Institute of Marine Engineering, Science & Technology

IMAREST

COLFAX Fluid Handling

Making the Green Agenda Pay

CONTENTS

FOREWORD

Ships are by far the most efficient form of transport, but growing concern about the state of the world's oceans and air quality close to major shipping routes has led to ever more legislation on emissions to both the sea and the atmosphere. The 'Green Agenda' attempts to address these issues by introducing equipment, products and operating procedures that reduce these emissions and costs to ship owners by increasing their energy efficiency.

But can conforming to mandatory legislation and applying additional 'green' approaches to shipping actually be profitable? With fuel being one of the most expensive items in a ship's operating costs and the main source of air emissions, any reduction in consumption brings a financial as well as environmental benefit. It can also be a positive in relationships with shippers who are themselves demonstrating environmental concerns.

There could be further financial returns if a carbon trading scheme were to be implemented such that any emission reductions could be turned into credits, which could be traded or be offset against carbon emissions elsewhere.

To investigate the possibilities, the Institute of Marine Engineering, Science and Technology (IMarEST) together with Colfax Fluid Handling, a leader in pumps, systems and Smart Technology solutions for the marine industry, held a high-level round table discussion in late October 2014, under the title 'Making the Green Agenda Pay'.

Prior to this, an extensive questionnaire was sent out to companies and individuals requesting details of their experiences, expectations and concerns regarding environmental trends. Results of this survey were used as a guide to develop topics to be raised at the round table and as additional data for this report.

The round table itself, chaired by Richard Vie (Vice President of Technical Development and Quality Assurance, Corporate Shipbuilding, at Carnival Corporation & plc, and President of IMarEST), gave a panel of experts from many sectors of the industry the opportunity to discuss green initiatives and debate the current problems and opportunities that exist, as well as whether it is possible to turn these opportunities into profitable investments.

ACKNOWLEDGEMENTS

In producing this report, we have been greatly assisted by the many individuals and businesses who contributed to both the survey and subsequent round table discussion. The 200 plus organisations who responded to the survey gave us a scalable and valuable insight into current market thoughts. The industry leaders who attended the round table added much to this and shared their own practical experiences and recommendations for making the green agenda pay. We are most grateful to them all.

GREEN AGENDA PANEL

The members of the panel attending the round table were as follows:

Mr John Barnes	*Consultant Editor*	IMarEST
Dr Alice Bows-Larkin	*Reader in Energy & Climate Change*	Manchester University Tyndall Centre
Mr Yannis Calogeras	*UK Marine Chief Executive*	Bureau Veritas, UK & Ireland
Mr Martin Crawford-Brunt	*Manager Classification - UK & Ireland*	DNV GL
Mr Paul Davies	*Regional Manager*	Colfax Fluid Handling
Mr Alastair Fischbacher	*Director*	Sustainable Shipping Initiative
Mr Jean-Marie Frizon	*Application Engineering Leader*	GE Power Conversion
Mr Steven Gould	*Executive Director, Smart Technologies*	Colfax Fluid Handling
Mr Jonathan Holloway	*Manager, Governance & Compliance*	BG Group
Mr David Kelly	*Head of Marketing*	IMarEST
Dr Bev MacKenzie	*Technical & Policy Director*	IMarEST
Mr Peter Mantel	*Managing Director*	BMT SMART
Mr Phil Martin	*Sales & Business Development Manager*	MAN Diesel & Turbo UK Ltd
Capt Melvin Mathews	*Director Maritime*	Eniram UK Ltd
Ms Katharine Palmer	*Environmental Manager*	Lloyd's Register
Dr Nishatabbas Rehmatulla	*Research Associate*	UCL Energy Institute
Mr David Roberts	*Senior Manager, Sustainability & Technical*	Gearbulk (UK) Limited
Mr Saurabh Sachdeva	*Strategy, Risk & Compliance - Maritime Policy & Regulatory Affairs Manager*	BP
Mr John Saunders (representing **Mark Bell**)	*Brand, Marketing and Membership Manager*	Society for Gas as a Marine Fuel (SGMF)
Dr Tristan Smith	*Lecturer in Energy and Transport*	UCL Energy Institute
Capt Kuba Szymanski	*Secretary General*	InterManager
Mr Richard Vie	*Vice President, New Building & Technical Development*	Carnival Corporate Shipbuilding
Ms Anna Ziou	*Policy Advisor*	UK Chamber of Shipping

MARINE ENVIRONMENTAL LEGISLATION

The harmful effects of emissions from industrial activities are well known and based on sound science. Particular advances in the knowledge of emissions took place in the 1970s with several studies confirming the hypothesis that air pollutants could travel several thousand kilometres before deposition and damage occurred. Particular focus was paid to airborne deposits of sulphur dioxides and nitrogen oxides which cause acid rain resulting in damage to crops and forests in particular. In addition continued research highlighted that inhalation of sulphur contributes to respiratory problems and specific attention has been paid to the harmful effects on human health for those living in the vicinity of ports with ships being a prime source for sulphur emissions.

To address the issues of shipping emissions, a new annex was added to the International Convention for the Prevention of Pollution from Ships (MARPOL) in 1997. The Regulations for the Prevention of Air Pollution from Ships (Annex VI) seeks to minimise airborne emissions from ships - Sulphur Oxides (SOx), Nitrous Oxides (NOx), Ozone depleting substances (ODS), Volatile Organic Compounds (VOCs) - and their contribution to local and global air pollution. Annex VI entered into force on 19 May 2005 and a revised Annex VI, with significant tightening of emissions limits, was adopted in October 2008 and entered into force on 1 July 2010.

The growth of world trade in the future represents an additional challenge, in meeting a target for the reduction of greenhouse gas (GHG) emissions, in particular carbon dioxide (CO_2), which is required to achieve stabilisation in global temperatures and mitigate the harmful impacts of climate change.

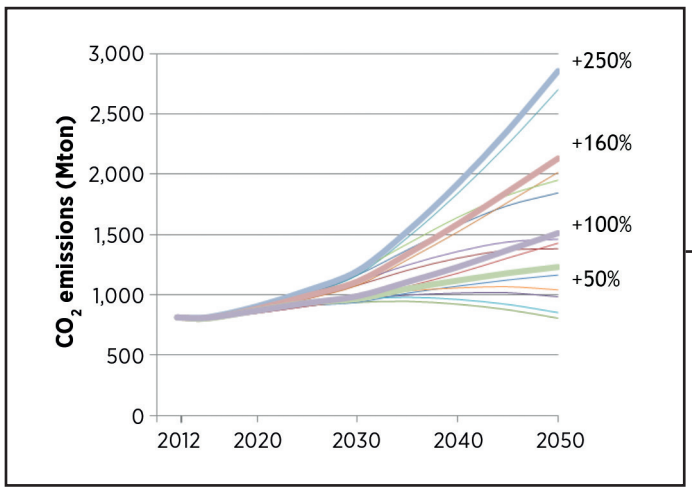
According to the International Maritime Organization (IMO) in its 3rd GHG report of June 2014, for the period 2007–2012, on average, shipping accounted for approximately 3.1% of annual global CO_2 and approximately 2.8% of annual GHGs on a CO_2e* basis. A multi-year average estimate for all shipping using bottom-up totals for 2007–2012 is 1,016 million tonnes CO_2 and 1,038 million tonnes CO_2e for GHGs combining CO_2, CH_4 and N_2O. International shipping accounts for approximately 2.6% and 2.4% of CO_2 and GHGs on a CO_2e basis, respectively. A multi-year average estimate for international shipping using bottom-up totals for 2007–2012 is 846 million tonnes CO_2 and 866 million tonnes CO_2e for GHGs combining CO_2, CH_4 and N_2O.

In 2007, international shipping was estimated to have contributed about 2.7% to the global emissions of CO_2.

As such, in 2011, IMO adopted mandatory technical and operational energy efficiency measures which are expected to improve the carbon intensity of international shipping. However, with the industry expected to grow, absolute emissions are expected to continue to rise. The 3rd IMO GHG report shows only one or two future scenarios where CO_2 will start to fall in real terms as shown below.

The mandatory measures include an Energy Efficiency Design Index (EEDI) for new ships and a Ship Energy Efficiency Plan (SEEMP) for all ships. The regulations apply to all ships over 400 gross tonnes and came into force through the tacit acceptance procedure on 1 January 2013.

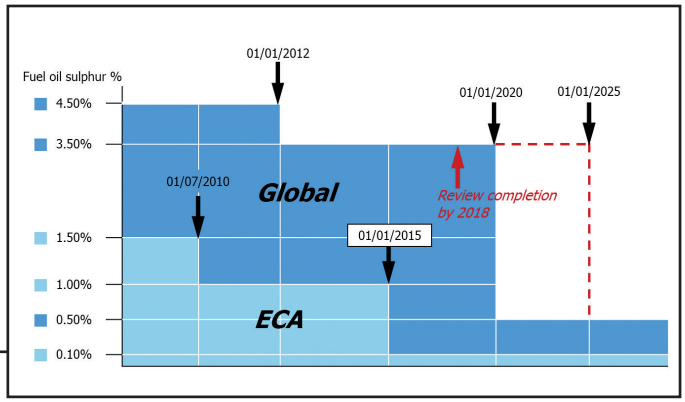
***Carbon dioxide equivalent, a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO_2 which would have the equivalent global warming impact.**



CO_2 emission projections from the IMO 3rd GHG report (Source: IMO)

SULPHUR EMISSIONS LEGISLATION

Under the revised MARPOL Annex VI, the global sulphur cap was reduced to 3.50%, effective from 1 January 2012; then progressively to 0.50 %, effective from 1 January 2020, subject to a feasibility review to be completed no later than 2018. The limits applicable in Emission Control Areas (ECAs) for SOx and particulate matter were reduced to 1.00%, beginning on 1 July 2010 and will be further reduced to 0.10%, effective from 1 January 2015.



The timetable and limits for sulphur reduction in heavy fuel oil as authorised by the IMO (Source: IMO)

NITROGEN EMISSIONS LEGISLATION

Progressive reductions in NOx emissions from marine diesel engines installed on ships are also included, with a "Tier II" emission limit for engines installed on or after 1 January 2011; then with a more stringent "Tier III" emission limit for engines installed on or after 1 January 2016 operating in ECAs.

> IMO regulations seek to minimize airborne emissions from ships (SOx, NOx, ODS, VOC shipboard incineration) and their contribution to local and global air pollution and environmental problems

GREENHOUSE GAS EMISSIONS LEGISLATION

The mandatory technical and operational energy efficiency measures which are expected to significantly reduce the amount of CO_2 emissions from international shipping are not considered by the IMO to be sufficient enough to satisfactorily reduce the amount of GHG emissions from international shipping in view of the growth projections of human population and world trade. Therefore, market-based mechanisms have also been considered and would serve two main purposes: providing a fiscal incentive for the maritime industry to invest in more energy efficient means, and contributing to the potential off-setting of growing ship emissions.

OTHER LEGISLATION ON EMISSIONS

Concurrently the European Union has introduced its own emission legislation in line with that of the IMO. A limit of 1% sulphur in fuel entered into effect from 1 July 2010 for ships operating in the Emission Control Areas comprising the Baltic Sea, North Sea and English Channel.

In addition, EU law requires all ships at berth or anchorage in EU ports to use fuels with a sulphur content of less than 0.1% by weight. This provision entered into force on 1 January 2010. However, as some vessel types needed to undergo an adaptation of their boilers to be able to use 0.1% sulphur fuels safely, and not all of these adaptations were completed before the entry into force of the new requirement, the Commission recommended that the Member States take this into account when enforcing the requirements.

OTHER ENVIRONMENTAL LEGISLATION

Other IMO environmental legislation which impacts the Green Agenda:

Marpol Annex I covers the prevention of pollution by oil from operational measures as well as from accidental discharges.

Marpol Annex II details the discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk.

Marpol Annex III covers prevention of pollution by harmful substances carried by sea in packaged form and contains general requirements for the issuing of detailed standards on packing, marking, labelling, documentation, stowage, quantity limitations, exceptions and notifications.

Marpol Annex IV details the requirements to control pollution of the sea by sewage.

Marpol Annex V deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of including the complete ban imposed on the disposal into the sea of all forms of plastics. A revision to Annex V prohibits the discharge of all garbage into the sea, except as provided otherwise, under specific circumstances.

In addition, there are measures in place to mitigate damage to the environment and to human health caused by invasive species carried by ships either through fouling or in ballast water. Biofouling, described as the undesirable accumulation of microorganisms, plants, algae and animals on submerged structures (especially ships' hulls), is considered one of the main factors for bio-invasions. The IMO has issued "Guidelines for the Control and Management of Ships' Biofouling".

The problem of invasive species in ships' ballast water is largely due to the expanded trade and traffic volume over the last few decades and new areas are being invaded all the time. The International Convention for the Control and Management of Ships' Ballast Water and Sediments (BWM Convention) was adopted by consensus at a Diplomatic Conference held at IMO Headquarters in London on 13 February 2004 and will require all ships to implement a Ballast Water and Sediments Management Plan, carry a Ballast Water Record Book, and carry out ballast water management procedures to a given standard. However, at the time of the round table the convention had yet to be ratified.

TOPICS DISCUSSED

The round table panel was tasked with examining a number of questions relating to the green agenda, pulling together experiences and understanding on the following topics:

THE CURRENT SITUATION

Does conforming to legislation have an impact on businesses? How does it impact your business? Which department(s) takes the strain?

Can and do shipping companies pursue other non-legislative initiatives to improve efficiency?

Can investing in optional green initiatives help to win new clients who themselves are expected by their customers to have strong 'green' policies in place?

Does an investment in 'green' initiatives provide a good Return on Investment (ROI)?

SHARING BEST PRACTICE

What best practices can we share and recommend?

Can we learn from other industries?

What are the steps to be taken to conform to legislation?

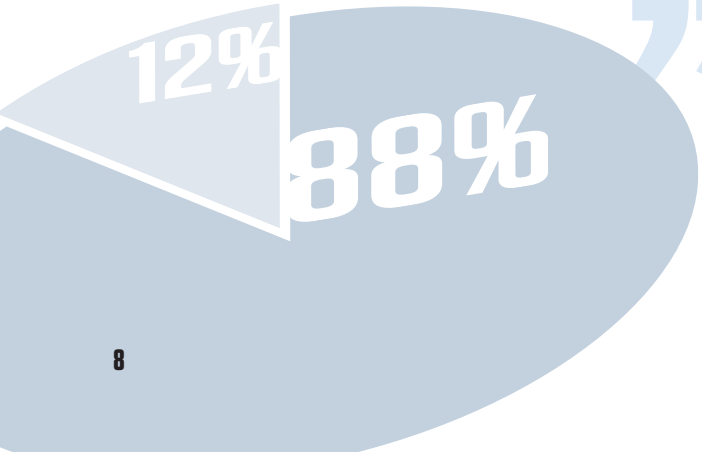
USE OF ALTERNATIVES

Are there any additional alternatives and how should businesses access the value and impact? (e.g. carbon credits, LNG, antifouling, fuel efficiency etc.)

SUGGESTIONS

What do we do next as a sector?

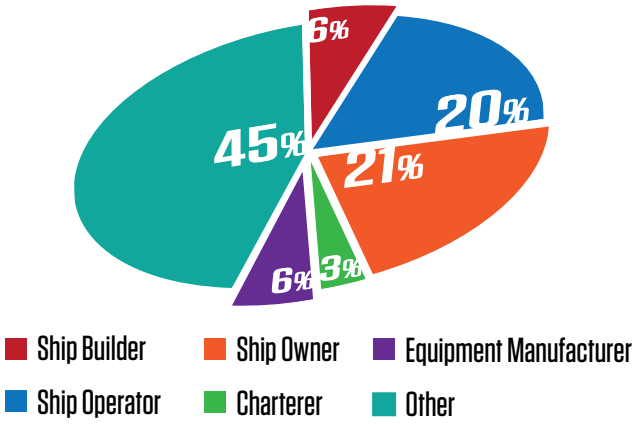
> "88% of the industry agrees that the Green Agenda is good for the global maritime industry"



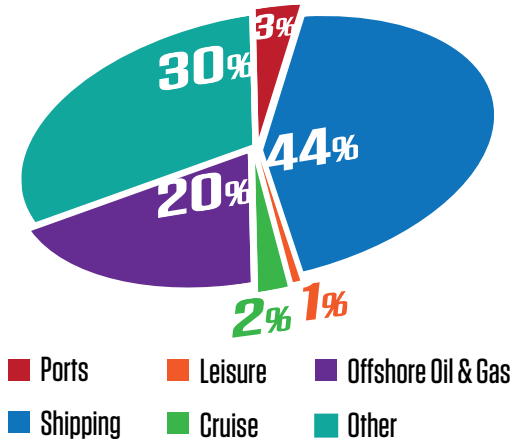
RESULTS OF THE SURVEY

The survey carried out by IMarEST together with Colfax Fluid Handing was a starting point for the discussions. It highlighted that 88% of the industry agrees that the Green Agenda is good for the global maritime industry, but less than 46% say it actually offers good value for money.

The survey produced around 200 responses, with a mix as follows:



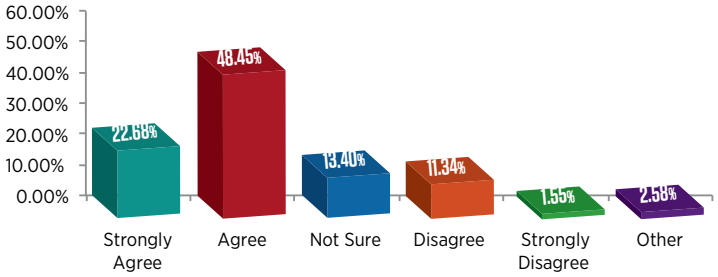
And who work in the following areas:



It showed that 75% of respondents think the Green Agenda can impact business and could act as a success factor, with 78% agreeing that more options need to be made available to encourage companies to invest in green initiatives.

There was wide agreement that customers were perceived to expect owners to have a 'green policy' in place. Further, the survey results highlighted the fact that the industry as a whole could use a best-practice guide or a set of options indicating what is available. Although there are a number of initiatives available to shipping companies, it is difficult to work out which solutions work, and for whom, when there are so many out there.

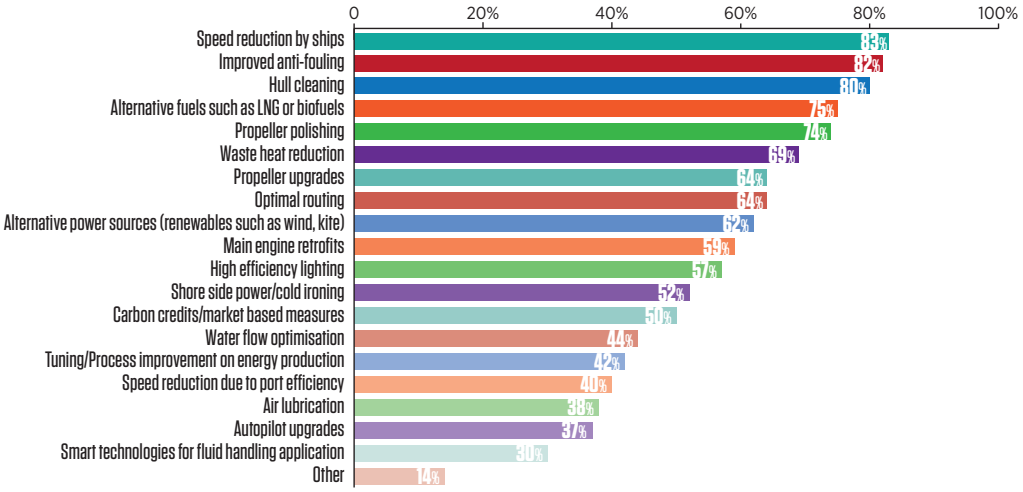
OUR COMPANY ACTIVELY INVESTS IN BEING 'GREEN'



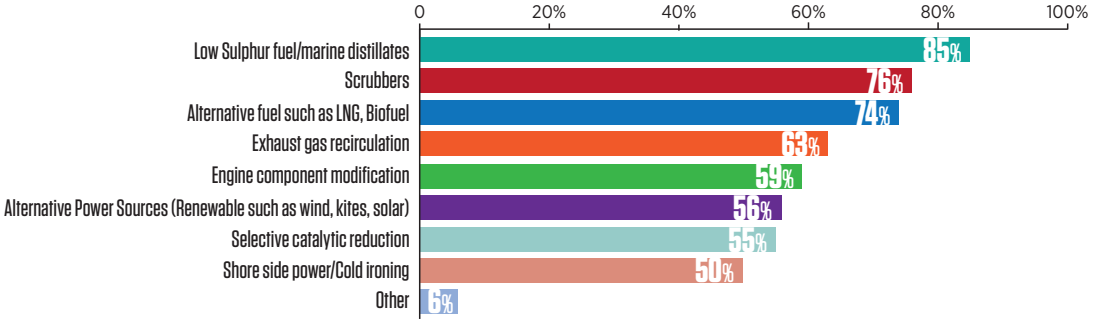
One respondent to the survey suggested that "companies are not going to invest [in green initiatives] unless forced to or there is an attractive financial incentive".

Other results from the survey include the following indications of awareness of the measures that can reduce GHG emissions from ships.

Awareness of green initiatives which impact greenhouse gas emissions:

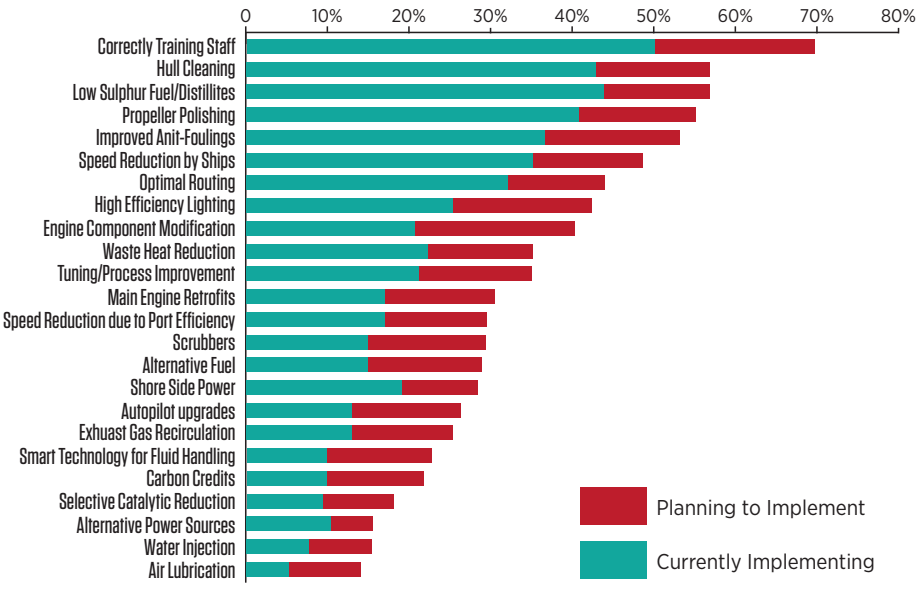


Awareness of green initiatives which impact NOx and SOx emissions:



TAKE UP OF GREEN INITIATIVES

Respondents to the survey were asked to indicate the green measures they had taken up, or were considering adopting, and the results are shown here:



ROUND TABLE DEBATE

The debate covered a wide range of topics and indicated a clear distinction between those practices that are mandatory and required by international legislation, and those that can make a significant contribution to improving the environment but which are at the behest of an owner and not mandatory.

LEGISLATION

The major impact on the green agenda has come through legislation, yet it was felt that this did not always take into consideration the views of shipowners and that legislators did not always understand the business of shipping. Further, it was felt that the regulations that are drawn up are often unrealistic, not taking into consideration the number and skills of the available crews.

Another problem identified was the slowness of drawing up and implementing any regulation and associated rules. It can happen that by the time an IMO Convention, for example, enters into force, circumstances and technology have moved on. A case-in-point is the evolution of ballast water treatment technology where the pace in development is being stifled by the delay in gaining enough signatories to the IMO convention.

There can be the situation where a sophisticated, and inevitably expensive, piece of equipment is selected that is demonstrated to reduce emissions, for example, but is not mandatory and in due course is excluded from the regulations. The owner is then forced to replace this with another system that is approved, at further cost.

Confusion and problems can also be caused when national and/or local policy and law are in conflict with international regulations forcing owners to meet different, and sometimes contradictory, requirements depending where their vessels operate. This situation is worsened when a vessel's route or service is changed so that it operates in a new regime.

BALLAST WATER MANAGEMENT AS A CASE STUDY

It is clear that some environmentally sound equipment and systems cannot be cost effective by their very nature. For example, the requirement to fit a ballast water treatment system, when the appropriate IMO convention enters into force, is considered a lost cause for any financial benefit. The end result is dischargeable water than causes no environmental damage, but results in the shipping industry incurring an estimated $6 billion in cost if all ships to which the convention applies are equipped.

It is unlikely that a vessel fitted with a system will command a higher day rate in the charter market. Indeed it may be that the cost of fitting a ballast water treatment system could even exceed the value of the ship. Should ports offer ballast water reception facilities as an alternative? The other option of building a zero ballast vessel would probably result in a more expensive ship.

FUEL CONSUMPTION

The achievement of improved propulsion efficiency will result in lower fuel consumption with a saving on bunker costs and a reduction in exhaust emissions. However, it can be difficult to quantify these savings because of the complex interplay of the various systems, with one affecting the other and thereby modifying the apparent results.

It is very difficult to quantify the savings that may be achieved through improved machinery efficiency and/or slow steaming when the bunker market is so volatile as is the position at present with crude prices at their lowest for four years and an expectation that they will continue to fall for some time yet. As at November 2014 the typical cost of heavy fuel oil was around $400/ton, down from a figure of $600/ton.

Currently slow steaming has become one of the most popular ways to reduce fuel consumption as other methods have been considered to have been taken to the limit of the available technology and little more can be gained by fine tuning the hull etc. Even so, as the vessel operates outside its optimum design conditions when slow steaming, there is a penalty in operational efficiency.

EMISSION CONTROL

Whilst much effort has been devoted in recent years to the reduction in exhaust emissions from ship's propulsion machinery, there remains an inherent contradiction in the steps to cut the emission of NOx and SOx – reducing one can lead to an increase in the other.

Modifying the operation of the diesel engine by adopting a Miller cycle*, going to two-stage turbocharging, or fitting selective catalytic reduction, will significantly reduce NOx emissions.

***In the Miller cycle, the intake valve is left open longer than in an Otto cycle engine. The compression stroke has two discrete cycles: the initial portion when the intake valve is open and final portion when the intake valve is closed. In this way at full load, the maximum cylinder temperature is lower, reducing NOx formation which occurs above 1,200°C.**

> It is very difficult to quantify the savings that may be achieved through improved machinery efficiency and/or slow steaming when the bunker market is so volatile

Use of a scrubber when burning heavy fuel oil or switching to marine diesel oil/gas oil will cut SOx emissions, but either option entails a cost. Detailed analysis is necessary to find which is the most cost effective solution, and this will vary from vessel to vessel and route to route.

Meanwhile an increasing concern for shipping is CO_2 emissions and the looming problem of particulates, especially in coastal waters, because of the carcinogenic risk.

Despite the challenges, it is generally recognised that the industry has a duty to implement technologies that will reduce all types of emissions to ensure the sustainable use of the seas. Additionally, this is likely to have a beneficial effect on the future recruitment of personnel who themselves will be increasingly environmentally conscious as awareness of global issues increases.

STAFF AND TRAINING

The human element is an important factor in making sure a vessel's operation is carried out as efficiently as possible. The quality of staff and their training therefore has a major impact on cost. Indeed correctly trained staff tops the list of practices, actual and planned, reported by respondents to the survey. However, in some individuals the understanding of overall concepts is fundamentally missing.

COMMERCIAL ADVANTAGE

There can be commercial advantage in a vessel or company meeting the environmental needs of its charterers or cargo owners who themselves may be required to demonstrate green policies. This is becoming an increasing requirement for shipping as wholesalers and retailers come under pressure to show how "green" they are.

As a global commitment to taking measures to improve the environment spreads around the world and from industry to industry, shipping must take the opportunity to respond with its own measures.

SO WHAT ARE THE OPTIONS?

A number of techniques are available to reduce fuel consumption and emissions and some of these can generate savings in addition to achieving compliance with regulation.

One means of achieving a financial return is the process of carbon credits whereby a saving in carbon emissions can be converted into credits that can be sold on the open market. The first example of this practice in shipping entails the use of an advanced antifouling from one of the leading coatings manufacturers. Benchmarking a vessel's performance before application and measuring the subsequent reduction in fuel consumption, and thereby CO_2 emissions, has generated carbon credits for two owners. The owners are due to be awarded a combined total of almost $500,000 when their first claims are finalised next year. A total of 17 vessels feature in the first two claims, while 50 further vessels are expected to join the scheme by the end of 2014. It should be noted that this approach can only be used once to record the improvements.

Switching to burning LNG is another option although best suited to newbuilds. With the price of LNG considerably less than heavy fuel oil, there is a strong financial incentive to adopt this option and, of course, the emissions are massively reduced. However, there is the extra cost of adopting the required machinery and systems, the need to develop a global supply network, concerns over safety, and the problem of methane slip whereby unburnt methane is vented to the atmosphere. There is also the risk that LNG prices will escalate in the future as demand rises while, the price of bunkers has dropped dramatically in the last few months leading to wide uncertainty.

Cold ironing, using shore supplied power when alongside in port, can result in the elimination of fuel consumption of auxiliary generation sets. It is important to understand, though, that this will transfer the energy production from the ship to shore-based sources which may themselves have a large carbon footprint.

It is clear from the survey that many owners are already adopting measures such as ensuring their crews are properly trained in the necessary techniques required to, for example, maximise fuel efficiency in machinery operation and optimise vessel routing.

Other techniques already being employed include ensuring the vessel's hull is as clean as possible and kept that way by using advanced antifoulings and by polishing the propeller.

Options that can also be considered include the use of selective catalytic reduction (SCR), two-stage turbocharging, and scrubbers. None of these contribute direct savings; indeed they are a net, and sometimes substantial, cost. But they can help to reduce the overall increase in costs by allowing the use of lower grade and thereby cheaper fuels.

Collaboration between owners, manufacturers and others is seen as one of the best ways of reaching a viable situation. The examples of the oil and gas and aviation industries should be examined and considered to see how such cooperation can work and how valuable it can be.

CONCLUSIONS

A number of key conclusions emerged from the round table. In particular the following needs were identified:

- Establish joint industry projects (JIPs) to investigate practical solutions to energy saving and environmental improvements
- Examine other sectors, such as aviation and offshore oil and gas, to see how they achieve results
- Incentivise the adoption of new techniques rather than impose a regime of penalties
- Encourage legislative bodies, organisations and the industry to do a better job of thinking through potential legislation to reflect the views of the end users and perhaps a better job of wording policies to support the sector
- Ensure the industry understands the goalposts in order to be able to plan effectively
- Develop a vision of where the industry wants to go.
- Foster longer term strategic thinking and more industry engagement in legislative processes
- Adopt more sophisticated measurement techniques to give accurate benchmarks for future developments, and carry out more testing
- Introduce more education amongst owners and crews in system engineering
- Consider small, incremental improvements which collectively can become significant
- Seek more cooperation and transparency by equipment and systems manufacturers to ensure that they deliver the performance improvements they claim
- Take a more holistic approach to carbon usage
- Look for more innovative measures beyond LNG – CO_2 agenda won't go away. Instead, the 2°C framing of climate change poses great challenges for the industry that will require a step-change in levels of CO_2 emissions rather than incremental adjustment
- Recognise the complexity of the issues involved
- Share data (where applicable) to support industry knowledge and therefore make better decisions which, in turn, drive the green agenda more cost-effectively
- Consider wind assist as an aid to emission reductions
- Recognise the diversity of shipping so that the 'one solution fits all' approach is not valid
- Get charterers to play a part in any discussions on processes
- Raise the profile of shipping and its green credentials so as to attract the next generation to the industry.

Implementing the recommendations above requires engagement and buy-in from industry, legislators, regulators and the research community. As an impartial organization the IMarEST will facilitate the continuance of the debate, taking the thought-provoking statements and making them actionable. It will do this by establishing a Special Interest Group (SIG) on Emissions from Shipping. The SIG will assess and prioritize the conclusions from the round table and take steps to address them working with all stakeholders. This will be done by a mixture of further round tables, meetings and online networking.

ACTION PLAN

RECOMMENDATION	RESPONSIBILITY
• Establish joint industry projects (JIPs) to investigate practical solutions to energy saving and environmental improvements	All sectors
• Examine other sectors, such as aviation and offshore oil and gas, to see how they achieve results	All sectors
• Incentivise the adoption of new techniques rather than impose a regime of penalties	Legislators

• Encourage legislative bodies, organisations and the industry to do a better job of thinking through potential legislation to reflect the views of the end users and perhaps a better job of wording policies to support the sector
  • The industry needs to understand the goalposts in order to plan effectively
  • There needs to be a vision of where the industry wants to go.
	All sectors

• Foster longer term strategic thinking and more industry engagement in legislative processes	Legislators
• Adopt more sophisticated measurement techniques to give accurate benchmarks for future developments, and carry out more testing	Ship designers, equipment manufacturers
• Introduce more education amongst owners and crews in system engineering	Ship owners
• Consider small, incremental improvements which collectively can become significant	All sectors
• Seek more cooperation and transparency by equipment and systems manufacturers to ensure that they deliver the performance improvements they claim	Equipment manufacturers
• Take a more holistic approach to carbon usage	All sectors
• Look for more innovative measures beyond LNG as the CO_2 agenda won't go away. Instead, the 2°C framing of climate change poses great challenges for the industry that will require a step-change in levels of CO_2 emissions rather than incremental adjustment	Ship owners, equipment manufacturers
• Recognise the complexity of the issues involved	All sectors
• Share data (where applicable) to support industry knowledge and therefore make better decisions which, in turn, drive the green agenda more cost-effectively	Ship owners
• Consider wind assist as an aid to emission reductions	Ship designers and consultants
• Recognise the diversity of shipping so that the 'one solution fits all' approach is not valid	Legislators
• Get charterers to play a part in any discussions on processes	Charterers
• Raise the profile of shipping and its green credentials so as to attract the next generation to the industry.	Trade associations

ABOUT THE INSTITUTE OF ENGINEERING, SCIENCE AND TECHNOLOGY (IMarEST)

The IMarEST is an international membership body and learned society for all marine professionals. A registered charity, it is the first Institute to bring together marine engineers, scientists and technologists into one international multi-disciplinary professional body. It is the largest marine organisation of its kind with a worldwide membership of around 15,000 based in over 100 countries.

Working with the global marine community, the IMarEST promotes the scientific development of marine engineering, science and technology, providing opportunities for the exchange of ideas and practices and upholding the status, standards and expertise of marine professionals worldwide.

Its vision is a world where marine resources and activities are sustained, managed and developed for the benefit of humanity. The IMarEST has a growing network of Corporate Marine Partners who benefit from a tailored programme to support each global organisation's specific requirements. Packages provide companies with a competitive edge by investing in staff and supporting Initial and Continuous Professional Development, supporting local, national, or international promotional programmes, providing specialised recruitment solutions, accrediting training courses, creating bespoke networking events, and providing company employees with access to one of the largest online knowledge resources – the IMarEST Virtual Library.

The IMarEST is a respected authority in every maritime country. It is a Non-Governmental Organisation with consultative status at the IMO, has observer status at the Intergovernmental Oceanographic Commission of UNESCO and at the International Hydrographic Organization, and it has special consultative status with the Economic and Social Council of the United Nations (ECOSOC), which facilitates its access to other international intergovernmental meetings where its specialized marine expertise is of particular use, e.g., the United Nations meetings on Areas Beyond National Jurisdiction, the Intergovernmental Panel on Climate Change (IPCC), and the work of the International Seabed Authority on marine mining. It is a nominated and licensed body of the Engineering Council (UK), a member of the Science Council and has significant links with many other marine organisations worldwide.

IMarEST runs a series of industry leading and technically excellent events and conferences as well as publishing internationally recognised publications including: The Journal of Marine Engineering and Technology; The Journal of Operational Oceanography; and The Marine Professional.

www.imarest.org

COLFAX Fluid Handling

Institute of Marine Engineering, Science & Technology
IMAREST

ABOUT COLFAX FLUID HANDLING

Colfax Fluid Handling, a business of Colfax Corporation (NYSE: CFX), is a global leader in critical fluid handling and transfer solutions for the commercial marine, defence, energy, industrial and reliability services markets, including the new Smart Technology CM-1000 Series intelligent controller to reduce energy and maintenance costs for sea water cooling systems.

With a broad portfolio of technologies, products, systems and services and a deep base of application and engineering expertise, Colfax Fluid Handling specialists work with customers to understand and focus on their toughest business challenges. As a result, Colfax can find and deliver the best customer solutions that provide the highest levels of reliability, efficiency and longevity with the lowest total cost of ownership.

Colfax Fluid Handling encompasses the trusted product brands Allweiler®, Clarus®, COT-PURITECH℠, Houttuin™, Imo®, LSC℠, Rosscor®, Sicelub®, Total Lubrication Management℠, Tushaco®, Warren® and Zenith®. Additional information about Colfax Fluid Handling can be found at www.colfaxfluidhandling.com.

The Institute of Marine Engineering, Science and Technology
Aldgate House, 33 Aldgate High Street, London, UK, EC3N 1EN
t +44 (0)20 7382 2600 ■ f +44 (0)20 7382 2670
www.imarest.org