Life and Reliability

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Comair Rotron conducts a continuous and comprehensive life test program for development purposes as well as for continuous monitoring of production units. The results of the life testing are reflected in continuous improvements in Comair Rotron's products in such critical areas as bearings, lubricants, materials, and insulation systems. The continuous monitoring of production units provides a means of evaluating the adequacy of production methods and quality assurance programs.

Because the primary mode of failure of an air moving device is bearing failure caused by eventual degradation of the lubricant, Comair Rotron has adopted the method of statistical analysis widely used by the bearing industry, known as the Weibull function analysis. The Weilbull function analysis method permits a statistically accurate determination of the failure distribution from a small representative sample of air moving devices. Comair Rotron's practice is to accelerate the life testing by operating its products at several elevated temperatures until enough failures of each sample group have been obtained to establish these statistical distributions. These data are then extrapolated to predict the time at which, in a large population, 90% of the air moving devices will still be operative. This time is referred to as the "L-10" life, or the time at which 10% of the sample could be expected to fail.

Based upon the results obtained at each of the elevated temperatures, (usually 40°C, 55°C and 72°C) a curve may be drawn which will permit the life to be expected at lower temperatures. The curves presented in this catalog have been determined from tests conducted in the manner described here.

Every model fan, regardless of manufacturer, will exhibit different life characteristics depending on the combination of voltage, frequency, ambient temperature, mounting attitude, environment and restriction to airflow conditions it encounters in an individual application. The normal failure mode is in the bearing system and it is usually related to the total temperature the bearing system sees, although other factors may apply.

Generally speaking, there is not much of a life differential between a sleeve bearing system and its equivalent ball bearing system when the total temperature the bearing system sees is relatively low, but as this total temperature increases, ball bearings give progressively longer life than sleeve bearings.

For normal computer type environments we recommend our sleeve bearing units since they will meet the life requirements, are quieter, are less expensive, and can be used in any mounting attitude. For high ambient temperatures, or other operating conditions which result in the bearing system seeing very high total temperatures, or hostile environments, ball bearings should be considered. If a sleeve bearing model will do the job, we suggest it be used instead of a more expensive, less quiet ball bearing model.

One area that is important to reliability is fan noise and the ability of the bearing system to endure a shock and not become noisier. Sleeve bearing fans, generally speaking, can easily sustain multiple shocks of 80 g's with a duration of 11 msec without impacting noise. The same is not true of ball bearing fans. Figure 1 shows what can happen to ball bearing fan noise if the fan is subjected to 40 g's (11 msec duration). This is important since the equipment manufacturer has no control over how his equipment is treated after the fan is installed, particularly in shipment. It is quite common for a ball bearing fan to be noisy before it is even used just from the handling of the system into which it is installed.

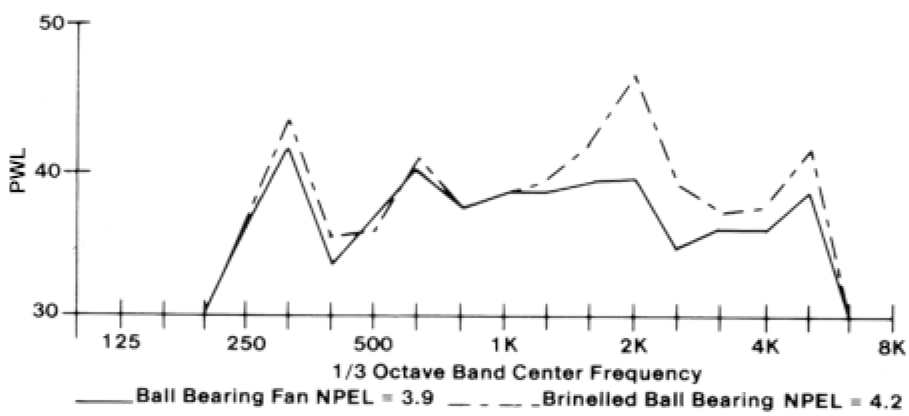

Figure 1: Effect on Fan Noise Due to Damaged Ball Bearing

One last important point is what happens to both types of bearing systems versus running time or life. Typically, sleeve bearing fan noise does not increase due to life. This remains true until the system begins to fail due to loss of oil. However, as can be seen in Figure 2, ball bearing fans can begin to get noisy in a very short time. This increase is due to many factors, such as grease channeling, loss of grease, damaged bearings camouflaged by the grease, etc. Also, as time goes on, the grease may begin to dry out which allows for a very noisy fan; the fan will continue to run for a long time. Thus, if usable fan life were defined to end when the fan became noisy, it is possible that the sleeve baring fan would out live an equivalent ball-bearing fan.

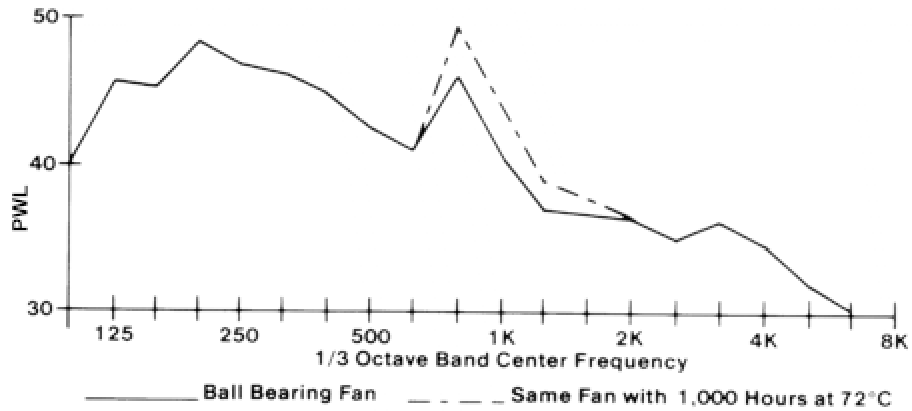

Figure 2: Effect on Fan Noise Versus Life

Test Methods

Rotron's Aerodynamic Laboratory is equipped with a testing chamber, illustrated schematically in Figure 3. This test chamber is designed to be in accordance with the requirement of Figures 4.1 and 52. of Air Moving and Conditioning Association's (AMCA) Standard 210.

The fan under test is mounted on the inlet of the chamber, and flow through the nozzle is varied by the movable gate assembly. The flow through the calibrated ASME nozzle is determined by measurement of the pressure differential across the nozzle, and simultaneous readings are taken of the static pressure developed by the fan. The function of the auxiliary blower is to provide sufficient pressure drop across the nozzle to allow free delivery flow readings when the static pressure across the fan is zero.

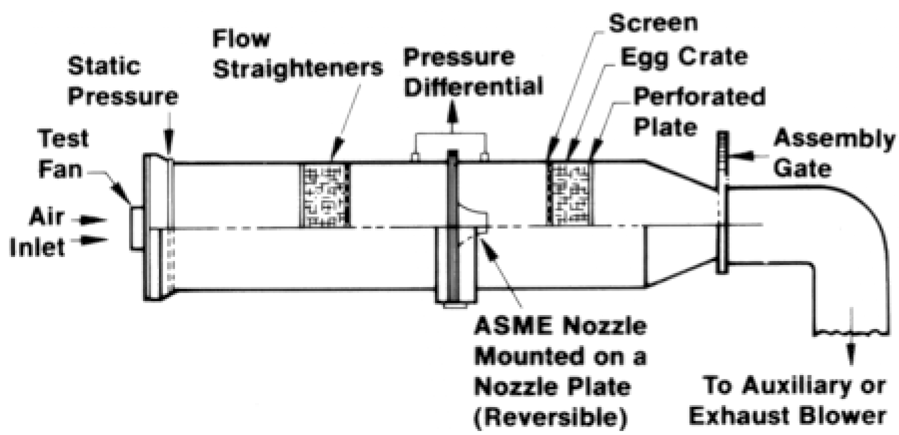

Figure 3: Comair Rotron Test Set-Up

In addition to testing fans, the test chamber may be used for determining impedance of a customer's equipment by using the auxiliary blower to force air through the equipment.