BENCH TESTING OF INDUSTRIAL FLUID LUBRICATION AND WEAR PROPERTIES USED IN MACHINERY APPLICATIONS

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STP 1404

ASTM

STP 1404

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ASTM Stock Number: STP1404

ASTM
PO Box C700
100 Barr Harbor Drive
West Conshohocken, PA, 19428-2959

Printed in the U. S. A.

Library of Congress Cataloging-in-Publication Data

Bench testing of industrial fluid lubrication and wear properties used in machinery applications / George E. Totten . . . [et al.], editors.
p. cm.—(STP; 1404)
"ASTM stock number: STP1404."
Includes bibliographical references and index.
ISBN 0-8031-2867-3
1. Lubrication and lubricants—Testing—Congresses. I. Totten, George E. II. ASTM special technical publication; 1404.

TJ1077 .B43 2001
621.8′9—dc21

2001022358

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Printed in Baltimore, MD
April 2001

Foreword

This publication, *Bench Testing of Industrial Fluid Lubrication and Wear Properties Used in Machinery Applications,* contains papers presented at the Symposium on Bench Testing of the Lubrication and Wear Properties of Industrial Fluids Used in Machinery Application held in Seattle, Washington in 26–27 June 2000. ASTM Committee D02 on Petroleum Products and Lubricants and its Subcommittee D02.L0 on Industrial Lubricants sponsored the symposium. George E. Totten, Union Carbide Corporation, Lavern D. Wedeven, Wedeven Associates Inc., James R. Dickey, Lubricants Consultants, and Michael Anderson, Falex Corporation, presided as co-chairmen and are co-editors of the resulting publication.

Overview

Bench tests are commonly used to evaluate the lubrication and wear properties of industrial fluids when used in various types of machinery. In some cases, custom-made equipment and test configurations have been developed to evaluate lubrication and wear of specific wear contacts in a particular machine. Unfortunately, bench tests are often used without any validation of the lubrication and wear properties obtained in the machinery being modeled. Such testing strategies are worse than no tests at all. Therefore, there is a great need in the lubricants industry to address this long-standing and increasingly important problem.

To address this problem, ASTM Committee D2 on Petroleum Products and Lubricants, along with its subcommittee D02.L0 on Industrial Lubricants, held a Symposium on Bench Testing of the Lubrication and Wear Properties of Industrial Fluids Used in Machinery Applications in Seattle, Washington on June 26–27, 2000. The objective of this conference was to provide a forum on the selection of bench tests and testing conditions to model lubrication and wear properties of fluids used in various industrial machines and components such as: compressors, pumps, chain drives, transmissions, bearings, and others.

This book is a collection of the papers presented at this event, all of which address various aspects of bench tests selection, limitations, along with lubrication and wear simulations. The topics discussed at the symposium were:

Problems of Bench Testing—Correlation with Industrial Equipment

The three (3) papers in this section discuss different problems associated with bench test selection, particularly as the test results correlate with equipment lubrication. Some suggestions to address equipment lubrication correlation problems are: selection of appropriate test conditions; development of custom-made test equipment and the use of lubrication and wear simulations to identify appropriate test conditions.

Bench Tests and Test Development

The ten (10) papers in this section describe the application of traditional tests, such as four-ball tests, to model hydraulic pump wear and lubricant additive evaluation and the development of new tests and testing protocol. In summary, this section shows that it is possible with proper design considerations, which are discussed here, and model validations to successfully apply bench tests in lubrication and wear analysis.

Analysis

In this section, eight (8) papers address a wide range of methodologies for evaluation of bench test results. These include: examination of experimental test parameters, detection of boundary and EHD lubrication transitions, wear mode identification by debris analysis, the utility of tribological aspect numbers and others.

Modeling and Simulation

The two papers (2) in this section outline the value and necessity of experimental simulation of tribological performance to properly evaluate machinery lubrication and wear problems. In many cases, the methodologies outlined here offer the preferred approach and illustrate the need for continued development of guides and standards that serve as a vital aid to the analyst.

In summary, although bench tests have been used from the beginning of tribological experience, there is a substantial and important need for the continued development of testing and analysis methodologies and related standards. However, in the meantime, this text will serve as a valuable reference for those in the field of lubricant analysis and wear.

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