SIGTTO

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SIGTTO News

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MESSAGE FROM GENERAL MANAGER

Reducing gas ship greenhouse gases

In contrast to the LPG ship situation, assigning energy efficiency indices to the various designs of LNG carrier is proving to be a challenging task

In the last SIGTTO newsletter, the Autumn 2011 edition, I spent some time on the development of regulations governing the technical means to reduce greenhouse gas (GHG) emissions from ships. The report noted that the 62nd Session of the IMO's Marine Environment Protection Committee (MEPC 62), held in July 2011, was dominated by political debate leading to the passing of a resolution to adopt an amendment to MARPOL Annex VI Chapter 4. The extent of the debate precluded full consideration of the technical issues relating to the new Energy Efficiency Design Index (EEDI) requirements.

There is still no agreement on how steam turbine-powered LNG ships will be treated by the proposed EEDI regime

As a result, the IMO Secretariat introduced an extra 'inter-sessional' meeting in January 2012 to address the technical issues not covered at MEPC 62, plus some new ones. This resulted in an agenda for the meeting which was overloaded. The current status for the application of EEDI to gas carriers is that LPG ships are all 'in' the scheme with an approved reference line.

LNG carriers powered by slow-speed diesel engines and fitted with reliquefaction plants are also included in the same reference line, but some adjustment is required to give a fair comparison with LPG. This adjustment methodology was agreed at the inter-sessional meeting in January.

There has, however, been no substantive progress on addressing the treatment of steam turbine LNG ships and dual-fuel diesel electric (DFDE) LNG ships. We are left with the rather anomalous situation in which some LNG carriers are in the regulation and some are out.

One other aspect is that, under IMO procedural rules, once a resolution is passed, as at MEPC 62, there can be no amendments to that resolution until after entry into force, in this case 1 January 2013. This rule is enforced, even when there is a self-evident error or incompleteness in the resolution.

It should be noted that issues relating to the application of EEDI requirements are not only affecting LNG ships. There are also serious issues surrounding the treatment of chemical carriers, large ore carriers, very large crude carriers (VLCCs), roll-on/roll-off (ro-ro) passenger and cargo vessels and cruise liners. All these shipping segments, plus unresolved issues around the treatment of ice class vessels, minimum power requirements and weather factors, are vying for time in the IMO meetings which is resulting in slow progress.

This article is being written just prior to MEPC 63 which is due to take place on 27 February - 2 March 2012. At this meeting SIGTTO intends to have

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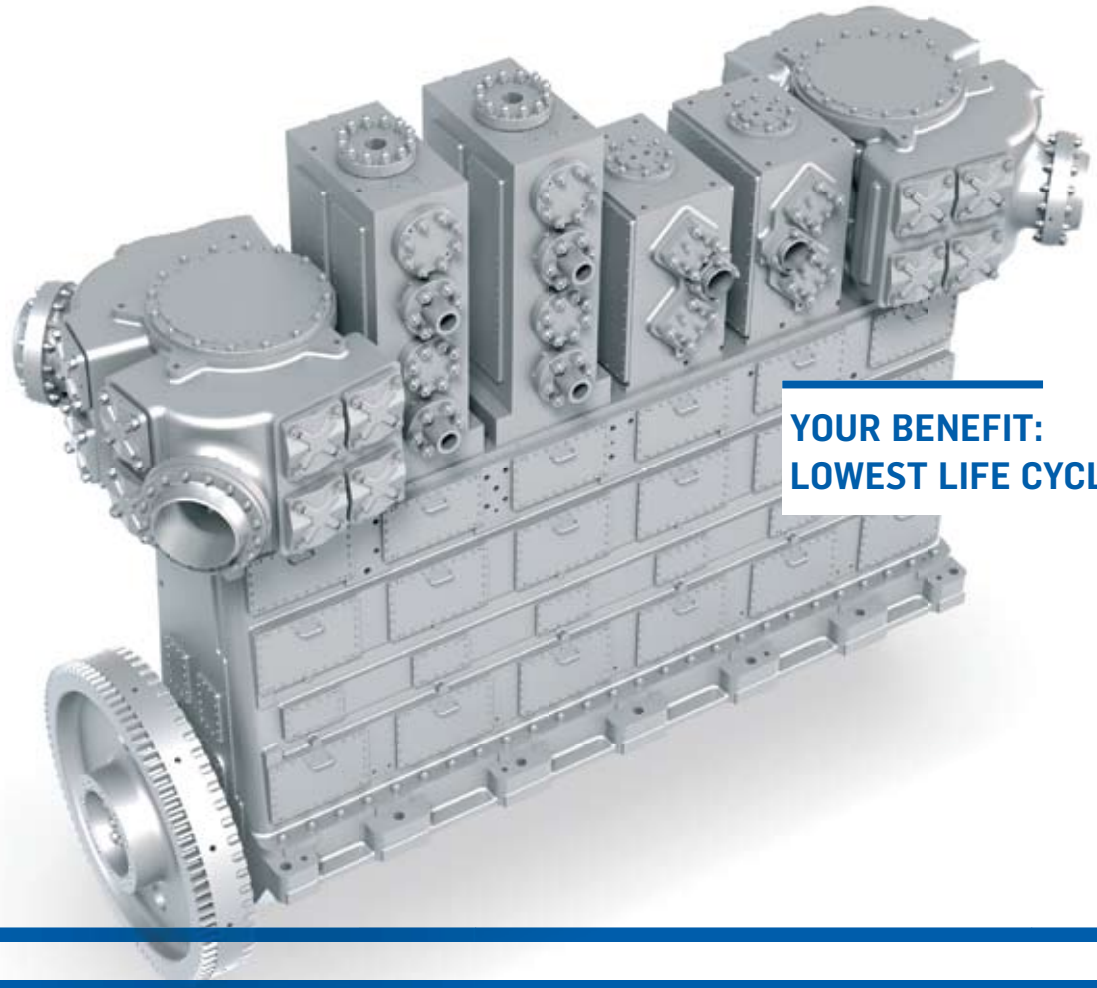

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informal discussions with various flag state delegations to try to reach some consensus on the treatment of steam and DFDE LNG vessels in EEDI. As per the comment above, if such discussions result in a need to change the IMO resolution in any way, it cannot be done until next year.

Two other gas carrier and gas-handling initiatives with which SIGTTO has close involvement are currently making progress at IMO. The latest status of the revised International Gas Carrier (IGC) Code and the new International Code on Safety for Gas-Fuelled Ships (IGF Code) is described on pages 9 and 7 in this newsletter.

Delegates to the February 2012 Japanese members' meeting gather in front of the tanks at the Sakai LNG terminal

SIGTTO's autumn General Purposes Committee (GPC) and Panel Meetings were held in Houston at the end of September 2011. We had just short of 200 registered attendees at the Panel Meeting. The main highlight of the Houston Panel was an afternoon session given over to Sandia National Laboratories to report on their large-scale LNG pool fire tests and the effects of such fires on an LNG carrier.

The Sandia work revealed some interesting insights into the behaviour of large pool fires, but did not change the overall appreciation of the consequences of severe events. In one particular respect, it gave further strong validation to the study done by a SIGTTO working group on the sizing of cargo tank relief valves in the *"Report into the Effects of Fire on LNG Containment Systems"* publication produced in 2009.

Another Panel Meeting highlight was a presentation on the experiences of an LPG ship master on a fully refrigerated LPG carrier caught in port of Kashima during the terrible Japanese tsunami of March 2011.

In the first two months of this year a flurry of SIGTTO Regional Forum meetings were held. The West European/ Scandinavian Forum, kindly hosted by BV and attended by 21 delegates, took place in Paris. The Mediterranean Forum, with 43 attendees, met in Athens and a special Forum meeting was set up in Brisbane to provide an update on the coal seam gas-based LNG export projects being developed around the Gladstone port area. The latter event had 23 participants.

I had the opportunity to visit Japan to join in with a Japanese members' meeting in Osaka. This gathering was hosted by Kansai Electric Power Co and 36 Japanese members attended.

Also planned, at the time of writing, is a special Forum meeting kindly hosted by the Panama Canal Authority (PCA). Whilst it is a being set up as a Pan-American Regional Forum, the invitation has gone to all members since the impact of the expanded capacity of the Panama Canal could be significant for the LNG trade worldwide. When opened in 2014, the new Canal locks will be able to accept ships with a breadth of up to 49 metres. This will enable LNG ships of up to about 165,000m^3 in capacity to transit the Canal.

Regional Forums and Members' Meetings are an important part of the SIGTTO process of engagement between the Secretariat and the broader membership. They serve an important two-way communications channel, i.e. that of briefing members on the activities of the Society and for the Secretariat to hear from the membership about specific issues they face or areas where a collective response via SIGTTO is the best way to resolve an issue.

Just before the meeting in Panama a group of SIGTTO members is participating with the PCA in a generic risk analysis for LNG carriers transiting the Canal. This is seen as an essential precursor to LNG ship transits since, to date, no LNG carrier has transited the existing Panama Canal owing to current breadth limitations.

Most readers will know by now that this will be my penultimate "Message from the General Manager" as I intend to step down in November at the Annual General Meeting (AGM) after five and a half years at the helm. The process of identifying and selecting a successor is in hand and the result will be announced in due course.

WEBSITE

Individual service

The SIGTTO website has been refreshed to make it easier to navigate and to provide additional functionality. One of the key changes is an improved search function which makes it easier to find what you are looking for. This will be particularly helpful in the Publications section.

Security has also been changed so that those accessing the site now have individual log-ins rather than company log-ins. This approach will simplify the control of access to documents. For example, the members of a working group will have exclusive access to those relevant files without requiring additional passwords.

Initially new passwords were sent only to the chief representatives at member companies. If an individual requires their own separate log-in, please email the Secretariat with your request, copying your chief representative at the same time. SIGTTO will then set you up with a log-in; once logged in, it is suggested that you change your password to something more memorable. If you forget your password, this can easily be reset by following the instructions on the website.

UPCOMING MEETINGS

2012	Date	Location
Western Europe Regional Forum	12 Feb	Paris
Asia-Pacific Regional Forum	16 Feb	Brisbane
Mediterranean Regional Forum	24 Feb	Athens
Pan-American Regional Forum	8 Feb	Panama
65th General Purposes Committee	26 Mar	Doha
57th Panel Meeting	27-28 Mar	Doha
Board	31 May	Kuala Lumpur
65th General Purposes Committee	11 Oct	London
Board and AGM	21 Nov	Bermuda

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NEW CONVENTIONS (1)

Ballast water - the pressure is on

Despite the slow progress in ratifying the new regime developed to control the bio-ecological threat to the marine environment caused by invasive alien species in ships' ballast, shipowners are under increasing pressure to comply with the agreed requirements. Acceptance of the regime by some leading maritime nations and the unilateral adoption of ballast water regulations in other countries are rapidly reducing the amount of time the shipping community has available for embracing the complex operational and documentary procedures and the novel treatment systems that called for.

The International Convention for the Control and Management of Ships' Ballast Water and Sediments (the BWM Convention) was adopted by IMO in 2004 and is due to enter into force one year after it has been ratified by 30 member states comprising 35 per cent of the world tonnage. The considerable technical challenges inherent in developing a suitable framework and implementing the BWM Convention

It will be necessary to consider the impact of the the chosen ballast water treatment technology on other ship systems

have translated into slow progress on the ratification front. As of 1 February 2012 some 33 countries representing just over 26 per cent of the world's tonnage had done so.

Recognising that ships differ in type, size and configuration, the BWM Convention initially allows for two standards of ballast water management - the Ballast Water Exchange Standard (BWE) - which is only acceptable until January 2014 or 2016, depending on the ship's ballast capacity - and the Ballast Water Performance Standard (BWP) where ballast water must be treated prior to discharge.

The greatest of the BWM challenges facing a shipowner is the choice of the most appropriate ballast water treatment (BWT) system for a particular vessel. The decision is not made any easier by the fact that BWT technologies are at a relatively early stage of development, the equipment is expensive and question marks remain over the ability of available systems to achieve the necessary performance standard when specified for larger ships with ballast capacities over 5,000m^3. The impact of the BWT system on other ship systems and performance monitoring also need to be borne in mind.

Apart from the choice of BWT equipment, there are considerations of developing a ballast water management plan; maintaining associated documentation; organising shipyard retrofit timetables; inspection and certification; the training of crew, staff and regulatory personnel; the possibility of sanctions; and understanding the 14 sets of guidelines developed by IMO to back up implementation of the regime.

One of the sets of IMO guidelines - that on ballast water sampling and analysis - is still at the draft stage and reaching agreement on its provisions has proved controversial. Following shipowner intervention, the draft guidelines will now be reconsidered by IMO and will not be ready until 2013 at the earliest.

An estimated 57,000 ships, representing a market worth US$34 billion, will be impacted by the BWM Convention.

NEW CONVENTIONS (2)

Level seafarer playing field

The Maritime Labour Convention (MLC) 2006 is expected to enter into force by summer 2013 and flag administrations and shipping associations are issuing guidance to assist shipowners and managers in implementing the new regime. Impacting 1.2 million seafarers worldwide and all ships trading internationally, MLC 2006 is set to replace 40 existing conventions and 29 regulations.

The wide coverage of the International Labour Organisation's (ILO) new convention encompasses working hours, seafarers' contractual arrangements, responsibilities of manning agencies, health and safety, medical and catering standards and crew accommodation. MLC 2006 will be subject to port state control as well as flag state inspection.

An important aspect of the convention's enforcement will be the issuance by flag administrations of Maritime Labour Certificates, usually following inspection by a recognised organisation such as a class society, and a separate requirement for ships to maintain a Declaration of Maritime Labour Compliance.

Flag administrations are advising shipping companies to develop the appropriate documentation and procedures to demonstrate compliance with MLC 2006 and to apply for a ship inspection once the documentation is ready. Once a ship inspection has been satisfactorily completed, the flag administration will issue an MLC Statement of Compliance. Upon ratification of MLC 2006 this Statement of Compliance may be exchanged for an MLC Certificate.

One of the challenges in implementing the new seafarer labour regime has been to align the MLC working hour

MLC 2006 has been designed as the 'fourth pillar' of the international regulatory regime governing quality shipping

requirements with those of IMO's Standards of Training Certification and Watchkeeping (STCW) Convention. This has been achieved through the adoption of amendments to STCW which were finalised in Manila in June 2010 and which entered into force on 1 January 2012.

MLC 2006 will enter into force one year after 30 countries with a minimum of 33 per cent of the world's tonnage have ratified it. As of February 2012 a total of 22 countries representing 56 per cent of world tonnage had signed the convention. The pace of ratification is accelerating and it is expected that the final eight signatures will be obtained in the next few months, enabling entry into force by summer 2013.

Preparing an LNG import terminal for re-exports

A number of technical considerations have to be taken into account when adapting an LNG receiving terminal to be able to load cargoes

The relatively recent change in the US LNG trade, associated with the unprecedented development of domestic unconventional gas, has caused US import terminal operators to seek new business opportunities for their currently underutilised terminals. The business for which an import terminal may be most readily adapted is that of temporarily storing imported LNG for later export when market arbitrage opportunities present themselves. However simple this may appear, there are a number of issues to be considered if the terminal's proposed loading operation is going to comply with the best practices for handling LNG.

An operator adapting an LNG receiving terminal for re-exports must consider, amongst a range of issues, the ship's ability to return cargo vapours ashore

The recent adaptation of an import terminal on the US Gulf Coast to the additional function of storing and backloading LNG provides an insight into the issues that should be addressed in undertaking the operational change. Following the regulatory agency permitting to adapt the terminal for this additional function, the issues to be considered include the following.

Cargo arms

If the revised business plan is to retain the terminal's import capability, as opposed to a complete conversion to an export terminal, then the cargo arm(s) to be used for loading must be designated and adapted by either reversing the non-return valve at the base of the cargo arm or by replacing the original non-return valve with a defeatable non-return valve. Depending on the LNG loading rate envisaged for the terminal, it may be found that changing the non-return valve(s) at the cargo arm(s) may be necessary only on one arm.

Planned loading rate/shore tank LNG pumps

The LNG transfer pumps installed in the shore tanks of a purpose-built receiving terminal are sized to match the volume of LNG that must be transferred to the terminal's vaporisers to satisfy the natural gas sendout specification of the terminal. Experience has shown that five of the total of six LNG transfer pumps installed in the two tanks of a terminal built for a peak natural gas sendout capability of 2.0 billion cubic feet per day (bcf/d) can together transfer approximately 4,000m^3 of LNG per hour. As an hourly loading rate, this volume can be safely transferred to a ship through one 16-inch cargo arm, thus requiring the modification of the non-return valve at only one arm. Should the proposed loading rate be typical of a purpose-built LNG export facility, then the shore tank transfer pumps must be upgraded to produce the required transfer rate and the non-return valves at the cargo arms required to handle that rate must be modified.

Surge pressure analysis on the terminal dock transfer line

The engineering design of the LNG transfer line between the terminal's dock and shore tanks takes into account surge pressures generated in the line by an emergency shutdown 1 (ESD-1) event. For a receiving terminal this analysis is typically performed utilising the terminal's designed liquid flow direction and rate. In adapting the terminal for loading, the engineering department must analyse and determine that, at the proposed loading rate in that flow direction, an excessive surge pressure will not be generated in the line at an ESD-1 event.

Cargo transfer ESD-1 functions (LNG pumps)

At a purpose-built loading terminal, if a high-high level alarm in any of the cargo tanks of a ship being loaded is activated, the ESD-1 signal generated by the ship's system will stop the LNG transfer pumps in the shore tanks. Conversely, at a purpose-built receiving terminal, if the high-high level alarm in a shore tank is activated, the ESD-1 signal generated by the terminal's system will stop the cargo pumps of a ship that is discharging into that tank.

The control system in the purpose-built receiving terminal is not configured for the shore tank transfer pumps to receive a shutdown signal from the ship. The system is configured for the transfer pumps to receive shutdown signals from the various downstream pieces of equipment, such as LNG vaporisers and gas sendout compressors, but not from ships at the berth.

Therefore, in adapting the receiving terminal to be able to safely load ships, the logic of the terminal's LNG flow control system must be able to be switched from the receiving mode to the ship loading mode, in which mode the shore tank transfer pumps will shut down if they receive a ship's cargo tank high-high level signal or any other ESD-1 signal from either the ship or from the terminal's own system.

Cargo transfer ESD-1 functions (terminal ESD-1 valves)

The recommended closing time for the ESD-1 valves at receiving terminals is between 30 and 60 seconds. However, the recommended closing time for those same valves at loading terminals is between 10 and 15 seconds (see SIGTTO publication "ESD Arrangements & Linked Ship/Shore Systems for Liquefied Gas Carriers", Edition 2009, Section 2.2).

Therefore, in adapting the receiving terminal to be able to safely load ships, the closing time of the ESD-1 valves must be able to be switched between the two different recommended closing times and set as appropriate for the particular operation to be performed.

Return vapour handling

Receiving terminals must deliver return gas to ships discharging at their dock(s) and, consequently, receiving terminals are equipped with gas blowers capable of delivering the return gas to the discharging ship. Conversely, a ship that is loading must send its return gas to some destination in the terminal.

To provide an adequate supply of gas to the discharging ship, the capability of a receiving terminal's return gas blower will be engineered for the length, configuration, diameter, etc of the terminal's return gas line. Until the time when air pollution emissions came under great scrutiny by national and international regulatory agencies, loading terminals had been equipped with marine flares located relatively close to the terminal's dock. The capability of the gas compressors installed on LNG ships was thus geared to the ship having to drive the return gas only as far as the marine flare.

However, receiving terminals are not equipped with marine flares. They are built with process flares that are generally located closer to the vaporising and gas sendout equipment

Attention will have to be given to the non-return valves on those cargo arms designated for reloading LNG

sections of the terminal. Such sections of the terminal are typically a considerable distance from the dock.

At the particular US Gulf Coast receiving terminal that has undertaken the added functions of storing and backloading of cargoes, it has been found that the typical LNG ship's compressors are unable to generate the required gas delivery pressure sufficient to deliver the return gas either to the terminal's process flare or to the terminal's gas compression station for further processing.

Consequently, return gas handling during loading operations at a purpose-built receiving terminal is problematic. Solutions may include the installation of a suitably configured compressor at the dock to boost the pressure of the ship's return gas or the installation of a marine flare, should radiation heat zones around its proposed location and the terminal's air emission allowances permit it.

Shore tank boil-off gas (BOG)

In catering to the customer base for the storage and backloading of cargoes, consideration must be given to the daily inventory loss due to boil-off while the cargo is being stored. Possible solutions to inventory loss through boil-off include a small re-liquefaction plant to capture the daily boil-off, re-liquefy it and return it to the tanks, or a commercial arrangement with the cargo owner to send out the daily boil-off gas to the natural gas pipeline grid.

In either case the terminal operator must also be aware of the weathering of the LNG due to the daily boil-off and must take provisions to prevent rollover when the material weathers or when additional material is added to LNG that has been stored for a considerable time in the terminal's tanks.

Conclusion

The experience of having adapted a purpose-built LNG receiving terminal to the added function of storage and ship loading clearly indicates that such an adaptation is feasible. However, if the adaptation is to be successful, all of the above issues must be included in the list of those which must be addressed by the terminal's operators.

IGF CODE

Gas-fuelled ship progress

As part of development work on the new International Code on Safety for Gas-Fuelled Ships (IGF Code), SIGTTO submitted a paper to the 16th Session of IMO's Bulk Liquids and Gases Subcommittee (BLG 16) raising concerns with regard to the concept of emergency shutdown (ESD)-protected machinery space and the location of bunker tanks under accommodation spaces. BLG 16 was held in London during the week of 30 January - 3 February 2012.

Following discussions on the paper at the BLG 16 plenary session, it was decided that the ESD machinery space provisions will be part of the IGF Code and that the technical aspects should be considered by the IGF working group. As regards bunker tank location, BLG 16 decided that, as this is a new code, there needs to be some flexibility and, therefore, bunker tanks under the accommodation spaces should not be prohibited. There remains concern about this issue.

Progress by the IGF working group during BLG 16 included a review of the later chapters of the Code and, as a result of this work, the group identified a number of areas where

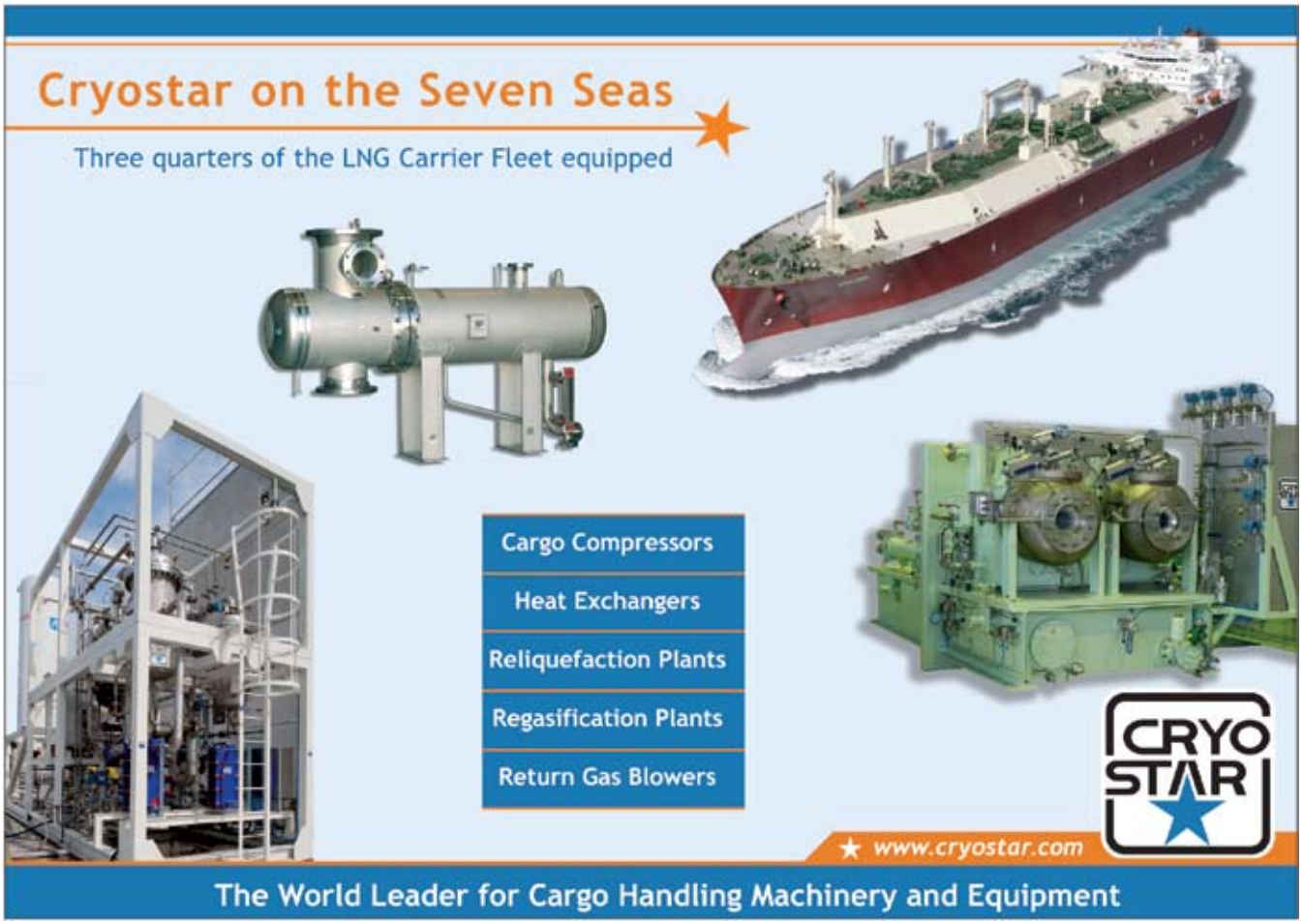
An LNG bunker tank on a Norwegian cross-fjord ferry

additional input is required from other IMO subcommittees. The Standards of Training and Watchkeeping (STW) Subcommittee has been asked whether the training requirements for gas and chemical tankers are suitable for officers and crew serving on ships fuelled by gas or low-flash point fuels or whether specific training is required.

The IMO Subcommittee on Stability and Load Lines and on Fishing Vessels Safety (SLF) has been requested to consider the proposal made by Germany on the distance from the ship side of bunker tanks while the Ship Design and Equipment (DE) Subcommittee has been asked to consider lifesaving appliances.

The IGF working group also discussed the installation of gas detectors in the inlets to accommodation and machinery spaces in order to cover situations involving an escape of gas, such as during bunkering operations. Although the majority of the group favoured this approach, a small minority objected on the grounds that the detectors were unreliable and false alarms would reduce crew confidence. During the BLG 16 plenary session SIGTTO pointed out that these allegedly unreliable detectors were also being used as the primary means of detection for the machinery space ESD shutdown.

The IGF correspondence group has been re-established to continue work on the draft IGF Code prior to the BLG 17 meeting next year. Copies of the draft are available from the SIGTTO Secretariat. Andy Alderson continues to represent SIGTTO on the correspondence group and is happy to be contacted should anyone have any questions.



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IGC CODE REVISION

IMO review on track

Good progress is being made with the IMO review of the draft revised International Gas Carrier (IGC) Code. After a busy week of ongoing update work the revised Code was approved by IMO's Bulk Liquids and Gases Subcommittee at its 16th Session (BLG 16) which was held in London from 30 January

The BLG 16 work on the draft IGC Code included editorial changes to align the text with other relevant international standards

to 3 February 2012. The draft IGC Code now moves onto the next stage, in which its provisions will be considered by other IMO subcommittees over the coming year.

The intention is then to collate the feedback from the reviews carried out by the various subcommittees for discussion at BLG 17 early in 2013. Any amendments agreed at the session will then be incorporated in a final draft of the IGC Code for consideration at the 91st session of the Maritime Safety Committee (MSC 91), BLG's parent body, which is scheduled for May 2013. SIGTTO is hoping that the text of the revised Code will be approved at MSC 91 to enable its entry into force in 2014.

There were serious concerns towards the end of the BLG 16 meeting that this anticipated revision timetable might slip. Because technical submissions from three administrations were not allowed to be considered by the IGC Code drafting group, it was thought that the Code and the submissions might be sent back to a correspondence group for consideration, thereby delaying the review process by a year.

In the event, however, a "concerned group of experts" managed to achieve a consensus on the comments contained in the three submissions. The amalgamated viewpoints were inserted in a paper which was presented at BLG 16's final plenary session. There it was agreed to insert the paper into the draft Code now being sent to other IMO subcommittees.

PUBLICATIONS

Loading arm disconnects

A member of the Society approached us last year with information on an incident during the disconnection of hard arms with a view to SIGTTO publishing some advice on such operations. When the Secretariat discussed the matter, it became clear that there were more incidents occurring than was commonly known and that there are notable differences in procedures worldwide.

In collaboration with the members SIGTTO has developed a new document entitled *"LNG Transfer Arms and Manifold Draining, Purging and Disconnection"*. The Society believes that the availability of this document will help to standardise procedures amongst the membership. Should you have any questions on the content, please contact the Secretariat.

SIGTTO was pleased to note that the preparation of the document generated a number of responses, some of which identified different disconnect procedures that are used. It was discovered that some ship manuals recommend closing drain and vent valves before disconnection. This procedure is not recommended.

SIGTTO has published new guidance on disconnecting loading arms

If there is some residual LNG or a valve leakage when such a procedure is used, it is possible that there may a pressure buildup in the space. This, in turn, could cause a rapid release of vapour or LNG droplets when disconnecting using quick connect/disconnect (QC/DC) arrangements. SIGTTO suggests that members review their ship operating manuals and procedures accordingly.

SIGTTO encourages all members to approach the Secretariat in a similar way to the member with the loading arm query should they wish attention to be drawn to a specific aspect of gas ship and terminal operations.

Seafarer survey

At its September 2011 meeting in Houston the SIGTTO General Purposes Committee (GPC) agreed to set up a Human Factors and Training working group under the chairmanship of Marc Hopkins. The first task of the working group was to develop a terms of reference for consideration by the GPC at its upcoming Doha meeting on 26 March.

The working group recognised that there are a significant number of publications dealing with human factors in the context of shipping operations and that they should focus on areas that would benefit the gas shipping industry. In order to help identify such areas Mark Charman offered to manage a survey of seafarers and shore staff. The working group then met and developed 21 questions; whilst these were phrased slightly differently for staff at sea and ashore, they asked comparable questions.

The survey was conducted through a website by means of an electronic questionnaire. As none of the documents asked for any identifying details, it is not possible to attribute any response to a company, ship or an individual. Members of the working group sent invitations to participate to those involved in vessel operations. As a number of the companies contacted also had other vessel types, it was decided to include these in order to determine whether there were significant differences between sectors of the shipping industry.

While experience of prior surveys suggested that less than 500 responses would be received, SIGTTO is pleased to report that over 1,500 responses were sent in, of which approximately one-third were from shore staff. Almost half the responses were from the LNG sector and over one-third from the oil tanker sector; responses from those involved principally in LPG operations was under 6 per cent.

For a number of questions there were notable differences between the responses from ship and shore staff. These are being investigated further and will form part of a presentation by Mark Charman at the upcoming SIGTTO Panel Meeting in Doha.

The working group has reviewed the results of the survey and prepared terms of reference for submission to the GPC in March 2012. Details of the survey results can be made available upon request.

Most seafarers find hands-on training and simulators offer the best route to skill enhancement

Quintet welcomed

Three companies have joined SIGTTO as full members since the last Newsletter was published, while another two have joined as associate members. The two associate members - SMIT-Lamnalco and Svitzer - are both tug companies. At the latest SIGTTO Board meeting it was agreed that associate membership could be extended to providers of specialist escort and harbour tug services at LNG terminals.

The listing of the five companies below shows their date of joining the Society. The SIGTTO membership now stands at 127 full members, 61 associate members and 20 non-contributory members.

Thenamaris Ships Management	1 Sep 2011
Svitzer	1 Jan 2012
SMIT-Lamnalco	1 Jan 2012
TMS Tankers	1 Jan 2012
Apache LNG	1 Feb 2012

Athens-based **Thenamaris Ships Management Inc** manages a fleet of 50 tankers and bulk carriers on behalf of its Greek principals. These principals have recently entered the LNG field by ordering three 160,000m^3 dual-fuel diesel electric-powered (DFDE) LNG carriers at Samsung Heavy Industries. The new ships will enter the Thenamaris-managed fleet upon delivery in 2013, 2014 and 2015, respectively.

Part of the of the AP Møller-Maersk Group, **Svitzer** provides towage services at 18 LNG terminals worldwide by means of a large fleet of custom-built tugs. The company's LNG terminal service portfolio includes pilotage, vessel escort in the approach channels, berthing and unberthing, line handling and safety capabilities such as firefighting and pollution prevention and control. Tug design and service solutions are tailored to meet the needs of the individual LNG terminal, with due consideration to LNG carrier size, tug bollard pull, ice classification, safety and environmental requirements. Crews are trained at existing LNG terminals and at Svitzer's simulator facilities in Denmark.

The amalgamation of the SMIT and Lamnalco terminal tug and anchor handling vessel operations in 2011, following an agreement between Royal Boskalis and Saudi Arabia's Rezayat Group, established a world class player in the oil and gas terminal services sector. The union was brought about when SMIT was purchased by Lamnalco, a 50/50 Boskalis/Rezayat operation. SMIT had been a fully owned subsidiary of Boskalis.

SMIT-Lamnalco operates over 50 terminal contracts, employs more than 2,000 staff on over 150 vessels and is active in more than 30 countries across five continents. The provision of escort tug services at a number of LNG terminals constitutes a major part of the new, combined company's operations.

SMIT-Lamnalco is amongst the inaugural SIGTTO associate members from the escort tug sector

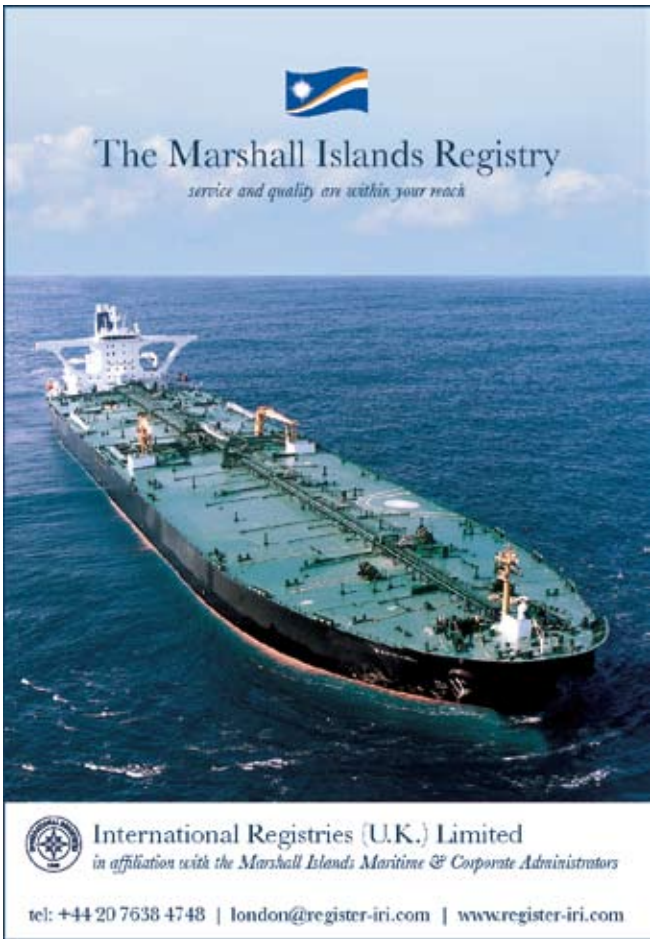
TMS Tankers Ltd of Athens undertakes the technical and commercial management of George Economou's tanker fleet. TMS Tankers is also responsible for supervising the construction of the fleet's newbuildings and amongst the current orderbook are four 160,000m^3 LNG carriers to be built at Daewoo Shipbuilding & Marine Engineering.

The quartet, contracted by Economou's Cardiff Marine in July 2011, represent the Greek shipowner's first foray into LNG ship construction. The vessels, which will be delivered over the 2013-14 period, will be powered by DFDE propulsion systems. A few months after ordering the four ships at Daewoo Cardiff Marine purchased the 2004-built, 145,000m^3 *Muscat LNG* from Oman Shipping. The vessel has been renamed *Fuji LNG*.

Apache LNG Pty Ltd is the Perth-based subsidiary of Apache Corporation, one of the world's leading independent oil and gas exploration and production companies. Involvement with the LNG sector commenced in September 2011 when Apache and its partners in the Wheatstone LNG project in Western Australia agreed to proceed with the scheme's development.

The two trains at the Wheatstone terminal will have a combined capacity of 8.9 million tonnes of LNG per annum (mta) and production is scheduled to commence in 2016. Apache will supply gas to Wheatstone from its Julimar and Brunello natural gas fields in the Carnarvon Basin. The Wheatstone partners have signed long-term LNG sales and purchase agreements with Tokyo Electric Power and Kyushu Electric Power in Japan.

Apache Corporation is also part of group seeking to develop Kitimat LNG, a 5 mta LNG export scheme in British Columbia, and for this project it is the operator.



REGIONAL PROFILE

Ras Laffan - service centre par excellence

The final piece of Qatar's massive LNG supply chain network fell into place with the opening of Nakilat's new Erhama Bin Jaber Al Jalahma Shipyard at Ras Laffan port in November 2010. The commissioning of the new facility, which coincided with the completion of the 14th and final LNG liquefaction train at Ras Laffan, has provided a service centre for the Nakilat fleet of 54 LNG carriers as well as a world-class ship repair complex.

Qatar's unprecedented investment in LNG facilities over the past decade is the driving force behind the country's phenomenal economic growth. Projects undertaken by Qatar Petroleum, RasGas, Qatargas, Nakilat and their joint venture partners have provided an LNG production capacity of 77 million tonnes per annum (mta) - equivalent to around 30 per cent of global supply in 2011- as well as the world's largest LNG fleet to ensure the safe and reliable delivery of the gas to customers worldwide.

Ras Laffan loaded a total of 1,000 LNG cargoes in 2011 and there are currently few LNG importing countries to which these Qatari shipments are not despatched. Qatar Petroleum also holds majority stakes in three new LNG import terminals in Europe and the US.

These record-breaking LNG activities helped push Qatari GDP to US$172 billion in 2011, a 35 per cent increase on the previous year. This equates to 2.5 per cent of global GDP and 12.5 per cent of GDP amongst Gulf Cooperation Council (GCC) countries. Qatari citizens are now the world's richest on a per capita basis.

N-KOM has established its credentials as a leading LNGC repair centre within a year

Named in honour of a Qatari tribal leader who lived a century ago, the Erhama Bin Jaber Al Jalahma Shipyard occupies an area of 110 hectares and is situated 8km offshore, along the new southern breakwater of Ras Laffan's expanded port. Centrepiece of the yard is the repair facility operated by a new joint venture company that Nakilat has established with Keppel Offshore and Marine.

Nakilat-Keppel Offshore and Marine (N-KOM) is responsible for the repair and conversion of large ships, including LNG carriers and very large crude carriers (VLCCs), as well as the repair of medium-sized ships of 20,000-80,000 dwt. Other activities that are being brought onstream in stages at the Erhama Bin Jaber Al Jalahma Shipyard are the fabrication and maintenance of offshore structures; the construction of high-value small ships of up to 120 metres in length; the repair of small ships of up to 20,000 dwt; and the production of fibreglass-reinforced plastics (FRP) commercial and leisure boats.

N-KOM has available a range of modern facilities, including a 400m x 80m drydock, a 360m x 66m drydock, a 230m x 38m floating dock and a dedicated cryogenic workshop. The company's operations, which are managed by Keppel, got off to a brisk start in 2011. A total of 20 LNG carriers were repaired between the arrival of the first such ship, the 145,000m^3, RasGas-chartered *Simaisma,* on 29 March and the end of the year. Over that nine-month period no repair yard in the world was busier servicing LNG carriers than N-KOM.

The N-KOM facilities have been designed to handle a large volume of ships. It is envisaged that once traffic has built up to plateau levels, Nakilat's fleet of 25 fully owned and 29 partly owned LNG carriers will take up just one-quarter of the yard's repair and maintenance capacity at any one time, leaving 75 per cent free for other vessels to be serviced on a commercial basis.

Nakilat is a joint stock Qatari shipowning company 50 per cent owned by its founding shareholders and 50 per cent by public shareholders. Its LNG fleet comprises nine conventional vessels of 146,000-154,000m^3, 31 Q-flex ships of 210,000-216,000m^3 and 14 Q-max vessels of 263,000–266,000m^3 in capacity. Nakilat's 25 fully owned LNG carriers - all the Q-max ships and 11 Q-flex vessels - are managed by Shell International Trading and Shipping (Stasco). The 29 partly owned LNG carriers are managed by various of the ship operators with ownership stakes in the vessels.

The location of the N-KOM repair facility adjacent to the gas carrier and oil tanker loading berths at Ras Laffan Industrial City puts it in an ideal position to handle the port's growing traffic volumes. The output of 77 mta of LNG generates large amounts of byproducts such as LPG, condensate and sulphur while the commissioning of the Pearl gas-to-liquids plant in summer 2011 is opening a new export flow of high-specification refined petroleum products. A number of dedicated berths have also been provided for the growing number of offshore support vessels and workboats based at the port.

By 2020 some 4,000 ships are expected to be calling at Ras Laffan port each year. At that date the US$2.8 billion Erhama Bin Jaber Al Jalahma Shipyard is set to be operating at full capacity and employing more than 10,000 workers.

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