AN INTRODUCTION TO MARINE LUBRICANTS

Nigel Draffin

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PETROSPOT

Dedication

This book is dedicated to the three gentlemen from Shell Research Centre at Thornton in Cheshire who took time out of their day jobs to explain the ‘how’ and ‘why’ of marine lubrication to groups of young engineer apprentices in 1970.

I do not recall their names but the lessons we learned have stood many of us in good stead throughout our careers.

Nigel Draffin

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by

Nigel Draffin

M.I.Mar.E.S.T.

First Edition

Foreword by

Caroline Huot
Global Head of Lubricants
Cockett Group

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Foreword

Rarely at the forefront of public preoccupations, the shipping industry is nevertheless at the core of world trade, with nearly 90% of raw materials and manufactured goods being transported by ship.

In recent years, the industry has been deeply challenged by the green revolution and has increasingly felt the impact of stringent environmental regulations, in particular with regards to the sulphur content of marine fuel. It has been tasked with meeting emission control area (ECA) regulations as well as the implementation of ballast water systems, and it is now preparing to meet the requirements of the 0.5% global sulphur cap in 2020. In addition to such changes, the whole environment for shipowners has been turned upside down as a result of the 2008 financial crisis that hit global trade as well the world's banking systems.

Within all of this turmoil, the role of marine lubricants would seem to be of little concern even though they represent a key element in contributing to healthy and smooth vessel operations.

Before 2008, it was essentially the oil majors who handled over 80% of the global marine lubricants market, and barriers to entry – technology, OEM approvals, the provision of an extensive delivery network – were very high.

In 2005 and 2006, with the cumulative effects of hurricane Katrina and accidents occurring in the Oronite Singapore plant, some measure of transparency was introduced on the technology side of the marine lubricants business. On the other hand, the majors' retreat from the downstream sector accelerated, and this resulted in key elements of the business (refineries, service station networks, lubricant plants, etc.) being sold off and whole areas of the world were left without coverage. Into this space came independent distributors and the huge trading groups.

From 2008 onwards, this trend allowed the emergence of new players as well as the expansion of giant national oil companies that were keen to develop a delivery network in their own countries with potential to go global.

Meanwhile, the shipping industry is still trading worldwide, and shipowners are facing increasing complexity in their daily operations.

With new types of engines (long strokes, super long strokes), new operating conditions (slow steaming), new and ever more stringent regulations, an increase in the diversity of fuels burnt as well as new combustibles (along with attendant quality issues), never before have marine lubricants been at the confluence of such complexity or have been of such critical importance.

The marine lubes sector has responded to these challenges by creating the products necessary to tackle the various types of fuels available or imposed

through regulations, but availability and stock levels have been limiting factors. There are now at least six types of different cylinder oils sold on the market and a typical vessel will be required to use at least three of them if trading worldwide and switching between heavy fuel oil (HFO) and low sulphur heavy fuel oil (LSHFO) or sailing in ECA areas.

Considering that a maximum of two tanks are usually available in most ship designs and that drum storage on deck is normally a last resort – being a possible hazard and an issue for vetting – regular availability has become a major issue for certain grades.

In addition, the fuel switching operation itself is still a grey area in terms of managing the transition, accurate feed rates and limiting the risk of costly wear.

Marine lubricants are generally called speciality products, as opposed to commodities. They are subject to the full cycle of sale: from technical prescription of the products, to delivery logistics, and to aftersales technical support which can include preventative maintenance or condition monitoring programmes.

The impact of marine lubricants on ships' engines and operations is much more important than their relative value. They have also been considered for far too long as a minor segment of the total lubricants industry.

Nigel Draffin's new book fully acknowledges the unique and essential role of marine lubricants. For the industry newcomer, it provides a brilliant introduction to all their major facets, while at the same time giving shipping experts the 'big picture' perspective that will inform and help shape tomorrow's market.

Caroline Huot

Global Head of Lubricants

Cockett Group

June 2017

Preface

A year ago, Llewellyn Bankes-Hughes asked me if I would consider writing a book to introduce commercial personnel to the world of marine lubrication. I said I would look at how to do it and the conversations I had with people persuaded me that there was a need for a book which explained the concepts of lubrication, the need for marine lubricants, and the use and application of them on board ship.

The work required me to revise and consolidate my own understanding of the subject and my appreciation of some of the more recent technical developments.

There is always a balancing act between the need to explain basic theory and the need for an explanation of the latest technical information. With lubrication, this has been more difficult than with other topics I have written about due to the breadth of the subject matter.

I have relied on answering the questions which I have been asked over the years, together with my objective of providing a work which should enable the reader to find the information he/she needs with ease and to be guided as to where to go when he/she needs more information, and also to produce a book with explains both the ‘why’ and the ‘how’ of the subject.

I can be certain that I have not got it all right; I will have left out things that should be included and included too much detail on some topics, but I trust that the reader will accept that the faults are all mine and not of those who have guided, advised and informed me during the writing.

As with previous work, I have tried to provide a comprehensive table of contents, a detailed index and a large glossary – these are the essential tools for those who wish to use this book as a reference. I have also included website details of sources which can provide further, more detailed guidance.

Whilst not intended to be a ‘do it yourself’ guide to fault diagnosis or an analysis of lubrication problems, I hope the sections included will be of value in helping the reader understand why this topic deserves to be treated as seriously as any other complex maritime and engineering discipline.

Nigel Draffin

June 2017

Acknowledgements

Once again, the team at Petrospot have worked really hard to produce a book that is well laid out and easy to use. The work they have done on proof reading, sourcing images and book design is impressive.

I have been helped by a number of industry specialists, some who do not want to be named (but they know who they are) and others, like Rob Chapman from Intertek, who helped me to cover some of the more specialised areas. My own understanding owes much to the willingness of colleagues in various Shell affiliates to explain the theory and practice to me throughout my career.

Nigel Draffin

June 2017

About the author

An Introduction to Marine Lubricants has been written by Nigel Draffin with the express purpose of shedding light on marine lubricants and greases, a sector of the maritime industry that may be well understood by petroleum engineers and other specialists but which for many remains highly complex and poorly understood.

The book is intended for all who need to know more about the machinery on ships that requires lubrication and the details of the lubricants used. This compact but highly practical book provides handy references, many explanatory photographs, charts and tables, a comprehensive glossary and helpful index, as well as a 'where to go for help' section designed to assist the reader. It will prove useful to lubes experts and virtual beginners alike.

With more attention now turning to lubricants in response to changes in bunker quality, specifically sulphur, this timely book will be of great assistance to those who require a basic understanding of this sector as well as those looking to find out more and develop their knowledge further. *An Introduction to Marine Lubricants* fits this role exactly.

Nigel has been involved in shipping for over 50 years and with the commercial bunker market for over 25 years. After joining Shell Tankers as an apprentice engineer in 1966, he rose through the ranks, serving on all classes of vessel, including VLCCs and LNG tankers. He came ashore in 1979 to join the newbuilding department of Shell International Marine. After two years of new construction in Ireland, South Korea and the Netherlands, he transferred to Shell's Research & Development unit, specialising in control systems, fuel combustion and safety systems.

In 1986, Nigel moved to the commercial department as a bunker buyer and economics analyst. In 1988, he was promoted to be Head of Operational Economics, responsible for all of the fuel purchased for the Shell fleet, the operation of the risk management policy and the speed/performance of the owned fleet.

In March 1996, he joined the staff of E.A. Gibson Shipbrokers Ltd in the bunker department, and became the manager. In 2006, this department merged with US-based broking house LQM Petroleum Services, where Nigel was senior broker and technical manager until he became a full-time consultant, lecturer and author in 2015.

Nigel is a founder member of the International Bunker Industry Association (IBIA) and has served several times on its council of management and executive board. He has also served as the association's Chairman. He is the author of IBIA's

Basic Bunkering Course and Course Director of the Petrospot Academy, which runs industry-recognised training events such as the *Oxford Bunker Course*.

Nigel is the author of a growing library of clearly-written, highly-respected reference books on every aspect of bunkering – including commercial issues, operations, marine engines, risk management, fuel analysis, measurement, LNG bunkering and shipping – which have now sold in over 100 countries around the world.

Nigel is a member of the Institute of Marine Engineering, Science and Technology and Past Master of the Worshipful Company of Fuellers.

Llewellyn Bankes-Hughes

Managing Director, Petrospot Limited

June 2017

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