Hydraulic Components Volume B

Hydraulic Filters

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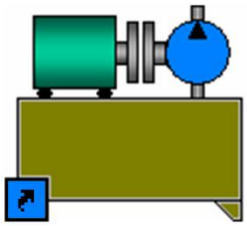

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It is always advisable to review the relevant standards and the recommendations from the system manufacturer. However, the content of this book provides guidelines based on the author's experience.

Any portion of information presented in this book might not be suitable for some applications due to various reasons. Since errors can occur in circuits, tables, and text, the author/publisher assumes no liability for the safe and/or satisfactory operation of any system designed based on the information in this book.

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Hydraulic Filters

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PREFACE

Keeping the oil clean is an essential requirement for reliable and efficient machine operation. This book introduces knowledge foundation about hydraulic filters. The book introduces about various types of filters constructions, configurations, accessories. The book also introduces the various concepts of filtration mechanisms and filter media. The book overviews various types of materialistic contaminations such a fluidic, chemical, and particulate contamination. The book discusses filter selection criteria, maintenance, troubleshooting, and failure analysis of filters including the standard test methods for filter performance.

Dr. Medhat Kamel Bahr Khalil

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

To the soul of my parents who taught me the values of ISLAM

To my family: wife, sons, daughters in law, and grandchildren

To my best teachers and supervisors

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The author thanks the following companies (listed alphabetically) for permitting him to use portions of their copyrighted literatures in this book.

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- Assofluid
- Bosch Rexroth
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- MSOE
- Noria Corporation
- Pall Corporation
- Parker Hannifin
- Schroeder
- Spectro Scientific

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www.ohfab.com
www.tricocorp.com
www. mecoil.net
www.metrohm.com
www.centerlinedistribution.com
www.oilmax.com
www.gallagherseals.com
www.capsnplugs.com
www.magneticfiltration.com

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. This book is the second in a series that the author plans to publish to offer separate book for every hydraulic component. This book introduces knowledge foundation about hydraulic filters. The book introduces about various types of filters constructions, configurations, accessories. The book also introduces the various concepts of filtration mechanisms and filter media. The book overviews various types of materialistic contaminations such a fluidic, chemical, and particulate contamination. The book discusses filter selection criteria, maintenance, troubleshooting, and failure analysis of filters including the standard test methods for filter performance.

Book Objectives:

Chapter 1: Introduction to Hydraulic Filters

This chapter presents an overview of hydraulic filters including the contribution of filters in hydraulic systems, ISO1219 symbols, construction, and operating principles. The chapter also presents various types of filters based on application in which the filter is used, type of connection to the circuit, body style of the filter, placement in the hydraulic circuit. The chapter also discusses the added accessories to the filter such as bypass valve and clogging indicators. Examples from industry are presented.

Chapter 2: Filter Media and Filtration Mechanisms

This chapter presents an overview of filter elements including the construction and material of the filter media. This chapter discusses surface filters versus depth filters. The chapter discusses also the principles of various filtration mechanisms that are applicable in hydraulic filters such as direct interception, absorption, adsorption, and magnetic separation.

Chapter 3: Hydraulic Fluid 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 4: 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 5: Chemical Contamination

This chapter presents the sources of chemical contamination. For each source, the chapter explains how the system performance will be affected and possible recommendations to minimize such consequences.

Chapter 6- Particulate Contamination

This chapters presents the sources of particulate contamination. For each source, the chapter explains how the system performance will be affected and possible recommendations to minimize such consequences.

Chapter 7- Maintenance of Filters

This chapter provides guidelines for **Filters** selection, replacement, maintenance scheduling, installation, testing, storage and transportation. This chapter is supported by examples and figures granted by leading fluid power manufacturers.

Chapter 8- Filter Selection Criteria

This chapter presents a selection checklist as a guide for selecting proper filters. The chapter also discusses briefly the concepts for cost-effective filtration and selecting a filter cleanliness level based on system requirements. This chapter presents several examples of filtration solution for hydraulic systems.

Chapter 9- Troubleshooting and Failure Analysis of Filters

This chapter discusses hydraulic filters inspection, troubleshooting, and failure analysis. In this chapter, a troubleshooting chart for filter faults is presented. This chapter also presents examples of defective filters.

Note: you may notice that there are some duplications in the figures and body text. The reason is that the author wants to make each subject is a standalone chapter that can be taught independent from the other chapters.

Book Statistics:

The table shown below contains interesting statistical date about the textbook:

Chapter #	Pages	Figures	Tables	Words	Editing Time (Hours)
Chapter 1	56	69	0		189
Chapter2	20	26	0		181
Chapter 3	59	57	18		181
Chapter 4	30	22	3		172
Chapter 5	18	22	1		168
Chapter 6	41	43	5		194
Chapter 7	31	25	5		120
Chapter 8	12	8	2		165
Chapter 9	5	4	2		89
	272				**1,459Hour = 61 Days**

ABOUT THE AUTHOR

Medhat Khalil, Ph.D. is Director of Professional Education & Research Development at the Applied Technology Center, Milwaukee School of Engineering, Milwaukee, WI, USA. Medhat has consistently been working on his academic development through the years, starting from bachelor's and master's Degrees in Mechanical Engineering in Cairo Egypt and proceeding with his Ph.D. in Mechanical Engineering and Post-Doctoral Industrial Research Fellowship at Concordia University in Montreal, Quebec, Canada. He has been certified and is a member of many institutions such as: Certified Fluid Power Hydraulic Specialist (CFPHS) by the International Fluid Power Society (IFPS); Certified Fluid Power Accredited Instructor (CFPAI) by the International Fluid Power Society (IFPS); Member of Center for Compact and Efficient Fluid Power Engineering Research Center (CCEFP); Listed Fluid Power Consultant by the National Fluid Power Association (NFPA); and Listed Professional Instructor by the American Society of Mechanical Engineers (ASME). Medhat has balanced academic and industrial experience. Medhat has vast working experience in Fluid Power teaching courses for industry professionals. Being quite aware of the technological developments in the field of fluid power,

Medhat had worked for several world-wide recognized industrial organizations such as Rexroth in Egypt and CAE in Canada. Medhat had designed several hydraulic systems and developed several analytical and educational software. Medhat also has considerable experience in modeling and simulation of dynamic systems using Matlab-Simulink. Medhat has been selected among the inductees for Pioneers in fluid Power by NFPA (2012) and Hall of Fame in fluid Power by IFPS (2021).

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