Fan Noise - Mechanical Considerations

Fan noise plays a significant factor in selection of a cooling solution for a certain application. Noise levels reflected on the fan specifications are the measurements taken in free air. Fan noise levels vary depending upon the application of the fan in a specific system. An early collaborative engineering effort between the customer and JMC helps in optimizing the fan specifications resulting in lower system noise levels.

Fan noise levels depend on various factors. These factors have been addressed briefly below.

- ## Speed of the fan

Higher fan speed generates more turbulent airflow and noise. Attempts should be made to reduce the fan RPM as much as possible, without compromising the cooling effect.

- ## Air Intake and Exhaust Impedance

This can be defined as the resistance of the enclosure to the airflow. The effects of the enclosure design on the overall noise can be controlled if the JMC Engineering Team is involved from the early stages of the enclosure/chassis design. Flow and thermal tests can be carried out to determine the operating point and temperature distribution of the chassis for a particular fan size. This helps to optimize the fan RPM and reduce noise.

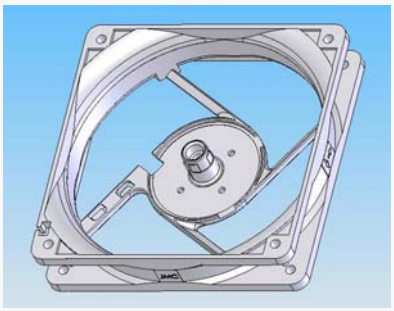
- ## Bearing system in the fan

Ball and Sleeve are the two types of bearing systems generally used on fans. At lower speeds sleeve bearing fans have been found to operate quieter than ball bearings. Serious consideration should be given to the effect of bearing system on the life of the fan.

- ## Vibration resulting from balance specification

ISO1940 standard specifies the minimum required balance grade of a rotor for specific applications. Cooling fans are generally balanced per G6.3 spec.
A tighter balance grade (G2.5) may be considered for special applications. Maintaining the balance grade within specification requires tight control over tooling and production processes.

• Fan Frame Design and Orientation of Struts

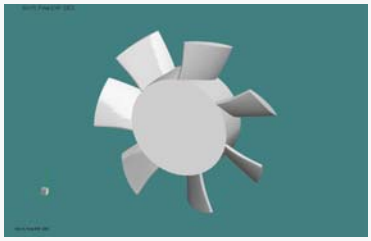


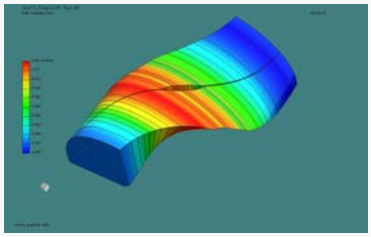
Frame Design involves design of appropriate geometry on the frame for the impeller air inlet. This inlet is also referred to as “throat”. A uniform circular contour on the frame inlet helps the impeller to intake air with laminar flow instead of turbulent flow. This feature boosts the flow rate, increases fan efficiency and reduces noise considerably.

Frame struts are necessary for fan support and stability, but they play a significant factor in creating obstruction to the airflow and noise. Careful attention should be given to the number of struts and their shape to minimize airflow losses and noise.

At JMC, an effective strut and frame design has shown to reduce noise levels by 1dBA to 2dBA. This is a significant factor in noise sensitive applications.

• Impeller Blade Profile





The Engineering group at JMC utilizes tools like NREC Concepts for blade profile design. Blade profile plays a major factor in the overall efficiency of the fan. Flow separation over the surface of blades leads to formation of vortices, which eventually increases the noise levels. CFD analysis on the impeller design helps to detect flow separation on a specific blade profile. It also helps to analyze and optimize the performance of impellers at a specific speed.

The JMC Engineering team looks forward to working with you, to meet your airflow and cooling requirements. To optimize existing solutions or to develop new solutions with better airflow and lower noise please contact us at 512-834-8866 or sales@jmcproducts.com.