The operation of a fan is governed by three basic parameters: specific weight of the air it impels d, angular (rotational) speed n and impeller diameter D. When these change, so do the characteristics of the fan. We will now consider each of the cases of changing one of the parameters while the other two remain constant:
4.1. Changing d, while n and D remain constant.
The characteristics of the fan are expressed for a specific weight d = 1.2 Kg/m3. Changes to this result in directly proportional changes to the pressures and to the power absorbed by the impeller. The airflow rate will remain unchanged.
If d' is the new specific weight, this gives:

$$Q' = Q \quad P' = \frac{d'}{d} P \quad N' = \frac{d'}{d} N$$

4.2. Changing n, while d and D remain constant.
Changing the impeller's rotational speed causes the characteristics to change as follows:

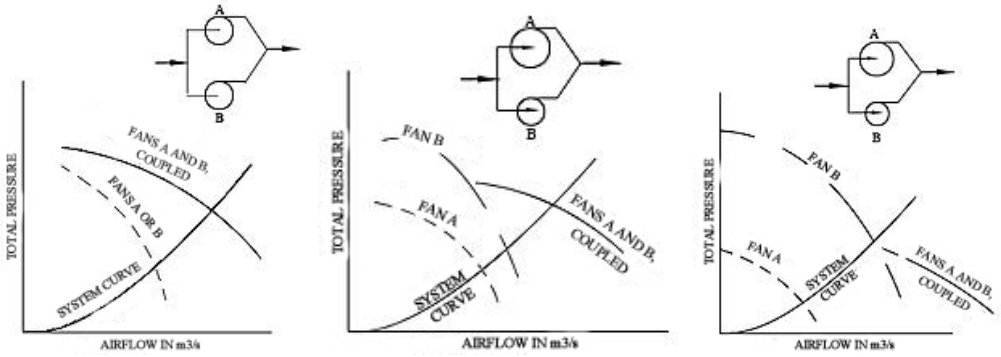
$$Q' = \frac{n'}{n} Q \quad P' = \left(\frac{n'}{n}\right)^2 P \quad N' = \left(\frac{n'}{n}\right)^3 N$$

n' is the value of the new speed.
4.3. Changing D, while d and n remain constant. This relationship is only valid for fans which are geometrically similar.
A new value, D' will give:

$$Q' = \left(\frac{D'}{D}\right)^3 Q \quad P' = \left(\frac{D'}{D}\right)^2 P \quad N' = \left(\frac{D'}{D}\right)^5 N$$

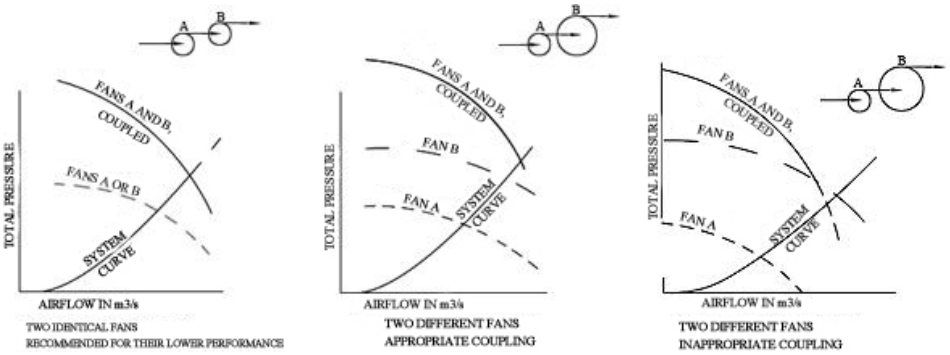
FAN COUPLING

5.1. Fans coupled in parallel



Notes: 1. Calculation of the curve for coupled fans. The airflow of the combination (Q) is the sum of the individual airflows of each fan at points of equal pressure.
2. When calculating the system curve, the losses in the individual connections to each fan must be included. 3. The system curve must cut the curve of the combination, otherwise the fan providing higher pressure, working alone, would give a higher airflow.
When the curve of the system does not cut the curve of the combination, or cut the prolongation of this curve before fan B, fan B will give a higher airflow than the coupling of A and B in parallel.

5.2. Fans coupled in series



Notes: 1. Calculation of the curve for coupled fans. The total pressure of the combination is the sum of the individual pressures, with the same airflow less the loss of head (or pressure) in the connection between fans. 2. The airflow through both fans will be the same because air is considered to be incompressible. 3. The system curve must cut the curve for the combination, otherwise the larger fan would give more airflow, working alone, than the combination of the two fans.