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Load Ratings & Bearing Life

Bearings are often regarded as a commodity product, however continuing advancements in materials, manufacturing, technology and design indicate that this is not the case. Unfortunately, the way these improvements are reflected in load ratings and life calculations has become increasingly complex and not always consistent between manufacturers. This paper aims to shed some light on this topic as a guide for those trying to make sense of the various claims and industry standards.

The current standards for load ratings and fatigue life for ball bearings and for roller bearings are defined by the International Organization for Standardization through standard ISO 281:2007. Additionally the joint American National Standards Institute (ANSI) and American Bearing Manufacturers Association (ABMA) Standard 9:1990 used for ball bearing load ratings remains in place and Standard 11:2014 used for roller bearing load ratings has been updated in 2014 to make it more consistent with ISO 281:2007. ISO/TS 16281:2008, an addendum to ISO 281:2007, recommends calculation methods to determine the modified reference rating life to include influencing parameters beyond those included in ISO 281:2007. The table below summarizes the principle differences between the various life calculation methods.

Life Method	Standard				Factors Considered					
	ISO 281:2007	ANSI/ABMA 9	ANSI ABMA 11	ISO/TS 16281:2008	Dynamic Load Rating	Dynamic Equivalent Load	Lubrication	Contamination	Fatigue Limit	Internal Stress Distribution
Basic Rating Life	✓	ball brgs	roller brgs		✓	✓				
Adjusted Rating Life		ball brgs	roller brgs		✓	✓	*	*		
Modified Rating Life	✓				✓	✓	✓	✓	✓	
Modified Reference Rating Life				✓	✓	✓	✓	✓	✓	✓

Table 1: Content Summary of Standards for Bearing Life Calculation

These standards provide the equations and factors needed to calculate the Basic Load Rating for rolling bearings of all types including various life adjustment factors, such as for reliability, for material, lubrication and for application conditions.

The purpose of this report is to point out two important issues pertaining to these standards. The first is to remind distributors who have perceived themselves as “selling a commodity” that the bearing industry has made technological improvements in their product — improvements that should be emphasized with the user. You are selling a

better product than you were ten years ago and should be able to explain why this is so and what it means to the user.

The second point is that some recent improvements such as cleaner bearing steels and improved understanding/control of bearing geometry are not accurately reflected by the methods in the standards. As a result bearing manufacturers have used two different methods to show the improved performance of the bearings. The first was to keep the original load rating and apply life adjustment factors to indicate that life had improved, either in time or revolutions. The other method of showing the improvement in bearing performance was to increase the load rating of the bearings. With these two very different methods, it was difficult and sometimes impossible to determine if like bearings had similar performance characteristics.

Advances in bearing material, both standard and special, and application analysis, including effects of misalignment and lubricant quality and resulting life analysis, have been dramatic in the past few years. It is, therefore, always wise for a user to contact bearing manufacturers or their authorized distributor for current load rating and life analysis.

This article is an update of the BSA briefs titled "Load Ratings & Bearing Life" dated April 1988 and "Status of Bearing Load Ratings" dated August 1990 and some of the information included in those briefs has been maintained.