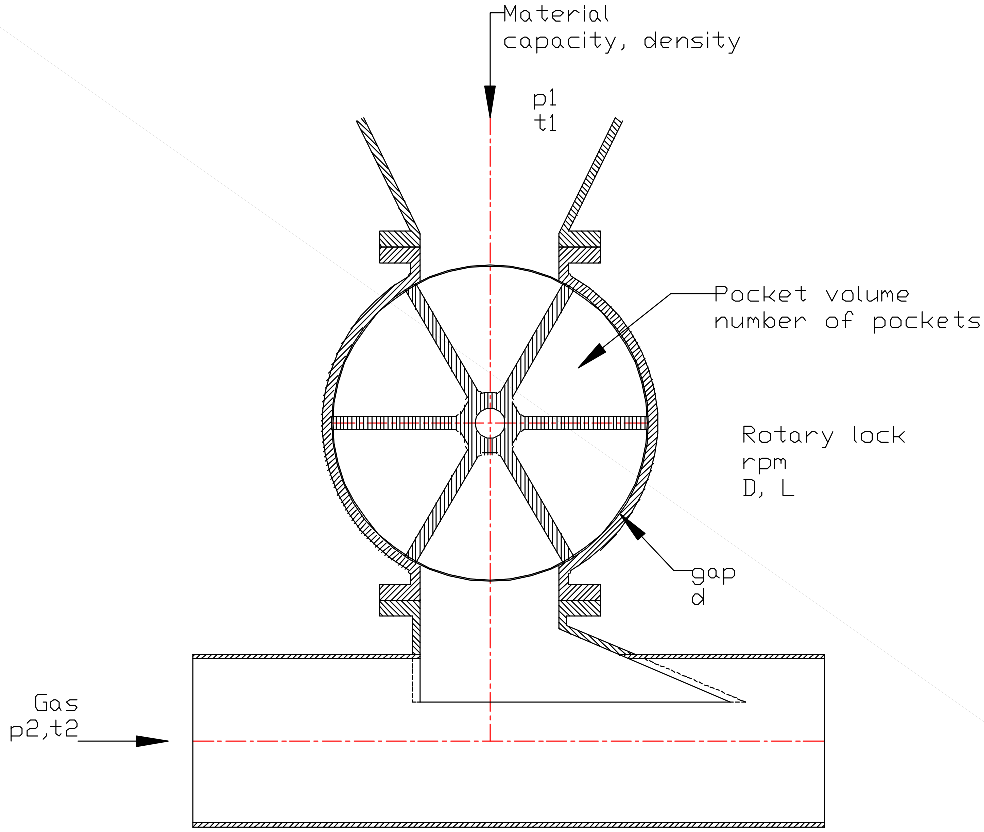
# Rotary lock losses

## pressure lock

1)




p1 and p2 in absolute pressure

RotarylockVolume = pocket volume * number of pockets

Capacity rotary lock = RotarylockVolume * rpm * material density * η vol *60 / 1000 tons/hr

Mass in pocket at p1 , t1 :

$$Mass1 = 1.293 * \frac{p1}{1} * \frac{273}{(273 + t1)} * RotarylockVolume$$

$$Mass2 = 1.293 * \frac{p2}{1} * \frac{273}{(273 + t2)} * RotarylockVolume$$

Rotary lock volume loss = ( Mass2 – Mass1) / air density * rpm / 60

Rotary lock volume loss =

$$\left(\frac{p2}{(273+t2)} - \frac{p1}{(273 + t1)}\right) * \frac{(273 + tambient)}{p(amb)} * RotarylockVolume * \frac{rpm}{60}$$

in which:
p2 – p1 = convey pressure
p2 = absolute compressor pressure
p1 = absolute hopper/silo pressure (ambient (atmospheric))
p(ambient) = absolute ambient (atmospheric) pressure (intake pressure compressor)
t2 = convey air temperature
t1 = hopper/silo temperature
tambient = intake temperature compressor

2)

Product displacement:

$$Volume = \frac{capacity}{3.6 * material\ density}$$

Volume at hopper/silo pressure (ambient (atmospheric))

$$Volume\ at\ p(amb) = \frac{capacity}{3.6 * material\ density} * \frac{273}{(273 + tambient)}$$

***<u>Filled in:</u>***

**Rotary lock volume loss =**

$$\left(\frac{1.4}{(273+27)} - \frac{1}{(273 + 27)}\right) * \frac{(273 + 27)}{1} * 0.32 * \frac{1}{60} = 0.00213\ m3/sec$$

$$Volume\ at\ p(amb) = \frac{2}{3.6 * 200} * \frac{273}{(273 + 27)} = 0.00252\ m3/sec$$

**Total leakage excluding gap losses: approx. 0.00466 m3/sec # 16,8 m3/hr**

**1.2% of 14 m3/hr**