Overview

The fatigue life of rolling bearings has experienced a significant increase in the past several years. The improvement is attributed to the lowering of oxygen content in the bearing steels to the level of less than 10 parts per million by weight. This accomplishment is the direct result of new ladle degassing practices adopted in the steel making processes. Associated with this progress the methods used to evaluate the quality of bearing steels have been also improved, refined, and in many instances newly developed.

It is very timely for the American Society for Testing and Materials Committee A01, Subcommittee A01.28 on Bearing Steels to sponsor an international symposium on the theme of effect of steel manufacturing processes on the quality of bearing steels. The symposium was held on 4 to 6 Nov. 1986 in Phoenix, Arizona. This is the third symposium sponsored by ASTM Subcommittee A01.28 since May 1974 on bearing steels. We have set up a target that for every five to six years we will provide a forum for bearing steel producers and users to get together to present their latest research results, the newest state of the art, and to discuss the direction for future development. The response from the scientific and engineering community in the world has been very enthusiastic. This symposium in Phoenix received papers from Canada, France, Germany, Italy, Japan, Netherlands, Sweden, United Kingdom, and the United States. Almost all the major rolling bearing and bearing steel manufacturers in the developed countries participated. We are extremely gratified for both the quality and quantity of the papers received.

This book has collected 22 papers presented at the symposium. It is divided into three sections. In the first section there are nine papers discussing quality requirements for better bearing steels. In this section the phenomenal improvement in rolling bearing fatigue life in recent several years is unambiguously shown in facts and figures obtained both in laboratories and in the field. The significant contribution of a new quantitative metallographical method, the SAM method, adopted by ASTM A01.28 to assess the nonmetallic inclusion content in bearing steels is also clearly demonstrated. This method is detailed in Supplementary Requirement S2 of ASTM Standard Specification for High-Carbon Ball and Roller Bearing Steel (A 295-84). It has proved once more how an improved test method can stimulate the progress of manufacturing processes. Since the rating of nonmetallic inclusions was the major theme of the first bearing steel symposium held in Boston, Massachusetts in 1974 and *ASTM STP 575, Bearing Steels: The Rating of Nonmetallic Inclusion* was the first book published anywhere dedicated entirely to that subject, we proudly feel that the symposium has become an integral part of that progress. The second bearing steel symposium was held in Phoenix, Arizona in 1981 and was published as *ASTM STP 771, Rolling Contact Fatigue Testing of Bearing Steels*.

The second section of this book contains five papers dealing with new methods to evaluate the quality of better bearing steels. Attention should be paid to papers discussing the analytical method for the determination of oxygen in steel, and the latest round-robin tests conducted jointly by ASTM Subcommittees A1.28 and E03.01 on Ferrous Metals. Again we are proud to show the world that ASTM has taken a leading role in the standardization of a new test method that has become very important in its application. It is equally significant that papers in this section do not respond to the papers in the first section of this book in that there is an urgent need to develop a practical and meaningful test method for the evaluation of macro-inclusions in bearing steels. This is no doubt an indication to the scientists and engineers of a future research subject.

The third section of this book has eight papers covering the new processes to produce better bearing steels. We designed the sequence of the papers in this book in such way so that the readers can appreciate what the quality requirements of good bearing steels are, and how they are tested before reading the new manufacturing methods. Judgment must be made on sound and thorough understandings. Only after good bearing steel is defined can the reader judge how good a new manufacturing method is. All eight papers in this section are presented by leading specialty steel manufacturers in the world.

Both rolling bearings and bearing steel industries are highly competitive. Many research results are tightly guarded as trade secrets. Moreover, because bearing steel fatigue testing is very time consuming and usually a set of good comparative tests lasts several years, the academic institutions have shown little interests in taking up the research. We feel this book adds valuable information to the science and technology of bearing steels.

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