Fan Selection Guide

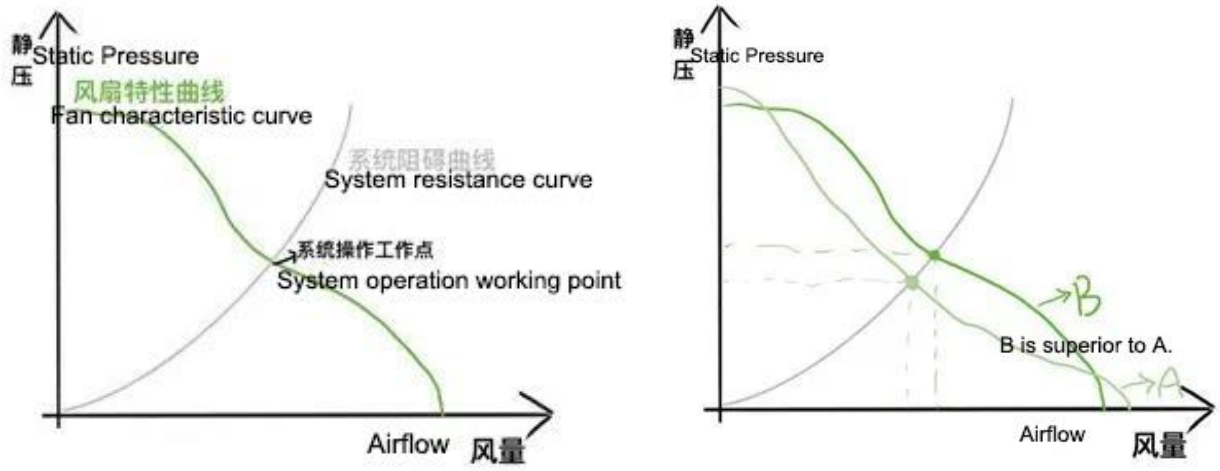
1. Fan Selection Factors

Fans are key components in electronic equipment, air conditioning systems, pneumatic systems, and other products. Proper fan selection is essential to ensure the product meets ventilation and cooling requirements. The selection process should follow the basic principles and steps outlined below:

- **A. Determine Requirements**: In the selection process, it is crucial to first clarify the requirements. Identify the fan's application, operating conditions, and process requirements.
- **B. Determine Fan Type**: Based on the clarified requirements, select the appropriate fan type. The main types include **axial flow fans**, **centrifugal fans**, and **propeller-type fans**.
- **C. Calculate Fan Parameters**: Fan selection requires the calculation and determination of key parameters, including structural dimensions, airflow, static pressure, power, noise, and other factors.
- **D. Other Factors**: In addition to the above, factors such as environmental adaptability, electromagnetic compatibility, reliability/lifespan, maintenance requirements, and cost should also be considered depending on the application and usage scenarios.

2. Fan P-Q Curve Operating Point

The **P-Q curve** (Pressure-Flow curve) is a fan's airflow-static pressure characteristic curve. It represents the relationship between airflow and static pressure, which is influenced by the pressure losses at the intake and exhaust.



- The **green curve** represents the fan's characteristic curve.
- The **gray curve** represents the customer’s system impedance curve. Since the customer's system may differ, only the P-Q curve of the fan is provided. The intersection of the two curves represents the optimal working point for the customer's cooling system. The higher the airflow and static pressure at the intersection, the better the fan's cooling performance.

Thus, when selecting a cooling fan, the **maximum static pressure** and **maximum airflow** on the P-Q curve are not the primary reference indicators. The appropriate operating point should be determined based on the system impedance and the chassis structure to select the best fan for cooling.

3. Estimating Cooling Airflow

The required airflow to dissipate a certain amount of heat can be estimated using the following simplified equation:

Q = 1.76 * P / (ΔT * c)

Where:

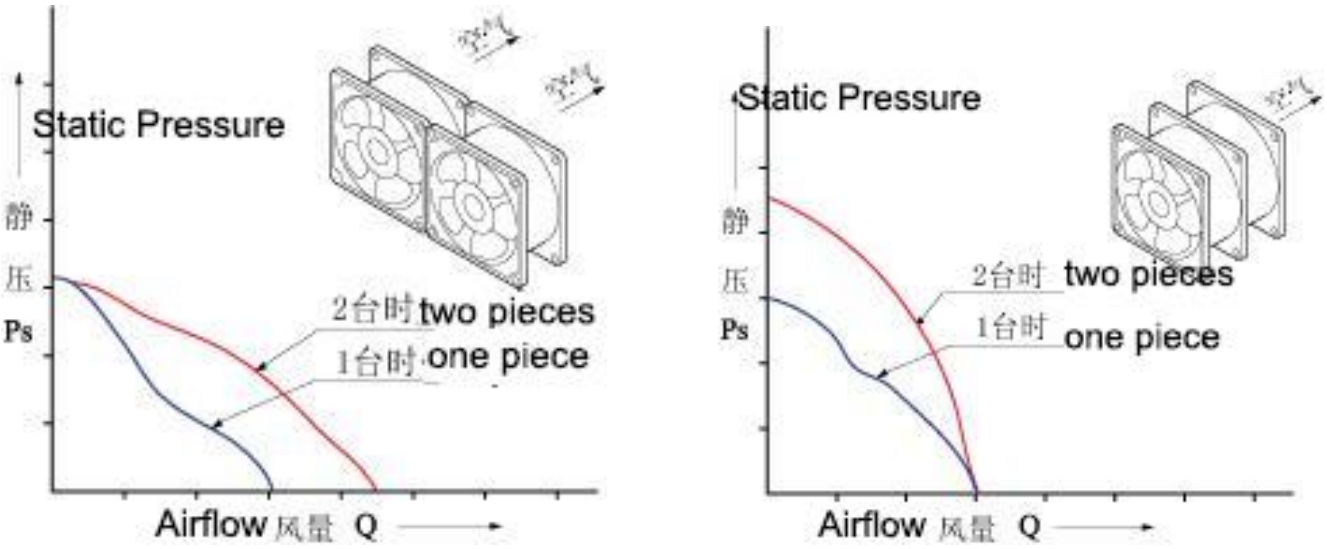
- **Q** is the airflow (CFM),
- **1.76** is the combined factor derived from air specific heat, air density, and unit conversion,
- **P** is the power consumed (W),
- **ΔTc** is the allowed temperature rise of the air (°C).

This calculation provides the airflow required at the working point. During the initial design phase, when system resistance pressure data is unknown, a fan with a maximum airflow 1.5 to 2 times the required airflow can be selected.

4. Fan Combination Usage

To overcome high heat dissipation or high airflow resistance in actual systems, multiple fans are often used in combination to increase airflow or pressure, improving the system's cooling capacity and enhancing operational reliability.

There are two ways to combine fans of the same performance: **parallel operation** and **series operation**. The combination and changes in the P-Q curve characteristics are shown in the diagram below.



- **Parallel operation**: Static pressure remains unchanged, but airflow doubles. This is suitable for increasing airflow in low-resistance systems.
- **Series operation**: Airflow remains unchanged, but static pressure doubles. This is suitable for overcoming system resistance in high-resistance systems.

When combining fans, it is necessary to consider the power supply load and the effect of the fans' own heat generation on the system's cooling capacity. Additionally, the system noise will increase. Generally, adding one more fan of the same specification increases the noise by **3 dB**.

5. Airflow & Static Pressure Unit Conversion Table

Airflow Conversion	Cubic Feet per Minute (CFM)	Cubic Meters per Minute (m^3/min)	Cubic Meters per Hour (m^3/h
	1	0.0283	1.699
	35.31	1	60
	0.589	0.0167	1

Pressure Conversion	Inches of Water Column (InH_2O)	Millimeters of Water Column (mmH_2O)	Pascal (Pa)
	1	25.4	249
	0.0394	1	9.81
	0.004	0.102	1