Fourth Edition

BUNKERS

An Analysis of the Technical and Environmental Issues

Chris Fisher
Robin Meech

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PETROSPOT

TRANSPORT, ENERGY & MARITIME INTELLIGENCE

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by

Chris Fisher and Robin Meech

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Foreword by
John Denholm

Published by
Petrospot Limited
England
2013

Published in the United Kingdom by

Petrospot Limited
Petrospot House, Somerville Court, Trinity Way,
Adderbury, Oxfordshire OX17 3SN, England

www.petrospot.com
Tel: +44 1295 814455
Fax: +44 1295 814466

First published 2013

British Library Cataloguing in Publication Data

A catalogue record for this book is available from
the British Library

ISBN 978-1-908663-02-3

Petrospot Limited (www.petrospot.com)
Designed by Cheryl Marshall, Petrospot Limited
Printed in the United Kingdom
by Newman Thomson

Foreword

Bunkers have always been a critical element for the shipping industry, yet, surprisingly, in the past they did not receive much attention as bunkers were readily available and only accounted for a small part of the cost of running a ship.

Those days are gone. Bunkers are now the single largest cost element in most commercial voyages. Where bunkers traditionally amounted to half the sum of other costs, it is now the opposite. The sum of other costs is now around half of the bunker costs – and it seems likely that the price of energy will rise and bunkers' share of voyage costs will grow and grow.

The rising cost of bunkers has focused attention on reducing the consumption and improving the management of marine fuel. New ship designs are being developed to improve consumption and it is speculated that the new generation of 'super-eco' ships will create a two-tier market. However, in the short term the focus has been on reducing consumption through slow steaming and improving the management of bunkers.

Measuring the quantity of bunkers delivered has always been an issue. With the increasing value of bunkers, custody transfer procedures, which are a well-known aspect of the bulk liquid commodity trade, are entering the bunkering industry and technology is being brought in to mitigate disputes on delivered amounts of bunkers.

Quite apart from cost issues and their consequences, the environmental protection agenda has forever focused attention on the shipping industry's environmental footprint which is, of course, determined by the quantity and quality of bunkers that the industry burns.

The international regulation of sulphur emissions is already a reality and is a significant challenge to the shipping industry. All too often bunker suppliers and receivers are disputing conformance with legal limits. This is a problem that has not been helped by the incompatibility between the commercial standards for determination of sulphur content and the procedures determining compliance laid down in the legal instruments.

It is imperative that everyone involved in the bunkering industry should understand the requirements and adhere to them, as failure to comply will be costly. Port State Control are already scrutinising bunker records to ensure that compliant bunkers have been delivered and that the ever more stringent blending requirements stipulated in the ISO 8217 standard for marine fuels have been met.

While today the issues are about the difficulties of complying with the new regulations, there is a fear that as the requirements for reduced sulphur emissions

are introduced, the refining industry will not be able to produce enough of the right quality of bunkers and compliance may not be possible.

Looking forward, it seems likely that the ever increasing cost of bunkers and the ever tightening environmental regulations will lead to a revolution in the type of fuel we burn and how we burn it. The requirements to limit sulphur emissions are already leading owners to look beyond the traditional heavy fuel oil to fuels such as liquefied natural gas and compressed natural gas rather than invest in scrubber technology. The selection of the type of fuel is inevitably going to become a differentiating parameter commercially.

There is no doubt that bunkers now have a role of unrivalled importance. It is in this vibrant environment that the bunkering industry and those people engaged in it must continue to focus on the safety of their operations, protecting the health of people and the environment.

I congratulate the authors on seeing the challenges ahead and producing such a comprehensive book on the subject.

John S Denholm

BIMCO President Designate

Preface

In 1985, Chris Fisher and Stephen Hodge compiled *Fisher and Hodge on Bunkers.* This was the first book dedicated to the practical aspects of fuelling merchant vessels. The book was revised and updated in 1994 and published as *Bunkers: An Analysis of the Practical, Technical and Legal Issues*. Chris was joined by a new co-author, Jonathan Lux, who contributed the legal section. Their book was updated and published as a third edition in 2004.

This book, the fourth edition, does not include a legal section, mainly because the subject was covered in depth in the last edition and little needs to be added. In this edition, which focuses on the practical and technical aspects of bunkering ships, Chris has been joined by co-author Robin Meech who has compiled the very topical and important sections on the environment, markets and future marine and abatement technologies.

Clearly some technology has not changed since 2004, such as refining and basic fuel handling and treatment and some test methods. For completeness, these fundamentals have been included in this book along with the many changes and new developments in fuel specifications, environmental matters, and new contaminants, testing technology and quantity determination.

Predicting the future is a risky business but the authors are able to suggest the likely possibilities based upon the evaluation of current information and the use of a number of more probable scenarios. This book discusses the future uses of different types of fuel, their availability and prices, how regulations will change and how laboratories will analyse this changing mix.

As shipping is, and will remain, the most cost-effective means of transporting goods long distances we should be safe in predicting that ships will still be needed for a very long time in the future. It is also a reasonable assumption that the cost of fuel is unlikely to fall and that the availability of fossil fuels will reduce as reserves diminish.

In the last few years there have been many challenges imposed on the shipping and bunker supply communities. More stringent environmental regulations, price volatility and the dramatic slow-down in world demand for goods moved by ship have occurred while there has been an unprecedented increase in the world fleet. Credit risk assessment and protection have become essential tools for suppliers and ship arrest for non-payment of bunkers has increased. Many ships have been laid up at a time when new builds were ready for delivery. Slow steaming has become the norm as charterers and ship owners struggle to keep fuel costs down. An interest in alternative fuels has emerged and natural gas looks like a strong contender as a future fuel for ships.

Bio fuels may find a place in the marine sector, with some owners already experimenting, but there are complications. In fact, alternative fuels from renewable sources would seem the way to go but at present there is no single solution. We cannot grow enough crops to convert them to fuel to satisfy the total world energy demand and be left with enough land to grow crops for human consumption. Plus, we need to preserve our rain forests to help manage our climate change problems. We also need to conserve and preserve our complex variety of flora and fauna on which we all depend for survival. Wind and solar power can assist but neither of these could totally power a ship using current technology. Nuclear power has possibilities but we should all be concerned with safety and decommissioning problems. Natural gas has potential but, again, reserves will not last for ever.

The authors have attempted in this book to predict the types of fuel that will be used to propel ocean-going ships over the next 20 years or so, and it is possible that our scenario for 2030 may be extended for another 20 years. However, beyond that it is clear that innovation will be needed to find alternative sustainable energy sources for all uses, not just ships. Clearly, energy conservation measures are vital not only to extend the period remaining for fossil fuel consumption but also to better manage air pollution and climate change.

At the moment, there is heavy dependence on internal combustion engines to power our ships, having moved through periods of coal, boilers and turbines and, further back, sails and wind. If we continue to burn fuels to create energy then the diesel engine is likely to remain as the principal propulsion system as it is reasonably efficient and robust. The ship's propeller has gone through a lot of design changes but optimum performance is still achieved when operating at a speed of around 100 revolutions per minute (RPM). This is unlikely to change very much so our prime mover speed needs to be around this level to avoid the use of gearing that increases fuel consumption.

The authors are of the opinion that the high price of distillate fuel, combined with uncertain availability, will encourage ship owners to adopt abatement technology – scrubbers – in order to comply with future emissions regulations. This will prolong the use of high sulphur residual fuel until such time that it becomes unavailable due to improved refinery conversion. However, while there is a market, refiners will supply residual fuels. Natural gas is becoming attractive but much depends on its future into-ship price and availability as well as the development of new ship designs and delivery infrastructure. Currently, there are too many ships and too few cargoes to sustain new building orders unless the new ship is designed in such a way as to be able to demonstrate very good energy efficiency with a fast pay back and scrapping of old tonnage speeds up.

The bunker supply market will probably remain a mixture of majors, large and small independents, traders and state-owned companies. The current trend of oil majors moving out of physical supply may well continue as margins are tight and the risks of non-payment and quality disputes make the business less attractive.

Some traders may also distance themselves from physical bunker supply for the same reasons. This will probably create more scope for larger independent suppliers and smaller local suppliers. This could create more quality problems as fuel blending will become more complex to meet environmental regulations. This may be offset to some extent as an increasing number of ships consume low sulphur distillates which are less likely to be detrimental to engine operations.

Unfortunately, the bunker business does not have a good reputation, although the vast majority of fuels supplied to ships are used without incident. Buyers have the impression that they always risk being cheated on quantity and quality but perhaps they are part of the problem when they tend to only negotiate on price rather than quality, price and, in the future, perhaps energy content.

Another area of concern is the lack of knowledge and understanding of bunker fuel quality and fuel management onboard ships. The number of crew onboard ships has reduced dramatically over the last 20 years and, to some extent, skills have been reduced due to limited and insufficient training. Ships' crew have become burdened with paperwork, mainly associated with quality management and safety systems, and although some of this may be needed there would surely be safer, more efficient and happier crews if they were properly trained in operating ships and machinery, and if there were sufficient personnel to deal with problems and emergencies when things go wrong.

Perhaps there is a need for a ship administrator or quality/safety manager (not ashore but on every ship) who could take care of documentation and procedures to free up senior deck and engineering staff from this endless chain of paperwork and allow them to concentrate on operating their ships to optimum safety and efficiency. Owners also need to understand that training is not something that crew do before they go to sea to gain their certificates but that it is a lifetime necessity to develop skills and knowledge, stay current and to produce highly motivated people who should earn a salary and have benefits commensurate with this vital and difficult business of running ships.

Training and career development in the bunker supply and service industry is also lacking and this results in claims and disputes that could largely be avoided.

The most intense immediate pressure on the bunker sector is the imposition of increasingly stringent environmental regulations. In the past, bunker fuels have been the depository of most of the poor quality by-products from refineries and, in some cases, other industrial sectors. The cleaning up of marine emissions has been considered by many to be long overdue, hence the process is being undertaken in a relatively short time. Unfortunately, this comes at a time when the ship owning sector, which is burdened with the majority of the costs, is experiencing one of its worst downturns in living memory. This, together with the fractious debate between developed and less developed economies, will slow the process down thus bringing further uncertainty. Investment in abatement technologies, the use of alternative fuels, particularly liquefied natural gas (LNG), the adoption of an ever widening range of fuel efficiency technologies together

with the development of a practical means to reduce greenhouse gas emissions (GHG) have been addressed in this new edition to provide the reader with a basis from which to address both shorter term tactical issues as well as to develop robust strategies.

The authors hope that with a better understanding of the complex issues involved with bunkering the number of disputes and claims can be reduced or handled in a more efficient and professional manner. The market and environmental sections should be of interest to the bunker supply industry, ship owners and charterers, especially those involved with planning and ship design and future operations.

The contents of this book have been selected on the basis that they will be of value to a wide audience, including marine engineering students, seagoing engineers, technical managers, members of the legal profession, insurers, owners and charterers of ships, fuel suppliers, environmentalists, abatement and marine technologists, as well as those involved with surveying, inspection and testing of marine fuels.

Postscript

The rower Steve Redgrave, perhaps one of the greatest of all Olympians who won gold medals at five consecutive Olympic Games from 1984, commented immediately after winning his fourth gold medal in 1996 that if anyone found him close to a rowing boat again they could shoot him. Thankfully, nobody did! After writing four books on bunkers, I (Chris Fisher) have reached the same conclusion. If anyone finds me writing a fifth book they can shoot me!

(As CF's latest co-author, I would just like to say that it won't be me doing the shooting! (RM)).

The authors

Chris Fisher

Chris began his nautical studies at Poplar Marine College. He sailed as an engineer on Texaco tankers and, having served as Chief Engineer for a number of years, he came ashore to take up the position of Marine Superintendent with Texaco Overseas Tankship in 1981. During this period, he became particularly interested in the deterioration in quality of marine fuels brought about by more intense refinery techniques and he became involved with related technical issues in the maintenance and repair of the Texaco fleet.

In 1984, he moved into consultancy, providing expert services to ship owners, and insurers, mainly in the field of liquid cargo losses and contaminations. He teamed up with Stephen Hodge, a chemist, and they wrote *Fisher and Hodge on Bunkers*. This was the first technical book devoted to the subject.

In 1987, Chris joined Det Norske Veritas Petroleum Services (DNVPS), which pioneered routine marine fuel quality testing for ship owners. In 1990, he moved with his family to the Netherlands, where he set up a new fuel testing laboratory in Rotterdam for DNVPS. In 1994, he joined up with Jonathan Lux and they produced *Bunkers: An Analysis of the Practical, Legal and Technical Issues*.

Through his interest in laboratories and all aspects of liquid cargo loss control, he joined the Inspectorate group of companies in 1995, as Director of their Northern European companies in the Netherlands, Belgium and Germany. He quickly established a new dimension to Inspectorate – Bunker Claims – which focussed on providing laboratory and technical services to those involved with bunker disputes.

In 2003, Chris and his family returned to the United Kingdom and he formed his own company, Bunker Claims International Ltd (BCI), to provide independent, expert opinion in litigation and arbitration. BCI also delivered bunker training courses around the world.

In January 2011, Brookes Bell took over BCI and Chris continues to provide expert services to its clients, including surveys of ships' machinery, reporting for arbitration and providing expert testimony. Training courses on bunkers are still a large part of his life and he frequently travels to all parts of the world to deliver courses to a wide range of clients, sometimes with his new co-author Robin.

Chris was involved in the early days of the formation of the International Bunker Industry Association (IBIA) and served as its Chairman in 2009. He is a fellow of the Institute of Marine Engineering, Science and Technology (IMarEST).

Robin Meech

Robin achieved a degree in civil engineering, a course which had a strong bias towards the use of computers in solving engineering and, subsequently, management problems. While a student he spent three months on a Grimsby-based trawler fishing in the Arctic which, perhaps surprisingly, gave him a taste for maritime matters.

He started his career in the research and development (R&D) section at W S Atkins, applying operational research techniques to, among other problems, determining the optimum depth to dredge the approaches to some of the UK's main ports. He then moved to Australia where he was seconded to Arthur D Little (ADL).

During his 20 years with ADL, he developed a wide practice supporting the energy downstream sector, from refinery optimisation through to all forms of land-based transport, ports and terminals, and shipping. He was also involved in the design of systems to manage container logistics. From the early 1980s, Robin realised that environmental issues would have a great influence on the design and operations of all aspects of the downstream sector, impacting on planning schedules as well as capital and operating costs and complexities.

In the late 1980s, he was a member of the team drafting MARPOL Annex VI at the International Maritime Organization (IMO), having undertaken extensive analysis of the impacts of the various proposed emissions to air regulations on both the supply and consumption sides.

Robin was appointed as a director of a Norwegian tanker company with a remit to reorganise the company and seek new business ventures. One of his responsibilities was as a director of a pool of 16 product tankers where he was introduced to the vagaries of purchasing bunkers.

From 1994 to 1998, Robin was based in Moscow with ADL where he was involved in restructuring enterprises which were emerging into, what was for them, a new world; a rewarding but very frustrating process. On his return to London, Robin assisted in the start-up of a privately funded on-line bunker trading system – the venture did not succeed but gave him an in-depth understanding of the commercial (and not so commercial) aspects of bunkers.

In 2001, he set up Marine and Energy Consulting Ltd which has subsequently provided services to the full gamut of maritime industry participants. The company prizes its independence, its knowledge of the issues surrounding marine emissions to air, and its association with a number of respected consultants, including Chris Fisher.

A recent innovation has been the establishment of a training company providing courses to all sectors of the bunker industry.

Robin has been involved with IBIA since its inception and became a member of the Board in 2012. He is also a member of the Energy Institute where he has given lectures on the environmental issues associated with bunkers.

Acknowledgements

We would like to thank Lesley Bankes-Hughes and Cheryl Marshall of Petrospot for their patience and skills in converting our sometimes chaotic scripts, figures and pictures into this book.

Thanks are also due to:

Alan Smaridge of Brookes Bell for his ideas and contributions to the chapter on test methods.

Mark Lewis, Managing Director of EMC-Energy Market Consultants (UK) Ltd, for his support and understanding of the vagaries of the global refining and products markets.

John Aitken, Secretary General of Shipping Emissions Abatement and Trading (SEAaT), for his insight into the abatement industry.

We would also like to thank the following people who have, over the years, always been there with stimulating ideas and challenging thoughts. Their professionalism and passion for bunkers and ships is unquestionable and invaluable. Without them life would be a dull place.

James Corbett, Environmentalist

Nigel Draffin, LQM Petroleum Services

Unni Einemo, Journalist

Don Gregory, Consultant

Timothy Gunner, Consultant

Rudy Kassinger, Consultant

Bob Thornton, World Fuel Services

Dr Vis, Viswalab

Timothy Wilson, Lloyd's Register

Chris Fisher & Robin Meech

February 2013

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