

On occasion, customers request that we furnish fans with a specified bearing life. Usually, the requests for bearing life are expressed in terms of B-10 or L-10 life in hours. This Sales Bulletin is an overview of what bearing life is and what conditions impact that life.

L-10 life, the more frequently used and modern term, is the probability of bearing failure expressed as a percentage. Bearing manufacturers are stating what percentage of bearings will fail after a designated time period based upon defined loads. A bearing L-10 life of 20,000 hours is defined as the probability that 10% of the bearings will fail after 20,000 hours of operation. If 100 bearings were subjected to the same speeds and loads, 10 are predicted to fail after 20,000 hours.

Average life, or L-50, is 5 times the L-10 life. In the above example, half of the bearings would fail after 100,000 hours.

All of this is predicated upon operating the fan bearings under ideal conditions with proper alignment, belt tension, lubrication, etc.

nyb selects bearings for fans based on minimum L-10 life. In calculating the bearing life, maximum cataloged BHP and fan RPM are used for all fans. For V-belt drive fans, fan sheaves are selected using the sheave ratio that obtains the maximum fan cataloged speed using the minimum acceptable motor sheave as defined by NEMA. This provides a worse case scenario or the most conservative design.

But what happens when a fan is selected at less than maximum conditions? Simply put, the bearing life is greatly enhanced. Bearing life varies inversely proportional to the speed. Bearing life also varies inversely as the cube of the load with ball bearings and inversely to the 3.33 power with roller bearings. Since BHP is also reduced at less than maximum cataloged speed, the bearing "loads" will also be less, thus having a compound effect.

For example, a Size 294 Series 20 DH with 2-3/16" LinkBelt P-300 ball bearings has an L-10 life of 28,674 hours at the maximum cataloged speed of 2194 RPM. For that same fan at 6042 CFM, 14" SP, 19.7 BHP, and 1756 RPM, the L-10 life improves dramatically to 200,659 hours!

Both of the above examples are based on a 7" diameter fan sheave. Bearing loads will **decrease** when the fan sheave diameter increases. A 10" sheave increases the life to 601,906 hours and a 14" sheave to 1,716,252 hours!

With V-belt drive fans, the outboard bearing is usually the most heavily loaded bearing. With direct drive fans, the inboard bearing becomes the bearing with the predominant load, but the load is much less than that of a bearing of the same size and type that is V-belt driven. Usually, the L-10 life is increased by a factor greater than 10 to 1. From the previous example, the L-10 life of a direct drive 294-DH would be 4,331,006 hours.

There are 8760 hours per year. As you can see, the theoretical L-10 bearing lives calculated above are extensive, and average life is five times greater.

nyb can furnish higher grade bearings to accommodate specifications which call for an L-10 life exceeding that of our standard bearings. However, it is important that the needs of the customer and the application be clarified to avoid additional, unnecessary cost.

Bearing life, as previously noted, is statistical and theoretical. Actual life will depend upon the care taken of the bearings by the end user. The following comments regarding the proper care and maintenance of fan bearings can greatly enhance bearing life.

1. **Lubrication** - It is of utmost importance to use proper lubricants. The vast majority of **nyb** fans use grease lubricated bearings. A good quality lithium based grease conforming to NLGI Grade 2 consistency should be used. Specific examples are listed in **nyb's** Installation, Maintenance, Operating literature. These manuals also include recommendations for the frequency of lubrication based on bearing type, speed, and diameter.
2. **Heat Fans** - When airstream temperatures exceed 300°F., **nyb** used shaft coolers to help dissipate the heat. A shaft cooler forces cooler ambient air toward the inboard bearing while acting as a heat sink to reduce the transmission of heat through the shaft.
3. **Vibration** - Excess fan vibration will cause premature bearing failure. It is important to keep the fan wheel clean. Also, it is good practice to isolate the fan from connecting ductwork to prevent air turbulence being transmitted back to the fan. Flexible connectors can be used for this purpose. They also help prevent undue force on the fan due to expansion and/or contraction of connecting ductwork when elevated temperatures are involved.
4. **Alignment** - Proper V-belt drive and coupling alignment are required to assure maximum bearing life. Belt tension is also important. Correct procedures are found in the appropriate fan Installation, Maintenance, Operating literature and drive manufacturers' literature.
5. **Storage** - if fans are to be stored for a period of time before placing them in operation, it is recommended that measures be taken to prevent bearing corrosion. Bearings should be pumped full of grease and the fan wheel turned at repeated intervals to prevent cavities from forming in the grease. Consult **nyb** when long term storage is contemplated.