

Series Preface

The first edition of this book was published in 2001. The book has quickly become a highly successful and popular text amongst the students, academics as well as amongst the practicing engineers. The readers valued this book as a good teaching material and a useful reference. It is thus of no surprise that it enjoys a five star ranking on the Amazon book list. The second edition is an extended and updated version of the original. The new edition follows the same format as the first edition and covers topics such as tribology in bearings followed by the demonstrations of the applications of the same basic principles to other machine components such as piston pins, piston rings, seals, viscous pumps, viscous dampers, hydraulic lifts, wet clutches and brakes. New additions include two new chapters on dynamic seals and bearing failure modes. The chapter on bearing failure modes is an especially welcomed addition as it completes the bearing's 'life cycle' from design to its failure. The practical aspects of bearing's failure are rather rarely discussed in the textbooks. Information provided in this chapter would be equally valuable for practicing engineers, designers, academics and the students. The text in the remaining chapters has been updated and is supported by numerous numerical examples. A manual with solutions adds to the attractiveness of this book as a teaching material in the classroom. Therefore this book is highly recommended as both the textbook to be used in teaching undergraduate and postgraduate courses in tribology and machine design as well as the preferred reference book for practicing engineers and designers.

Gwidon Stachowiak
University of Western Australia
Perth, Australia

Preface

Tribology is a diverse field of science involving lubrication, friction, and wear. In addition to covering tribology as involved in bearings, the same basic principles are also demonstrated here for other machine elements such as piston rings, magnetic disk drives, viscous pumps, seals, hydraulic lifts, and wet clutches.

In this second edition of *Applied Tribology* all the chapters were updated to reflect recent developments in the field. In addition, this edition contains two new chapters: one on the fundamentals of seals and the other on monitoring machine behavior and lubricants, as well as bearing failure analysis. These topics are of considerable interest to the industry practitioners as well as students and should satisfy the needs of the tribology community at large.

Computer solutions for basic fluid film and energy relations from the first edition have been extended to seal performance. New developments in foil bearings are reviewed. For ball and roller bearings, conditions enabling infinite fatigue life are covered along with new ASME and bearing company life and friction factors.

Properties of both mineral and synthetic oils and greases are supplemented by an update on the greatly extended service life with new Group II and Group III severely hydrocracked mineral oils. Similar property and performance factors are given for full-film bearing alloys, for dry and partially lubricated bearings, and for fatigue-resistant materials for rolling element bearings. Gas properties and performance relations are also covered in a chapter on gas bearing applications for high-speed machines and for flying heads in computer read-write units operating in the nanotribology range.

Problems at the close of each chapter aid in adapting the book as a text for university and industrial courses. Many of these problems provide guidelines for solution of current design and application questions. Comprehensive lists of references have been brought up to date with 145 new entries for use in pursuing subjects to greater depth.

Both SI and traditional British inch-pound-second units are employed. Units in most common use are generally chosen for each section: international SI units for ball and roller bearing dimensions and for scientific and aerospace illustrations, traditional British units for oil-film bearings in industrial machinery. Many analyses are cast in dimensionless terms, enabling use of either system of units. Conversion factors are tabulated in two appendices, and guidelines for applying either system of units are given throughout the book.

The authors are indebted to past coworkers and students for their participation in developing topics and concepts presented in this book. Comprehensive background information has been assembled by the authors from their combined 80 years of laboratory, industrial, teaching, and consulting experience. Much of this background has been drawn from well over 250 technical publications, most of them in archival literature. Theses and dissertation projects at Ohio State University, the University of Pittsburgh, Southern Illinois University, Louisiana State University; and the Pennsylvania State University; numerous industrial projects at the Center for Rotating Machinery at Louisiana State University; four tribology handbooks organized and edited for the Society of Tribologists and Lubrication Engineers; and a 1957 book *Bearing Design and Application* coauthored with D. F. Wilcock.

This book is intended (1) for academic use in a one-semester senior engineering elective course, (2) for a graduate-level course in engineering tribology and (3) as a reference book for practicing engineers and machine designers. It is hoped that these uses will provide paths for effectively designing, applying, and lubricating bearings and other machine elements while taking advantage of concepts in tribology—the developing science of friction, wear, and lubrication.

MMK
ERB