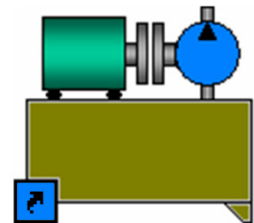


**Workbook**

# **Introduction to Hydraulics for Industry Professionals**

*Dr. Medhat Kamel Bahr Khalil, Ph.D, CFPHS, CFPAL.  
Director of Professional Education and Research Development,  
Applied Technology Center, Milwaukee School of Engineering,  
Milwaukee, WI, USA.*



**CompuDraulic LLC**  
[www.CompuDraulic.com](http://www.CompuDraulic.com)

Workbook  
**Introduction to Hydraulics for Industry Professionals**

**ISBN: 978-0-692-65544-3**

Printed in the United States of America  
First Published by 2016  
Revised by October 2019

All rights reserved for CompuDraulic LLC.  
3850 Scenic Way, Franksville, WI, 53126 USA.  
[www.compudraulic.com](http://www.compudraulic.com)

No part of this book may be reproduced or utilized in any form or by any means, electronic or physical, including photocopying and microfilming, without written permission from CompuDraulic LLC at the address above.

**Disclaimer**

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

The publisher does not endorse or recommend any brand name product by including such brand name products in this book. Conversely the publisher does not disapprove any brand name product by not including such brand name in this book. The publisher obtained data from catalogs, literatures, and material from hydraulic components and systems manufacturers based on their permissions. The publisher welcomes additional data from other sources for future editions.

Workbook: Introduction to Hydraulics for Industry Professionals  
Table of Contents

**Workbook**  
**Introduction to Hydraulics for Industry Professionals**

**PREFACE, 4**

**Chapter 1: Hydraulic Systems Overview, 5**

**Chapter 1: Reviews and Assignments, 22**

**Chapter 2: Basic Concepts Review, 26**

**Chapter 2: Reviews and Assignments, 68**

**Chapter 3: Hydraulic System Sizing Calculations, 73**

**Chapter 3: Reviews and Assignments, 82**

**Chapter 4: Hydraulic Pumps and Motors Overview, 85**

**Chapter 4: Reviews and Assignments, 143**

**Chapter 5: Hydraulic Valves Overview, 152**

**Chapter 5: Reviews and Assignments, 277**

**Chapter 6: Hydraulic Reciprocating Actuators, 235**

**Chapter 6: Reviews and Assignments, 256**

**Chapter 7: Hydraulic Accumulators, 261**

**Chapter 7: Reviews and Assignments, 270**

**Chapter 8: Hydraulic Circuits for Basic Applications, 273**

**Chapter 8: Reviews and Assignments, 332**

**Answers to Chapters Reviews, 343**

## **PREFACE**

This Workbook is a complementary part to the textbook of the same title. This book is used as a workbook for students to take notes during the course delivery. It contains colored printout of the PowerPoint slides that are designed to present the course. Each chapter is followed by a number of review questions and assignments for homework.

**Dr. Medhat Kamel Bahr Khalil**