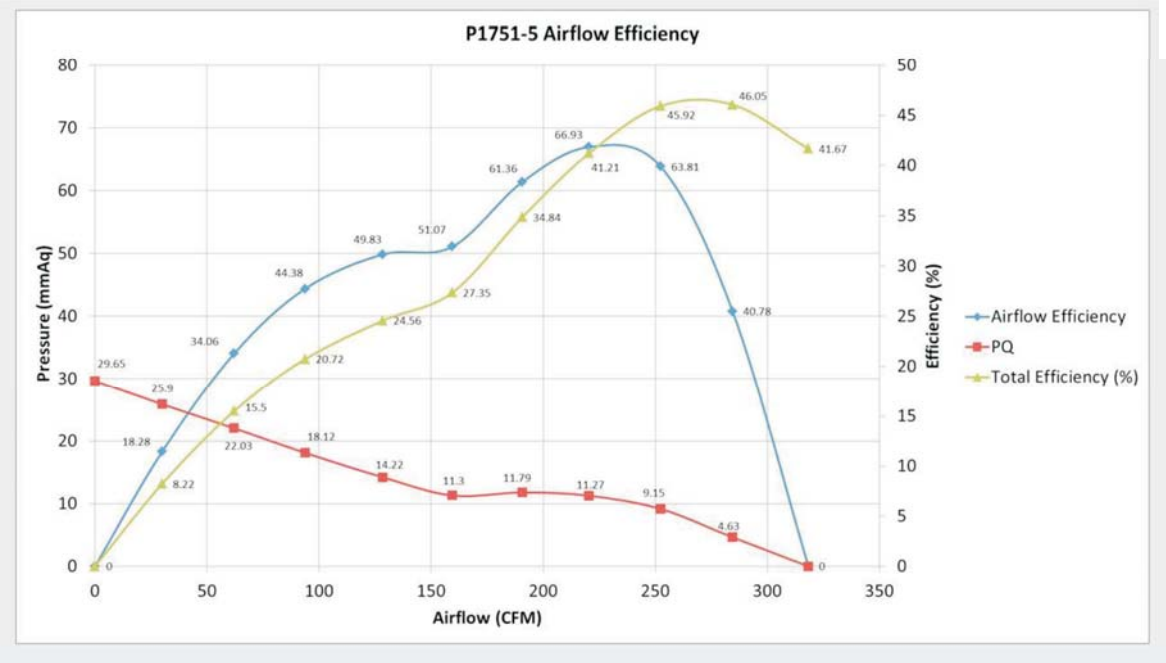
FAN MOTOR EFFICIENCY

In general the efficiency of a system is defined as η = Out Power / Input power
In the case of a motor the incoming power for example in horsepower terms is expressed in electric power of watts equivalent to 746 W/hp (watts/horse power) and the output power is in units or energy/second.

In the case of Fan Motors the efficiency is measured in 2 different ways:

A. (η = P*Q / W) = (Pressure*Air Volume / Input Power) = (Output Power / Input Power)
Where: P*Q is air flow power expressed in Watts if P is in Pascal (Pa), Q is the air flow in m /Sec and the Input Power is expressed in Watts.

The figure of efficiency varies according to the operating point of fan. When there is no obstacle in the airflow (i.e. free air condition) we have the maximum airflow but the pressure presented to the airflow is zero. As a result no actual benefit is provided and at this point the efficiency is zero. Likewise, when the airflow is totally blocked by closing the exhaust opening of the fan in which case we have the maximum pressure but zero airflow the system's efficiency is also zero.
Below please see a typical efficiency graph for our model G1751 indicating the fan motor's efficiency for all the points from zero airflow-max pressure and zero pressure-max airflow.



The units of measurement are: Pressure in Pa (Pascal)
Air Volume: Q in m^3/second
Input power is expressed in watts
[η=P*Q/W * 100%]

Please note that the above fan has peak airflow efficiency of 36.88% running at 3553RPM and delivering 250.70CFM. The free air, air volume of this fan is 280.1CFM.

B.In the second way of airflow efficiency the total static pressure conditions are taken into consideration.
η=Pt*Q/W, where: Pt=Ps+Pd
Where: Ps=Static Pressure
Pd=m*V^2/2=dynamic pressure of the airflow
m=density of the air in Kg/m
V = is the air velocity through the Blow Area in m/s
Blow area S in m2 is the air exhaust area including the hub area.
V=Q/S=Air volume/Blow area (Where Air Volume Q is expressed in m /second)
Therefore Pt=Ps+m*(Q/S)/2