NOISE GENERATION AND MEASUREMENT

NOISE GENERATION

In fan motors there are 3 distinguishable sources of noise:

AIR FLOW NOISE This is the noise created solely by the air movement. As the air is moving under pressure exerted by the fan blade, it is directed at a lower pressure environment or it hits against nearby objects. Such air movement will generate ***Air Noise***. Such air noise is not bothersome to the human ear but on the contrary at low levels it can be soothing.

A. **ELECTRICAL NOISE:** Electrical noise can be generated by the power source applied to the motor. In the case of an AC motor powered even with perfect sinusoidal waveform, coil-winding noise can be generated due to electromagnetic forces. The result will be a *"**Buzzing Noise**"* in a poorly manufactured motor (such as a non-varnished motor).
Electrical noise can be created in the case of a phase controlled AC motor due to generated higher harmonics (***High Pitch Noise***).
Electrical noise can also be created in the case of a poorly regulated power source.

B. **MECHANICAL NOISE*:*** Mechanical noise is due to motor construction details, and other than due to gross construction problems (such as the fan blade touching on the frame or rotor colliding with the stator) the main source of mechanical noise is generated by the bearing system.

i. **Sleeve Bearing Noise**

In this case noise is generated at the point of friction between the shaft (hardened and well polished steel) and the sleeve tube (usually made of brass type oil impregnated alloy). When the sleeve bearing is new and properly oiled the noise level is generally lower than the noise created by ball bearings. However as the sleeve bearings are put to use, they will consume their oil and deteriorate by reduction of their inner diameter due to friction. In this condition the sleeve will create a "***Wobbling Noise***".

ii. **Ball Bearing Noise**

In this case noise is generated by the friction between the moving balls and their inner housing. This noise maybe increased if the ball bearings are not sealed and dust particles have entered inside the moving section of the bearing. In this case the bearing is "shot bearing" resulting in a bothersome irregular noise. Another source of bearing noise can be due to improper fitting of the bearing inside the tubular bearing holder horizontally (loose bearing). The last source of ball bearing noise can be generated due to vertical motion of the bearing by insufficient spring loading and cushioning (loose bearing).
The ball bearing system is superior to the sleeve bearing with good performance for a long period of time running at high speeds and at elevated temperatures. Also it can run horizontally or vertically due to the fact that it is spring-loaded.
However a *"**High Pitch Noise**"* generated by the ball bearings still remains one of their main drawbacks.

NOISE MEASUREMENT

The usual method of fan motor noise intensity measurement is done in an anechoic or semi-anechoic chamber at the distance of 1 meter. The measurement of this noise is expressed in dB (A), which is the weighted noise intensity as sensed by the human ear.
However noise intensity is not really an accurate criterion, especially for demanding low noise applications. The noise quality is more important rather than the noise intensity for such applications. For example the “HIGH PITCH” ball bearing noise may not be acceptable even though the intensity level maybe well within the noise intensity specified limits. For this reason the noise quality and abnormal noises are best detected by young and trained personnel.

NOISE CALCULATION BY SPEED COMPARISON

If the noise (dBA1) of a Fan at RPM1 is known, the noise of the same Fan type at RPM2 (dBA2) can be calculated based on the following experimental formula:

dBA2 = dBA1+60*log10(RPM2/RPM1)

©Copyright, ***PELKO Motors***