Formula for Current Calculation

Powerloss

V = Air Flow Rate in l/min
P = Powerloss in
 T= Difference of temperature (in/out) in Kelvin

$$V[l/\min] = \frac{P[W] \times 50}{\Delta T[K]}$$

Hook's Law

(Speed variation at constant fan size and constant density)

The volume flow changes proportionately to the speed

$$\frac{V_1}{V_2} = \frac{n_1}{n_2}$$

All pressures (static, dynamic, total) change proportionately to the square of the speed

$$\frac{pst_1}{pst_2} = \left\{\frac{n_1}{n_2}\right\}^2 = \left\{\frac{V_1}{V_2}\right\}^2$$

The power requirement at the shaft changes proportionately to the third power of the speed

$$\frac{P_1}{P_2} = \left\{\frac{n_1}{n_2}\right\}^3 = \left\{\frac{V_1}{V_2}\right\}^3$$

Flow resistances

General information:
Every resistance to flow changes (exception: Laminar Flow) proportionately to the dynamic pressure p_d or the density ρ i.e. simultaneously to the square of the speed c, or the volume flow $\dot{V}$.

This means that identical mathematical interrelationship applies here as for fans, so that in a working together between fan and plant there is a constant balance.

p_{st} is called static pressure. This is the pressure against a flow-parallel wall.

p_d is called dynamic pressure (velocity head or pressure head). It is the highest pressure increase in front of the center of an obstacle to the flow. It corresponds to the pressure difference required to accelerate from rest to the speed in question.

p_t is called total pressure. It is the algebraic sum total of static and dynamic pressure.

As design basis for the delivery output of a fan, only the total pressure difference Δp_t to the formula is clear.

$$\Delta pt = pst_2 + pd_2 - (pst_1 + pd_1)$$

The prescripts hereby mean:
1 = intake
2 = outlet

The entry of total pressure difference should therefore be preferred to any other method.