Fan Laws OR Affinity laws

Engineers and designers who select and specify fans use fan laws to accurately predict changes (assuming the fan diameter and air density are constant) in fan or blower performance. Following laws govern the performance specifications of **"VENTECH"** blower wheels:-

When these conditions are fixed	And this is the variable	The laws are	The equations are
Impeller	Speed (n)	1. Flow rate varies directly as the speed ratio.	$Q_2 = Q_1\ n_2/n_1$
System		2. Pressure varies as the square of the speed ratio.	$\rho_2 = \rho_1\ (n_2/n_{1)}^2$
Density		3. Horsepower varies as the cube of the speed ratio	$HP_2 = HP_1\ (n_2/n_{1)}^3$
Speed	Impeller Diameter(D)	4. Flow rate varies as the cube of the fan diameter ratio.	$Q_2 = Q_1\ (D_2/D_1)^3$
Density		5. Pressure varies as the square of the fan diameter ratio.	$\rho_2 = \rho_1\ (D_2/D_1)^2$
Point of Rating		6. Horsepower varies as the 5th power of the fan diameter ratio.	$HP_2 = HP_1\ (D_2/D_1)^2$
Flow Rate	Density (γ)	7. Horsepower and pressure vary directly as the air density ratio.	$\gamma_2 = \gamma_1\ (\rho_2/\rho_1)$
Speed			$HP_2 = HP_1\ (\rho_2/\rho_1)$

Fan efficiency = $\dfrac{Q \times \Delta P_t}{HP \times 1000} \times 100$

Legend

n = Fan speed in revolutions per minute
Q = Flow rate in m^3/sec
ρ = Pressure in pascals
HP = Horsepower (kW)
D = Fan Diameter in mm
γ = Air density in kg/m^3

Subscript (1) denotes values of existing conditions
Subscript (2) denotes values computed to the desired conditions