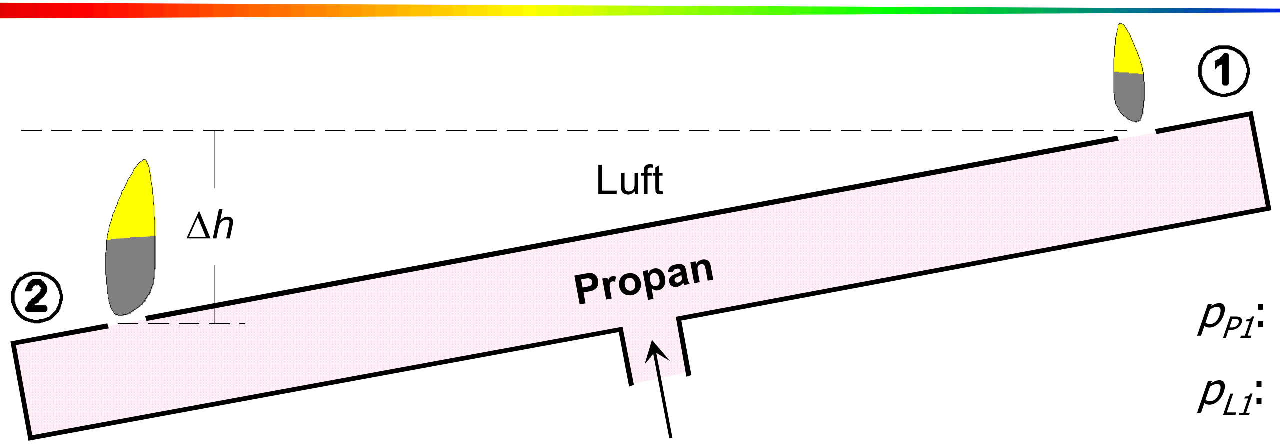
Behn‛sches Rohr

Barometrische Höhenformel

Behn‘sches Rohr



p_{P1}: Propandruck

p_{L1}: Luftdruck

an der Stelle ①

Stelle ②:

$$\begin{cases} p_{L2} = p_{L1} \exp\left\{\dfrac{M_L\, g\, \Delta h}{RT}\right\} \approx p_{L1}\left\{1 + \dfrac{M_L\, g\, \Delta h}{RT}\right\} \\ p_{P2} = p_{P1} \exp\left\{\dfrac{M_P\, g\, \Delta h}{RT}\right\} \approx p_{P1}\left\{1 + \dfrac{M_P\, g\, \Delta h}{RT}\right\} \end{cases}$$

Berechnung des Druckunterschieds

①: $\Delta p_1 = p_{P1} - p_{L1}$

②: $\Delta p_2 = p_{P2} - p_{L2} = \Delta p_1 + p_{L1}\, g\, \Delta h \cdot \dfrac{M_P - M_L}{RT}$

Somit strömt das Propan an der Stelle ② mit einem um

$$\Delta p = \Delta p_2 - \Delta p_1 = p_{L1}\, g\, \Delta h \frac{M_P - M_L}{RT} \approx 0{,}8\ \mathrm{Pa}$$

höheren Druck aus.

(M_P = 40 g/mol, M_L = 30 g/mol, Δh = 0,2 m, p_{L1} = 10^5 Pa, T = 300 K)