Selecting Fans

PQ Curve Characteristics

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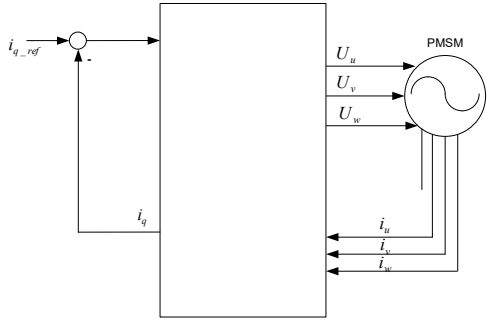
Brief Introduction – PQ Curve Characteristics

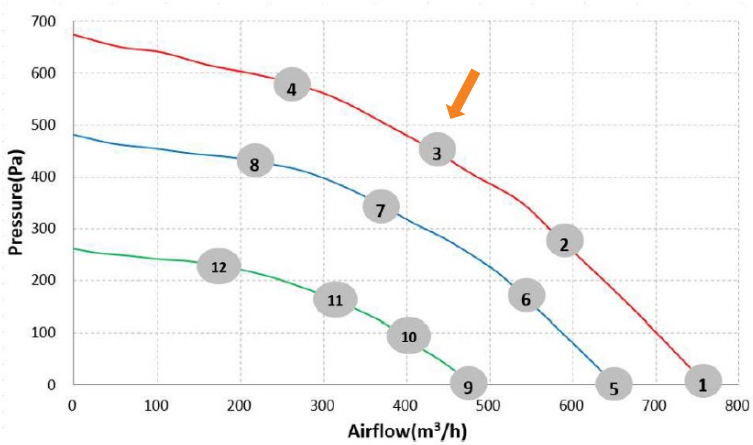
- **Fans exhibit a linear relationship between active Power (P) and Flow Rate (Q)**
  - As flow rates increase, the active power required to maintain that flow rate increase
  - In extreme operating conditions (high flow rates or high static pressure), fans may deviate from this linear relationship where efficiency of the fan may decrease, and the power consumption may increase
  - Therefore, it is important to choose the right fan for your application!
    - The right fan ensures maximized efficiency and reliability when operated within its recommended flow rate and static pressure

Types of PQ Curves

- **Constant RPM**
  - Common in the marketplace
  - At full speed, the PQ curve depends on max power consumption & aerodynamics
  - Under modulation, the RPM and modulation signal are a corresponding relationship
- **Constant Air Flow**
  - Customized per application
  - A Model-Based Design (MBD) code/algorithm is developed to achieve constant air flow at multiple static pressure points

Constant RPM





- **Constant RPM is a stepless modulation**
- **Once the static pressure (Pa or InH₂0) and air flow requirements are understood, the RPM and input power can be provided**
- **For example: 440 m3/h @ 450 Pa requirement would require .89A with a constant RPM of 2601 (3 on PQ curve)**

No.	Voltage (V)	Frequency (Hz)	Speed (RPM)	Power (W)	Current (A)	Air flow (m^3/h)	Pressure (Pa)
1	230	50	3656	97	0.81	760	0
2	230	50	3582	119	0.93	586	276
3	230	50	2601	110	0.89	436	446
4	230	50	3627	108	0.84	268	577
5	230	50	3141	66	0.56	650	0
6	230	50	3141	79	0.65	546	158
7	230	50	3139	77	0.64	371	342
8	230	50	3139	70	0.59	229	426
9	230	50	2340	31	0.29	479	0
10	230	50	2341	35	0.31	402	84
11	230	50	2340	35	0.32	307	166
12	230	50	2340	33	0.31	192	223

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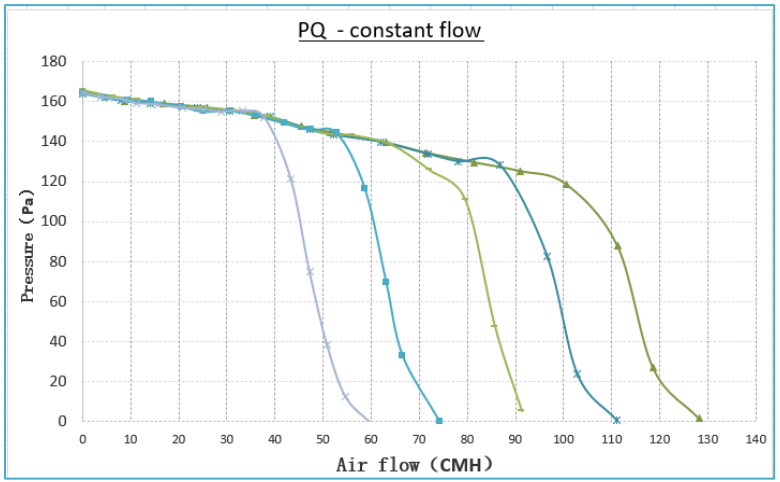
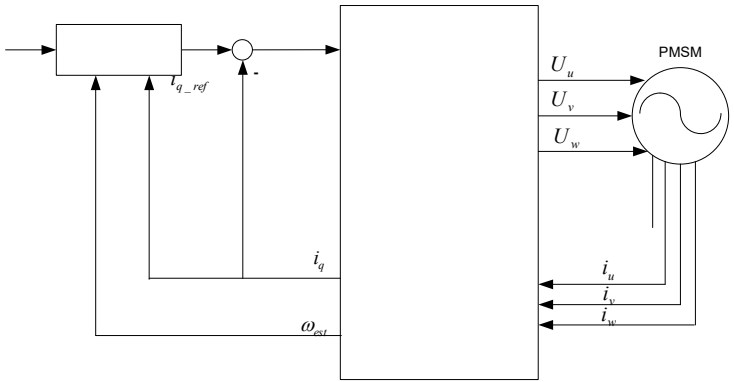
Constant Air Flow

- **Constant air flow is not a stepless modulation**
- **A MBD code database is developed and fine tuned through CFD simulations and validated with state-of-the-art wind tunnel equipment**
- **To achieve constant air flow, a fixed design of customer's unit is required. Including impeller, scroll housing, filter, pipes, heat exchanger, clear definition of modulation signal input, etc…**
  - Even a small change to the design could require a complete modification to the algorithm





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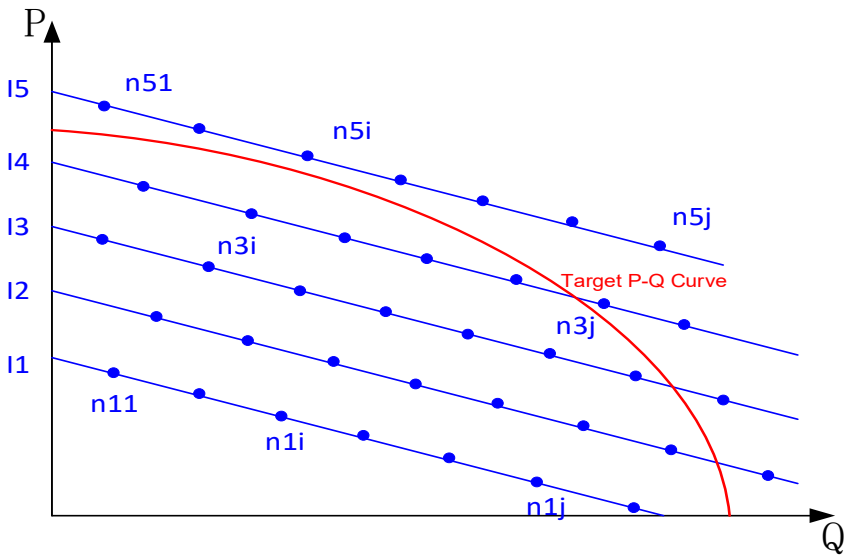
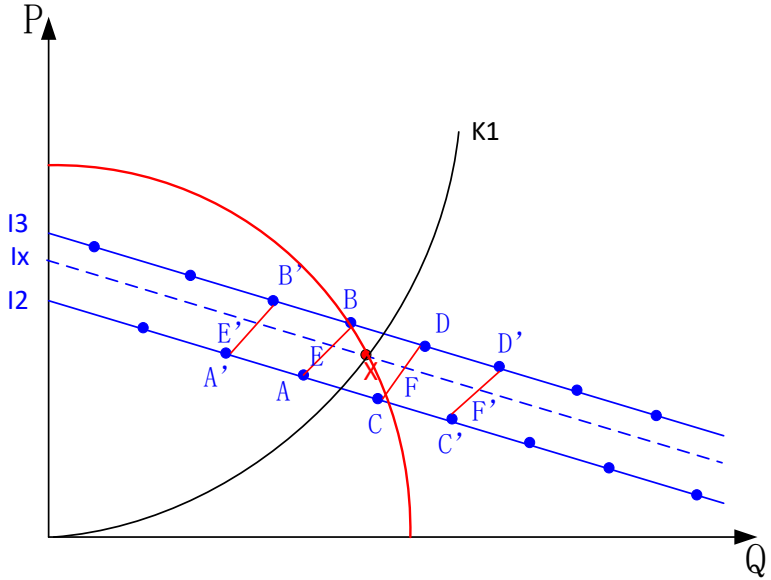
Constant Air Flow

- **Step 1:** Get Original Data from the Lab



- **Step 2:** Generate the data of the target PQ curve according to its system resistance, point by point



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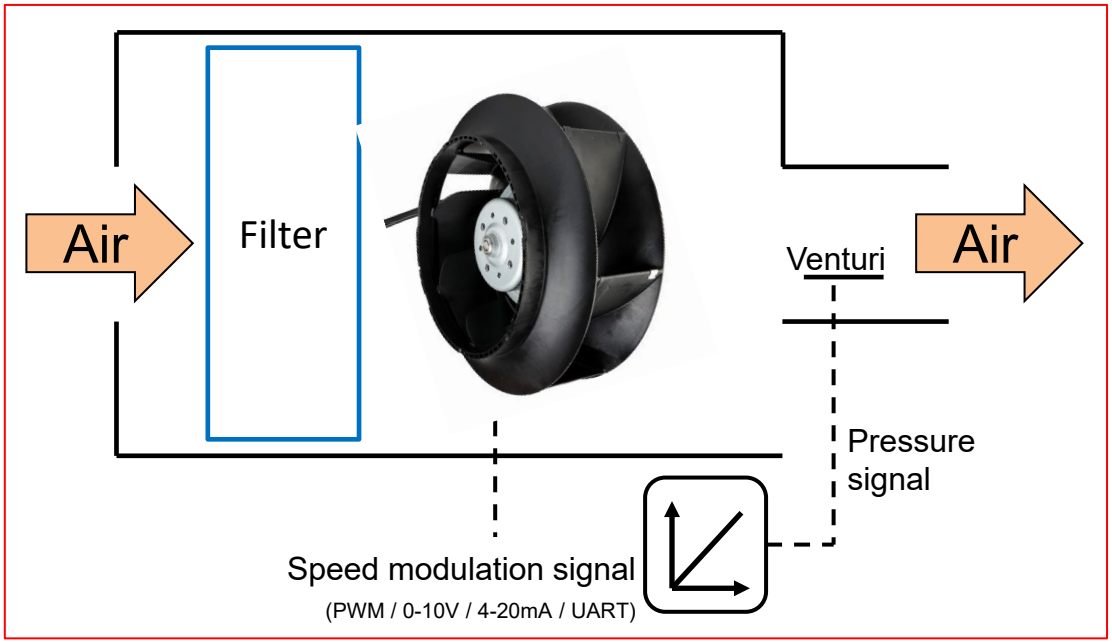
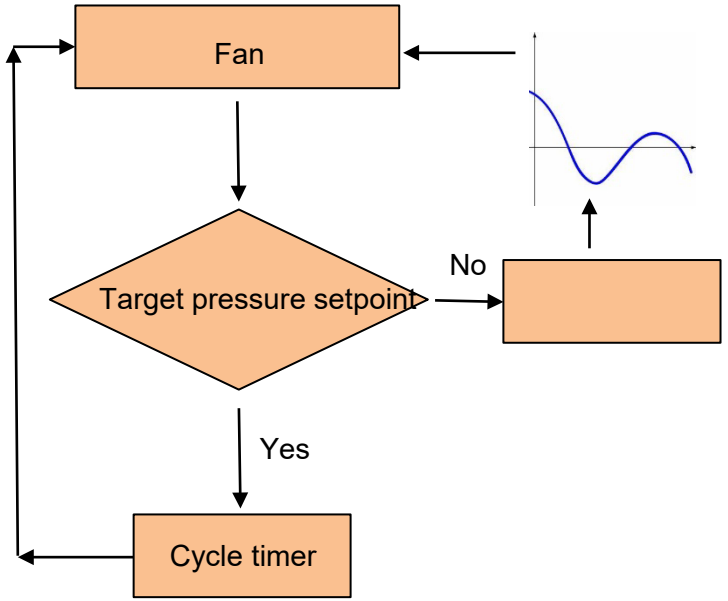
Achieving Constant Air Flow w/ Constant RPM



Principle:



- **With pressure setpoint monitoring, the fan speed will be automatically modulated with PWM input.**
- **If the filter is getting dirty with higher system pressure, the air flow will be maintained constantly under higher PWM input.**

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Thank You

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