Preface for Series

The Modern Diesel Technology (MDT) series of textbooks debuted in 2007 as a means of addressing the learning requirements of schools and colleges whose syllabi used a modular approach to curricula. The initial intent was to provide comprehensive coverage of the subject matter of each title using ASE/NATEF learning outcomes and thus provide educators in programs that directly target a single certification field with a little more flexibility. In some cases, an MDT textbook exceeds the certification competency standards. An example would be Joe Bell's *MDT: Electricity and Electronics* in which the approach is to challenge the student to attain a higher level of understanding than that required by the general service technician but suited to one specializing in the key areas of chassis electrical and electronics systems.

The MDT series now boasts nine textbooks. As the series has evolved, it has expanded in scope with the introduction of books addressing a much broader spectrum of commercial vehicles. Titles now include *Heavy Equipment Systems; Mobile Equipment Hydraulics;* and *Heating, Ventilation, Air Conditioning & Refrigeration,* with the latter including a detailed examination of trailer reefer technology, subject matter that falls outside of the learning objectives of a general textbook. While technicians specializing in all three areas are in demand in most areas of the country, there are as yet no national certification standards in place.

In addition, the series now includes two books that are ideal for students beginning their study of commercial vehicle technology. MDT's titles *Preventive Maintenance and Inspection* and *Diesel Engines* are written so that they can be used in high school programs. Each uses simple language and a no-nonsense approach suited for either classroom or self-directed study. That some high schools now offer programs specializing in commercial vehicle technology is an enormous progression from the more general secondary school "shop class," which tended to lack focus. It is also a testament to the job potential of careers in the commercial vehicle technology field in a general employment climate that has stagnated for several years. Some forward-thinking high schools have developed transitional programs partnering with both colleges and industry to introduce motive power technology as early as grade 10, an age at which many students make crucial career decisions. When a high school student graduates with credits in "Diesel Technology" or "Preventive Maintenance Practice," it can accelerate progression through college programs as well as make those responsible for hiring future technicians for commercial fleets and dealerships take notice.

Because each textbook in the MDT series focuses exclusively on the competencies identified by its title, each book can be used as a review and study guide for technicians prepping for specific certification examinations. Common to all of the titles in the MDT series, the objective is to develop hands-on competency without omitting any of the conceptual building blocks that enable an expert understanding of the subject matter from the technician's perspective. The second editions of these titles not only integrate the changes in technology that have taken place over the past five years but also blend in a wide range of instructor feedback based on actual classroom proofing. Both should combine to make these second editions more pedagogically effective.

Sean Bennett 2012

Preface

The reason for writing this textbook is to give truck technicians a solid foundation in the area of current HVAC systems. The book starts with an introduction to the system as well as to environmental and safety practices. The chapter on thermodynamics is a key building block for students to comprehend. All other chapters of this book build on the principles that are learned in that chapter. My belief is that if technicians understand how something is supposed to function, they will have a greater ability to diagnose and make the necessary repairs to the system than technicians who arbitrarily change parts until the system operates correctly and/or the complaint goes away. The text is written in a step-by-step format for the entry-level technician, in appropriate language so as to not leave new technicians behind. Once the fundamentals of air conditioning have been discussed, the text continues on to the air-conditioning components, types of systems, service procedures, air-conditioning protection units (ACPU), and troubleshooting.

The second part of the text deals with truck-trailer refrigeration equipment. Skilled technicians in this area of the trucking industry are in great demand. Again, this section of the text builds on the earlier chapter on thermodynamics and goes forward from there to an introduction of the mobile refrigeration unit (reefer), then takes the technician through the components, refrigerant flow, electrical components, and system preventive maintenance. A secondary objective of this book is to cover some of the ASE T7 and NATEF task objectives. This section is included in the instructor's manual. The learning outcome objectives are designed to meet or exceed ASE T7 and NATEF task objectives. Included in learning objectives are HVAC system service and repair; A/C system and component diagnosis, service, and repair; heating and engine cooling systems diagnosis service and repair; and refrigerant recovery, recycling, and handling.

Heating, Ventilation, Air Conditioning & Refrigeration, 2nd Edition is unique to today's market because there is currently no competitive textbook that combines truck HVAC and truck-trailer refrigeration systems. This book should be a very usable study re source for entry-level as well as experienced techni cians working on HVAC systems. In addition, mobil refrigeration technicians get an overview of refrigera tion systems and maintenance tasks required in th industry.

New to this edition:

- **Chapter 12** is a completely new chapter o coach air conditioning. This chapter takes th technician through Carrier large bus systen refrigerant flow schematics, system controls performance testing, and service procedures.

I would like to thank Stuart Bottrell, corporate traine at Freightliner Canada, LLC, for all of his help an technical expertise in the production of this textbook Index Sensors & Controls, which provided technica information, art, and troubleshooting charts for thi text; and Carrier Refrigeration Operations for it excellent training and service procedures in bus ai conditioning.

John Dixon, August 201

ACKNOWLEDGMENTS

I feel it is important to thank my apprenticeshi students for their feedback over the years. While de veloping this text, I was able to teach from it a sort o field test run, if you will. This allowed my students t be my greatest critics, and I was able to make an changes as required. My rationale is that if my student didn't understand a concept, I would try another ex planation until they did. Many of my students hav been working in the trade for five years or more on th front line of new technology. Their feedback was an is paramount to me.

I would also like to thank my wife, Connie, and ou three daughters, Alyzza, Jaymee, and Olyvia for giving me the time to work on this text. They sacrificed muc of their time spent with me, allowing me to pursue my goals.

Finally, I must thank Sean Bennett for being such a great mentor to me in the production of this book. Without his encouragement, expertise, and patience, this book would not have been possible.

INDIVIDUALS

Ken Attwood, Centennial College
Jim Bardeau, Mack and Volvo Trucks Centennial College
Sean Bennett, Centennial College
Brad Bisaillon, Proheat, Inc.
Susan Bloom, Centennial College
Dan Bloomer, Centennial College
Stuart Bottrell, corporate trainer, Freightliner Canada, LLC
Sean Brown, Denver Auto Diesel College
Mike Cerato, Centennial College
David R. Christen, University of Northwestern Ohio
David Chyznak, Centennial College
Alan Clark, Lane Community College
Don Coldwell, Volvo Trucks Canada, Inc.
Owen Duffy, Centennial College
Boyce H. Dwiggins, Delmar, Cengage Learning author
Danny Esch, Southwest Mississippi Community College
Jim Gauthier, corporate trainer, Mack/Volvo
Dennis Hibbs, West Kentucky Community College
Helmut Hryciuk, Centennial College
Ray Hyduk, Centennial College
Serge Joncas, Mack and Volvo Training Centennial College
John Kramar, Centennial College
George Liidermann, Freightliner Training
Alan McClelland, Dean School of Transportation Centennial College
Rock Mezzone, Centennial College
John Montgomery, Mack and Volvo Trucks Canada
David Morgan, Mack and Volvo Training Centennial College
John Murphy, Centennial College
Josephine Park, Centennial College
Daniela Perriccioli, Centennial College
Greg Schwemler, Centennial College
Glenville Sing, Mack and Volvo Trucks Training Centennial College
Martin Sissons, Centennial College
Darren Smith, Centennial College
Angelo Spano, Centennial College
Russ Strayline, Lincoln Technical Institute
Gino Tamburro, Centennial College
Al Thompson, Centennial College
Trevor Thompson, Centennial College
Pierre Valley, Mack and Volvo Trucks Canada
David Weatherhead, Canadian Tire Training Centennial College
Gus Wright, Centennial College

CONTRIBUTING COMPANIES

We would like to thank the following companies that provided technical information and art for this book:

ASE
Battery Council International
Carrier Refrigeration Operations
Caterpillar, Inc.
Espar Heater Systems
Freightliner LLC
Index Sensors & Controls
Proheat, Inc.
Robinair, SPX Corporation
Snap-On Tools Company
Thermo King Corporation
Toyota Motor Sales, U.S.A.
Volvo Trucks North America, Inc.

INSTRUCTOR RESOURCES

Time-saving instructor resources are available at the Instructor Companion Website for the text or on CD. Either delivery option offers the following resources: PowerPoint chapter presentations with selected images, an ExamView test bank, an Image Gallery containing images from the book, an Instructor's Guide which includes an answer key to chapter review questions, Word documents containing the chapter review questions, a chart correlating NATEF tasks to text pages, and a set of job sheets for use in the shop.