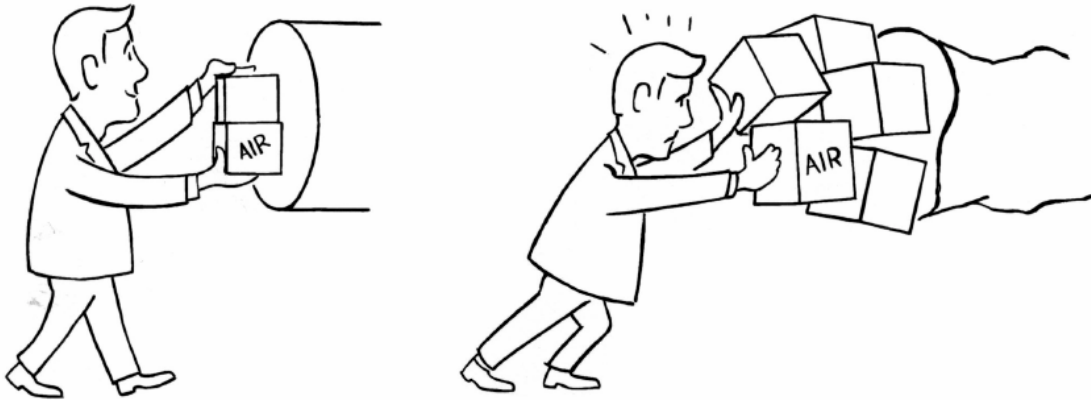


System resistance

The system, be it a tube, black box or a room has a resistance to airflow, along it or through it. This resistance to airflow is expressed as a pressure. The value of this resistance to flow increases with increase in volume flow and velocity.



The system resistance curve is a square law. The pressure changes by a factor of a change in air volume to the power of two.

Pressure (p) is proportional to volume squared (v^2).

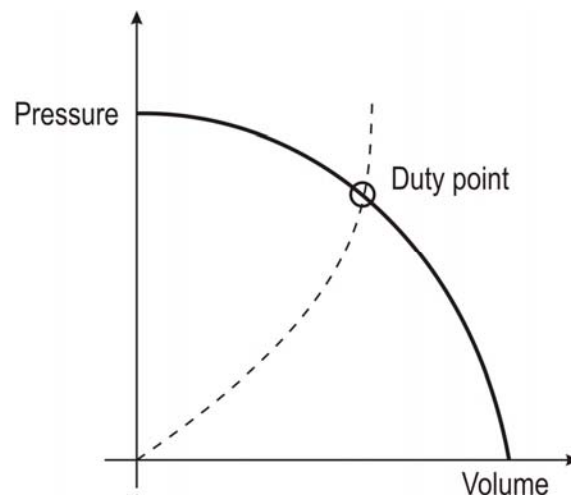
For example doubling the volume flow requires four times the pressure development.

$p \propto v^2$ therefore $(2 \times v)^2 = 4 \times p$

Halving the volume flow only requires a quarter of the pressure development.

$p \propto v^2$ therefore $(\frac{1}{2} \times v)^2 = \frac{1}{4} \times p$

This can be plotted on the fan curve. The duty point is where the system resistance line crosses the fan curve.



The system resistance for a ducted installation can be calculated from standard equations and using K factor for the duct being used. A more complex system, for example a fan in an electronic enclosure is more difficult. There are Fluid Dynamic software systems that can calculate the system resistance, but where this is proven to be expensive or an application is not covered by the software package then estimation and trial is the norm.

Fan manufacturers can provide samples of fans for evaluation and testing. Alternatively fan manufacturers can measure the performance of an application on an airflow test rig to determine the system resistance and then select the appropriate fan. .



Airflow test rig