Hydraulic Systems Volume 3

Hydraulic Fluids and Contamination Control

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Hydraulic Fluids and Contamination Control

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PREFACE

Contamination control is a crucial for hydraulic systems to survive and to sustain their reliability and performance. Hydraulic fluids are inevitably contaminated by various sources. Hydraulic fluid contamination is not limited to just the particulate contaminants as many people may think. Hydraulic fluid contamination can be broadly defined as any internal or external reason that can change the properties or performance.

Therefore, this textbook focuses on hydraulic fluids and contamination control. The text book discusses thoroughly the different types of hydraulic fluids, their properties and standard methods of testing. The textbook also covers all types of contamination, their sources, effects, and best practices to avoid and control them.

With 30+ years of experience in teaching fluid power for industry professionals, the author had effectively applied his solid understanding to the subject and his post-doctoral level of academic education in developing this book.

The author wants to continue his goal of supporting fluid power and motion control professional education by developing the following series of volumes:

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All praise is to Allah who granted me the knowledge, resources and health to finish this work.

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ABOUT THE BOOK

Book Description:

The book is targeting students and professionals who are looking to advance their fluid power careers. The book is colored and has the size of standard A4. The book is associated with a separate colored workbook. The workbook contains printed power point slides, chapter reviews and assignments. This book is the third in a series that the author plans to publish to offer complete and comprehensive teaching references for the fluid power industry. This book is an attempt to fill the gap between the very academic style of fluid power books and the very commercial style of books that are produced by fluid power manufacturers basically to promote their products.

The book presents the different types of hydraulic fluids, their physical properties, and their standard test methods. The book also overviews the various types of contamination including, energetic, gaseous, fluidic, and particulate contamination. This book introduces, comprehensively, methods for hydraulic fluid analysis including the various types of standards for evaluating cleanliness level of hydraulic fluids. This book discusses methods for controlling contamination in hydraulic transmission lines including projectile cleaning and flushing.

The book contains a total of ten chapters distributed over 300 pages with very demonstrative figure and tables. The contents of the book are brand non-biased and intends to introduce the latest technologies related to the subject of the book.

Book Objectives:

Chapter 1: Introduction
This chapter introduces the scope of hydraulic fluids conditioning and contamination control. The chapter also overviews various organizations who are involved in developing standards and set standard test methods for fluid power components and systems.

Chapter 2: Hydraulic Fluids
This chapter provides an overview of the commonly used hydraulic fluids including petroleum-based, water-based, chemical-based, fire-resistant, and environmental-friendly types of hydraulic fluids. The chapter discusses thoroughly 21 various properties and the relevant standard test methods of hydraulic fluids. Fluid properties are categorized as physical, thermal, and chemical properties. The chapter introduces the best practices for hydraulic fluid selection, replacement, and storage.
Chapter 3: Energetic Contamination
This chapter presents the sources of hydraulic fluids energetic contamination. For each source, the chapter explains how the system performance will be affected and possible recommendations to minimize such consequences.

Chapter 4: Gaseous Contamination
This chapter presents the sources of hydraulic fluids gaseous contamination. For each source, the chapter explains how the system performance will be affected and recommendations to minimize such consequences.

Chapter 5: Fluidic Contamination
This chapter covers the sources of hydraulic fluids fluidic contamination. For each source, the chapter explains how the system performance will be affected and possible recommendations to minimize such consequences.

Chapter 6: Chemical Contamination
This chapter presents the sources of hydraulic fluids chemical contamination. For each source, the chapter explains how the system performance will be affected and possible recommendations to minimize such consequences.

Chapter 7: Particulate Contamination
This chapter presents the sources of hydraulic fluids particulate contamination. For each source, the chapter explains how the system performance will be affected and possible recommendations to minimize such consequences.

Chapter 8: Hydraulic Fluids Analysis
This chapter discusses standard methods for hydraulic fluid analysis including methods for particle and material analysis. The chapter covers the various standard cleanliness classes used to evaluate the contamination level in hydraulic fluids. The chapter also provides examples for interpretation of hydraulic fluid analysis reports.

Chapter 9: Hydraulic Filters Performance Ratings
This chapter discusses the standard methods for evaluating the performance of a hydraulic filter. The purpose is to make the reader aware of the factors based on which type of filter may be more suitable than other for a specific application.

Chapter 10-Contamination Control in Hydraulic Transmission Lines
This chapter discusses best practices for controlling contamination in hydraulic transmission lines including projectile cleaning and hydraulic system flushing.