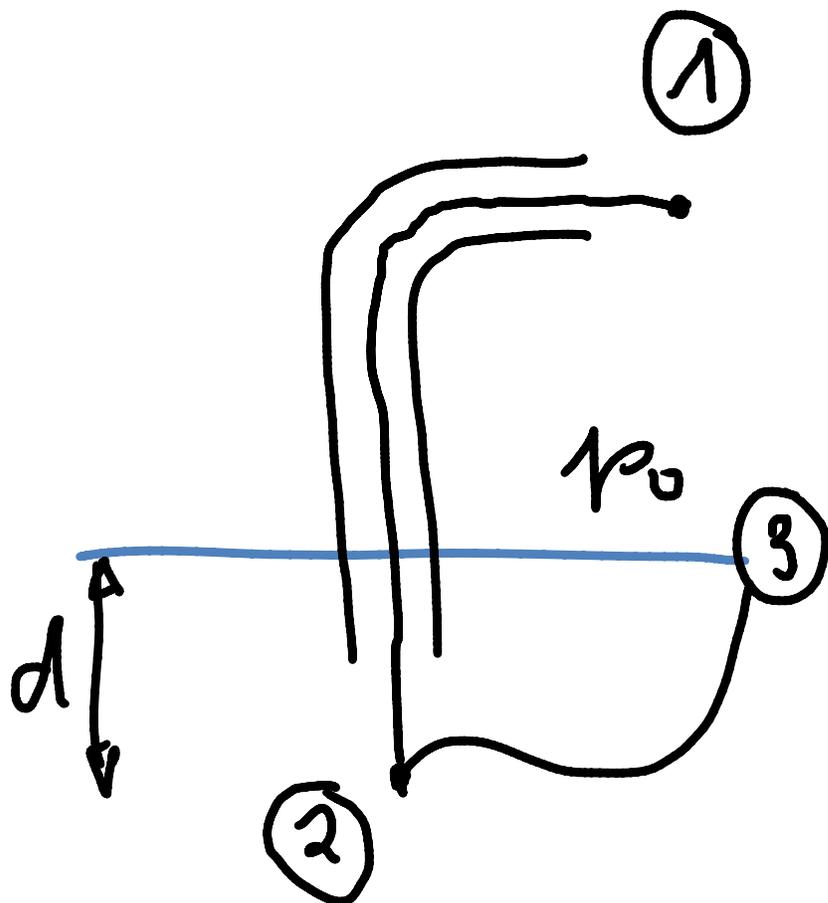
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Sommersemester 2012
Übung 5 F 29



$$\begin{aligned} p_0 - \frac{\rho}{2} (\Omega r_0)^2 + \frac{\rho}{2} w_A^2 + \rho g h \\ = p_{\min} + \frac{\rho}{2} w_A^2 + \rho g h \end{aligned}$$

$$p_0 - p_{\min} = \frac{\rho}{2} (\Omega r_0)^2$$

$$r_0 \sqrt{\frac{(p_0 - p_D)}{\frac{1}{2} \rho}} = \Omega_{\text{krit}}$$



rot. Bernoulli

①-②

$$\frac{\partial w}{\partial t} l + \frac{w^2}{2} + \frac{p_0}{\rho} + gh - \frac{1}{2} (\Omega r_0)^2$$

$$= \frac{p_2}{\rho} - gd$$

Bernoulli im Inertial sys.

$$\frac{p_0}{\rho} = \frac{p_2}{\rho} - gd$$



$$\frac{\partial w}{\partial t} l + \frac{w^2}{2} + \frac{p_0}{\rho} + gh - \frac{1}{2}(\Omega r_0)^2 = \frac{p_0}{\rho}$$

$t=0$

$$b = \frac{\partial w}{\partial t} \bigg|_{t=0} = \frac{1}{l} \left[\frac{1}{2}(\Omega r_0)^2 - gh \right]$$



$$\frac{\partial w}{\partial t} l + \frac{w^2}{2} + gh - \frac{1}{2}(\Omega r_0)^2 = \sigma$$

$$\frac{dw}{dt} = \frac{(\Omega r_0)^2 - 2gh - w^2}{2l}$$

$$\int_0^w \frac{d\bar{w}}{(\Omega r_0)^2 - 2gh - \bar{w}^2} = \int_0^t \frac{d\bar{t}}{2l}$$

c^2

$$w = c \tanh\left(\frac{ct}{2l}\right)$$