1. Volume flow:-

$$q_{v2} = q_{v1} \times \left(\frac{n_2}{n_1}\right)^1 \times \left(\frac{d_2}{d_1}\right)^3$$

2. Pressure:-

$$p_2 = p_1 \times \left(\frac{n_2}{n_1}\right)^2 \times \left(\frac{d_2}{d_1}\right)^2 \times \left(\frac{\rho_2}{\rho_1}\right)^1$$

3. Absorbed power:-

$$P_{R2} = P_{R1} \times \left(\frac{n_2}{n_1}\right)^3 \times \left(\frac{d_2}{d_1}\right)^5 \times \left(\frac{\rho_2}{\rho_1}\right)^1$$

4. Sound Power Level:-

$$PWL_2 = PWL_1 + 70 \log_{10}\left(\frac{d_2}{d_1}\right) + 55 \log_{10}\left(\frac{n_2}{n_1}\right)$$

5. Density:-

$$\rho_2 = \rho_1 \times \left(\frac{B_2}{B_1}\right) \times \left(\frac{T_1}{T_2}\right)$$

6. Fan Total Efficiency %:-

$$\frac{q_v \times p_t F}{10\, P_R}$$

7. Fan Total pressure:-

$$p_t F = p_s F + p_d F$$

or Fan Static pressure:-

$$p_s F = p_t F - p_d F$$

8. Velocity pressure:-

$$p_d = 0.5\, \rho\, V^2$$
$$p_d = 0.6\, V^2 \text{ (Standard air, where } \rho = 1.2 \text{ kg/m}^2 \text{)}$$

Nomenclature for symbols used in this page:-

q_V = volume flow of air, m³/sec

η = rotational speed of fan

d   = diameter of fan

p   = pressure developed by the fan

ρ = density of air, kg/m³

P_R = power absorbed by the fan kW

B   = barometric pressure

T   = absolute temperature, K 9K = °C + 273)

$p_t F$ = fan total pressure, P

$p_S F$ = fan static pressure, P

$p_d F$ = fan dynamic/velocity pressure, P

p_d = system dynamic/velocity pressure, P

V   = velocity of air, m/sec

PWL   = sound power level

Formulae 1 to 4 can only be applied to fans that are geometrically similar and it doesn't matter what units are used as long as both the values of rotational speed, diameter etc. are the same.
In formulae 5 to 8 the units shown tin the nomenclature must be used to satisfy the formulae.

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