

MESSAGE FROM GENERAL MANAGER

Looking back with fond memories

As his tenure as SIGTTO General Manager comes to a close, Bill Wayne looks back at the highlights and forward to the industry's prospects and challenges

As this is the last 'Message from the General Manager' that I will pen, I will take a few moments to look back over the last five and one-half years that I have been in post. What have been the highlights?

One highlight has to be the effort to revise the International Gas Carrier (IGC) Code co-ordinated by SIGTTO. It

the "International Code of Safety for Ships using Gases or other low Flashpoint Fuels", has increased. While it is likely that the majority of the IGF Code users will be running their ships on LNG, the Code is being developed to cater for the possible use of other low flashpoint fuels.

In fact the issues we need to consider

e.g. the EU Fuels Directive, and at IMO, e.g. the resolution implementing the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP) initiatives.

The objective for SIGTTO in both arenas has been to ensure that poorly prepared regulations do not adversely impact the LNG and LPG shipping sectors. Whilst there has been progress, it has been slow and somewhat frustrating at times, and there is still much to do. It is in this area of guiding the development of new regulations that SIGTTO's engagement can potentially have its biggest impact.

I have, at times, encountered suspicion from authorities and government delegations concerning our motives in this. Is SIGTTO pleading a special case to distort regulation in favour of its members?

I have always stressed that what we are seeking is the absence of distortion and the malign effects stemming from unintended consequences of ill-thought-through legislation. We need to be very careful with our approach to ensure that we do not become regarded

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Qatari VVIPs with SIGTTO officials at the Doha Panel meeting

entailed managing the input from a range of experts from both within the membership and amongst the wider gas shipping and storage industry. The commitment by all was exemplary. The revised document was returned to IMO and we are still actively supporting the document through the IMO procedures. The target for entry into force of the revised Code is 2014.

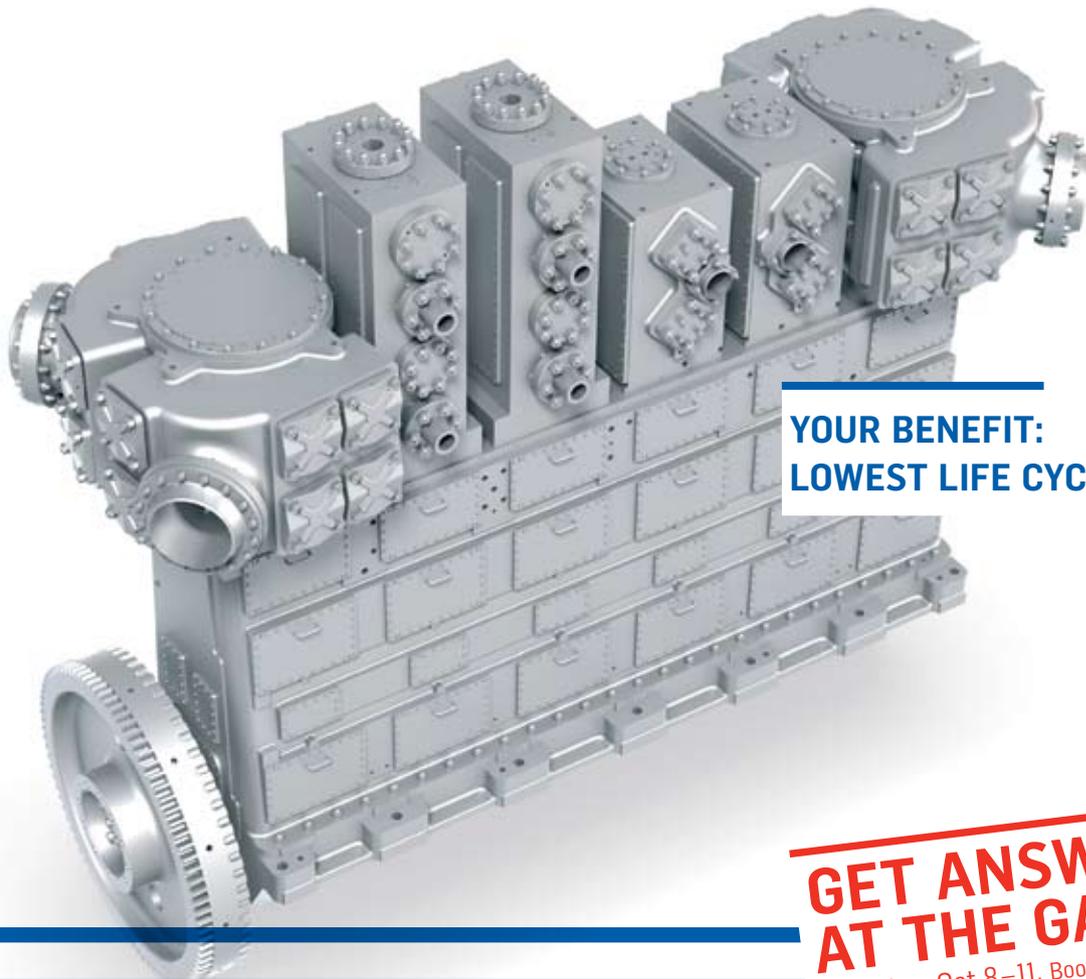
As the workload on the IGC Code has eased off, that addressing the issues associated with the development of the new IGF Code, or, to give it its full title,

are much broader than those relating to the IGF Code, which only covers the design of ships running on gas or similar fuels. These wider issues consider a range of operational aspects such as the training of those involved in bunkering operations and the provision of suitable bunkering infrastructure. This whole subject will keep my successor busy for a while!

There has been a steady effort over the years on technical matters relating to the introduction of environmental regulations, both at the European level,

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as simply an industry lobby group. Such a perception would have negative connotations around the impartiality of our message. Should this happen, the ability of SIGTTO to influence the regulatory process will be adversely affected.

We have produced a steady stream of publications over the past five years, comprising some re-works and updates of earlier publications and a number of completely new ones.

In many ways, the production of publications is one of the more visible aspects of what we do. Every publication comes about from a suggestion or request from members. We have now established quite a library of publications and one of the ongoing challenges is to ensure that they all remain relevant and up to date.

Progress in all the foregoing areas is only achievable with active support and commitment from members, for which I remain very grateful.

The one issue that I cannot look back on with any sense of satisfaction is that surrounding piracy off the coast of Somalia. Having said that, it is good to note that the piracy success rate has dropped dramatically this year and there are a number of possible reasons for this. They include worse weather, better tactics by the military and better adherence to best management practices (BMP). In addition, though I regret to say it, the employment of private armed guards on high-risk vessels has played a part. Nevertheless, the gains achieved against the piracy threat this year could be easily reversed if we lower our guard.

As has been commented before, the permanent solution to Somali piracy will not be found at sea but, rather, in the re-establishment of the rule of law in the country itself.

While recent experience has shown that we are gaining some measure of control over the Somalia problem, security challenges in other parts of the world seem to be on the increase. My definition of success with these issues will be when the last private maritime security company (PMSC) goes out of business because seafarers are content to sail anywhere in the world without the protection of armed guards. I fear I may have to wait a while for this.

While the foregoing paragraphs look back over my time here, the next ones look forward. I'd like to point out that the comments below represent my personal view rather than any formal SIGTTO position.

Any look into the future entails uncertainty, particularly when a single, unforeseen event can significantly impact the market. The tragic aftermath of the Japanese tsunami in March 2011 provides an unfortunate example of the scale of the impact stemming from such a random occurrence.

However, in general I am optimistic about the future of natural gas as an energy source, and hence of LNG. Indeed,

the aforementioned tsunami may have a longer-term positive impact on the use of natural gas since any serious incident affecting the nuclear power sector tends to result in the increased use of gas in thermal power stations.

Notwithstanding the foregoing, it seems to me that if society, in the broad sense of the word, wishes to move to a lower carbon footprint future, then we will have to accept the fact that nuclear energy will have an essential part to play in any future energy mix.

An underlying assumption is that no society will willingly follow a course of action which seriously diminishes its standard of living. There is, based on current technical knowledge, no feasible alternative to nuclear that provides the sought-after reductions in emissions of harmful atmospheric pollutants.

Could there be another alternative to nuclear in this respect? It is not impossible. If we were having this discussion 100 years ago, we could not have imagined the concept of a nuclear power station. However, based on current knowledge, no alternative which is technically feasible and practical in an economic sense is readily apparent.

In this view of the energy future nuclear will provide the baseload power supply. Renewables will contribute a larger share of the energy mix than today, but I have difficulty in seeing the contribution exceeding more than about 20 per cent in any foreseeable energy scenario.

The role for gas will be as the 'filler' between the baseload and the contribution to the energy mix that renewables are able to make. The underlying assumption is that gas replaces coal. The only way that the widespread use of coal could have a role in the increasingly environment-conscious world of today is if carbon capture and storage (CCS) is developed to provide an economic alternative to the modern combined cycle gas turbine power plant. Again, based on current knowledge, I believe it will be difficult to achieve these CCS breakthroughs anytime soon.

I find it rather curious to note that, in society's assessment of risk, nuclear power generation causes much greater concern than any possible consequences of global warming. This is despite the fact that the effects of global warming are largely unknowable and unquantifiable while there have been no fatalities to nuclear workers or members of the public as a result of exposure to radiation due to a commercial nuclear reactor incident since Chernobyl in 1986.

For the record the Chernobyl accident resulted in 56 direct fatalities although a 2005 study postulated that there may be up to 4,000 further related early deaths from cancer. Putting these figures into context, the US has recorded more than 33,000 road accident fatalities and over 12,000 gun-related

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There was a good turnout of the gas shipping and terminal industry at the Doha Panel meeting in March

Alongside all the way



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homicide fatalities annually in recent years while Chinese coal mining industry fatalities have been topping the 3,000 mark each year. Nuclear reactor designs of the Chernobyl type are no longer permitted.

Aside from the buoyant prospects for the use of gas generally, there is a significant potential demand for the use of LNG as a transport fuel in both the marine and large vehicle sectors. It is difficult to quantify the scale of that demand at this stage but it is worth noting that the current consumption of marine fuel oil worldwide is larger than the world trade in LNG. Any swing from traditional oil fuels will have a proportionally larger impact on the LNG market.

Whilst on this subject, people have said to me that the one thing which could stop the development of LNG as a marine fuel in its tracks is a serious accident, particularly if it involved members of the general public. This is a serious point and the only way the industry can progress is to ensure that safety standards in this nascent sector are at least equivalent to those established over many years in the large-scale shipment of LNG.



The SIGTTO Board at its May Kuala Lumpur meeting

Turning to the Society's activities over the last few months, we had very successful General Purposes Committee (GPC) and Panel meetings in Doha in March, kindly hosted by Qatargas and RasGas. We had 200 registered attendees for the Panel and after the meeting we paid a technical visit to the Nakilat-Keppel Offshore and Marine (N-KOM) ship repair yard in Ras Laffan. Those of us who have drydocked ships in yards around the world, many of which have long histories, could not fail to be impressed by this impressive, brand new, purpose-built repair facility!

On the staff front, as you all will be aware, my successor will be Andrew Clifton and he will formally take over at the Annual General Meeting (AGM) on 20 November in Bermuda. Andrew should be known to many of you as he was a Technical Adviser in the SIGTTO Secretariat from April 2004 to December 2005. He has spent the last six years in Indonesia as shipping manager for the Tangguh LNG project, a very exciting and demanding position covering the full project start-up phase. His seagoing career was dominated by service in LPG ships.

We have also been faced with an unplanned change of Technical Adviser this summer. Owing to a major reorganisation within his employing company, we have unfortunately lost the services of Craig Jackson. Since he joined us in December 2011, Craig has done some really good work for SIGTTO, particularly in guiding various working groups and Regional Forums. We would like to record our thanks to him for the work he has done for the membership during his time here. The process of identifying a replacement is in hand and we should be able to announce the result shortly.

As this is my last 'message', I would also like to record my thanks to the Secretariat staff and to all the SIGTTO

membership. I feel enormously privileged to have had the opportunity to serve the LNG and LPG sector over the last few years. Any success can only really be attributed to the full support I have had from you all. I wish you all well and trust that your business endeavours will be safe and successful.

GENERAL MANAGER

Captain Andrew Clifton

Bill Wayne announced his intention to step down from the role of SIGTTO General Manager and Chief Operating Officer at the autumn 2011 Board of Directors and Annual General Meeting (AGM). His stated desire of bringing his five and one-half year tenure to a close in autumn 2012 allowed plenty of time for a successor to be found and a formal process to identify a suitable replacement was initiated with



Andrew Clifton - the new SIGTTO General Manager

the help of a specialist firm of 'head-hunters'.

The process produced a shortlist of candidates for interview by a panel consisting of the General Manager, SIGTTO President Steffen Jacobsen and Vice-President Luc Gillet. The recommendation, ratified at the subsequent board meeting, was to appoint Captain Andrew Clifton to the position.

Andrew brings a wealth of experience to the role, not least over 30 years in the liquefied gas shipping industry. This involvement includes 19 years at sea,

mainly on liquefied gas carriers, a first class honours degree in shipping operations and shore managerial experience over the last 12 years. The latter includes three years working at the UK's Marine Accident Investigation Bureau (MAIB), almost two years in the SIGTTO Secretariat as a Technical Adviser and, most recently, over five years in Indonesia as LNG shipping operations manager for the BP Tangguh LNG project.

In this most recent posting Andrew was responsible for the project's shipping activities and overseeing their development, from the early construction days at Tangguh through to the commissioning and entry into service of the marine facilities and the ships built to serve the project.

Andrew is also the current SIGTTO Panel chairman and has held this role since October 2008.

The Secretariat staff look forward to welcoming Andrew to the office in St Helen's Place and hope that all members of SIGTTO join us in wishing Andrew every success in the role.

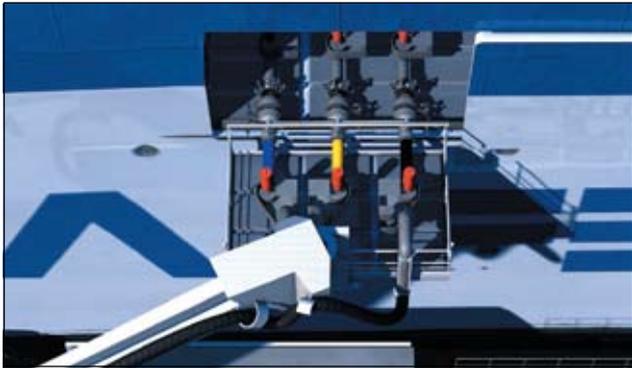
UPCOMING MEETINGS

2012	Date	Location
66th General Purposes Committee	11 Oct	London
Asia Pacific Regional Forum	7 Nov	Shanghai
Board and AGM	20 Nov	Bermuda
2013		
67th General Purposes Committee	15 Apr	Houston (tentative)

LNG bunkering safety group established

The inaugural meeting of the Natural Gas Marine Fuel Safety Advisory Group was held in London on 10 July 2012. The cross-industry group has been established by the liquefied gas shipping industry to advise on the design, operation, maintenance and training for natural gas marine fuel systems. SIGTTO organised the July meeting and is playing a central role in co-ordinating the work of this industry initiative.

The terms of reference of the new group cover the full LNG bunkering logistics spectrum, from bulk storage, bunker



Courtesy TGE Marine Gas Engineering

SIGTTO and the new Advisory Group are working to make the gas shipping industry's experience and expertise available to the expanding LNG bunkering sector

vessel design and operations and LNG transfer arrangements to shipboard gas containment and handling systems. All the LNG supply chain stakeholders are encompassed in the group's membership, from shipowners, gas companies, terminal operators and engine manufacturers to class societies, naval architects, research establishments, training organisations and regulatory agencies.

The use of LNG as marine fuel, as one of the three principal alternatives available to shipowners for complying with the increasingly strict IMO requirements governing ship emissions, is not only opening up a major new energy market but also introducing technological challenges for the shipping industry. LNG bunkering will bring a range of ship and port operators into contact with a fuel that requires careful handling.

Gas carrier and terminal operators have built up an exemplary safety record over the past 50 years and it is this achievement that provides the industry with its license to operate. The safety record is underpinned by an impressive safety regime which the gas industry has developed to minimise the risks associated with the handling of, in the case of LNG, a cryogenic liquid at -162 C and its flammable vapours.

The establishment of the Natural Gas Marine Fuel Safety Advisory Group reflects the gas shipping industry's desire to pass on the body of knowledge it has accumulated to a rapidly emerging LNG bunkering community to ensure a continuation of the excellent safety record.

Although there are currently only a handful of LNG-powered vessels that are not LNG carriers in service, the orderbook is growing and LNG bunkering operations are poised to blossom. On the one hand energy majors, national governments and regional administrations are stepping in to provide and support the development of the necessary LNG logistics infrastructure. On the other, new small-scale LNG terminals, coastal LNG carriers and the first dedicated LNG bunkering vessels are being built to ensure the safe delivery of the fuel to ships' LNG bunker tanks.

Going forward, the Natural Gas Marine Fuel Safety Advisory

Group will examine current proposals, operational procedures and training practices in projects proposing the use of LNG as a bunker fuel. The very earliest work will include identification of not only the relevant stakeholders in the LNG bunkering supply chain but also any gaps that may exist in the current body of rules, regulations, guidelines and standards governing training, operations, design and project development.

From this work the members can then develop a position and offer advice where appropriate, referencing current codes, standards and industry guidelines wherever possible. If serious concerns not believed to be adequately addressed are identified, the Advisory Group will lobby flag states and other relevant bodies to draw attention to the problem and offer possible solutions. This process may include the preparation of submissions to IMO.

Amongst the Advisory Group's terms of reference is the provision of guidance and assistance to SIGTTO that, in turn, enables the Society to establish sound and practical policies which aid the development of natural gas as marine fuel. A press release on the establishment of the Natural Gas Marine Fuel Safety Advisory Group was issued to the international maritime and energy press on 23 July 2012.

SAFETY

Ensuring lessons stay learnt

There are two schools of thought on the way man makes his way through history. The two contrasting views are equally applicable to how we perceive safety.

The optimists believe that man's progress is linear, that we are all moving onward and upward towards a goal and utilising advances in modern technology to smooth the way.

The pessimists take a dimmer view, pointing out that our path is more cyclical in nature rather than one of steady advances. Over time a laissez-faire attitude will inevitably creep in while new gadgets save us from having to think as much as in the past and make us lazy. In this scenario we are condemned to repeat our past mistakes.

The argument is relevant in the gas shipping and storage industry at the moment as trade levels surge, the labour pool swells and the gas delivery infrastructure worldwide mushrooms. Coping with extremely rapid technological advances in the workplace and an LNG bunkering network that is poised to blossom adds further dimensions to the debate, as does the worrying increase in minor accidents and near misses that has taken place in tanker shipping in general in recent years.

One man who has always taken a level-headed view of industrial safety, indeed made a distinguished career out of advising on safety issues, is the chemical engineer Trevor Kletz. Writing in *The Chemical Engineer* publication as long ago as June 1987, Professor Kletz stressed the importance of basing designs on our experience of people's actual behaviour, not on how we think they ought to behave.

Equally as important, most so-called human error accidents are not due to a lack of responsibility but, rather, a moment's forgetfulness, the lack of training or instruction or simply an inability to handle the assigned task. Even when someone deliberately decides to ignore the rules, it may be because the rules are difficult to follow or had been broken before but no-one had said anything.

The modern drive towards error-proof technologies and solutions needs to take these human fallibilities into account. Professor Kletz concluded his observations with a timeless home truth - we, as professionals setting and implementing the standards, need to accept people as we find them and go from there.

FIRE SAFETY TRAINING

Managing the LNG fire hazard

Resource Protection International (RPI), part of the Falck Group, is following up its pilot Spanish fire hazard management workshop, which was held on 26-27 September, with two similar programmes in the first half of 2013. Next year's events are scheduled for 12-13 March and 22-23 May and, like the pilot, they will take place at the Centro Jovellanos training establishment near Gijon in northern Spain.

Working with RPI, Jovellanos has developed a purpose-built demonstration facility for use with LNG. As reflected in the workshop's title - LNG Hazard Awareness and Fire Hazard Management, with Practical LNG Demonstrations - hands-on LNG firefighting exercises form an integral part of the programme.

RPI has configured the workshop, the hours of which will count on the Institution of Fire Engineers' continuous development programme, to make those responsible for risk analysis, hazard identification, design or the implementation of incident mitigation systems or incident response at LNG facilities fully aware of the special hazards posed by this fuel. Attendees will have the opportunity to experience first hand the special characteristics and behaviour of LNG in the practical demonstrations.

Niall Ramsden of RPI will be the lead course instructor at the upcoming events. Niall has over three decades of experience in all aspects of fire hazard management for the oil and petrochemical industries and has had a close working relationship with SIGTTO for many years. He was a key contributor in the writing of the Society's "Liquefied Gas Fire Hazard Management" book and more recently has assisted SIGTTO and Videotel in the compilation of the updated



Centro Jovellanos will be demonstrating the latest industry best practice at its new, purpose-built LNG training facility

"Liquefied Gas Fire Hazard Management" training video.

RPI has been responsible for the development of much of the current industry best practice guidance in LNG hazard awareness and has extensive experience in the field of LNG fire hazard management.

HUMAN FACTORS

The human element

Following the establishment of the Human Factors working group in 2011, that body's terms of reference were approved by the SIGTTO General Purposes Committee (GPC) in March 2012.

One of the first tasks of the new group was to ascertain how certifying bodies approve training courses as meeting the SIGTTO Competency Standards developed by the Society in 2004. This exercise found that there was little commonality and the findings will enable the development of a standard guidance document for all approving bodies.

It is likely that the guidance to class societies will include the requirement for Competence Assessment on receipt of training to ensure that it has been effective. A first draft of this document has been prepared and is now under review by the working group.



The Human Factors working group is set to look more closely at the training needs of shore-based staff

Additionally, in support of the working group a questionnaire on training and its effectiveness was distributed to over 4,500 personnel both at sea and ashore. Over 1,500 responses were received, of which almost one-half were from the LNG sector, over one-third from those involved with oil tankers and the balance from chemical and LPG carrier operations.

The survey results provided several surprising findings. They reinforced the fact that training is not meeting the needs of key personnel both afloat and ashore. As a result the scope of work for the working group has been expanded to include addressing training for shore-based personnel as well as the original competency standards that only addressed the training of seagoing staff.

The working group has also identified that while there is a strong emphasis on minor injuries (slips, trips and falls), on some occasions the risk of a major incident is very high but not recognised. Examples of this will be drawn upon and reading material identified to learn from such potentially major incidents and encourage discussion on them to ensure persons involved in the LNG and LPG transportation are more aware of the bigger picture.

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RISK ANALYSIS

Safe passage through an enlarged Panama Canal

The enlargement of the Panama Canal, scheduled for completion in 2014, will enable the passage of all sizes of LNG carriers with the exception of the 216,000m³ Q-flex and 266,000m³ Q-max ships. SIGTTO understands that the acceptability of the Q-flex ships, which are just on the limit size-wise, may be reviewed in the future.



Construction work on one of the new Panama Canal locks

As part of preparations for the launch of the new era in the waterway's history, earlier this year the Panama Canal Authority (ACP) invited SIGTTO to participate in an assessment of the risks associated with the passage of LNG carriers through the new waterway.

The review team used a matrix in which risk levels were rated as low, moderate, high or extreme. The highest risk identified in the assessment was moderate and the group was not able to identify any scenarios with a risk level of high or extreme.

The analysis of the collision risk at anchorage or approaching the new locks showed that there is only minimal differences with anchorages elsewhere in the world and that the Canal posed no specific additional risk. Pilots are onboard during the approach to the locks and will coordinate vessel movements with the control centre.

As regards collision (collision) with locks, the risks were found to be no greater than those associated with lock

transits anywhere else. No locomotives will be used but, rather, tugs will accompany and be made fast to transiting vessels. Pilots and tug operators will be trained in simulators prior to vessels using the new locks. The current intention is to gain experience on increasing vessel size before permitting passage to the maximum size ships. It was pointed out that existing vessels may not have sufficient mooring lines and securing points.

Passing with other vessels will only be permitted in the lake in the central isthmus and the current intention is to permit passing on wide bends. The study group recommended that consideration be given to either the scheduling of LNG carrier transits to avoid meeting at bends or the use of escort tugs at such locations. It also advised that simulations be conducted to identify limiting weather criteria for Canal transits and any requirements for additional tugs.

ACP has studied a number of scheduling options to make best use of the new locks and revised channels. One such is to operate a convoy system; this has the benefit of removing the risk posed by passing ships.

Future charter parties are likely to require Panama Canal compatibility. It is recommended that shipowners consider making any adjustments needed to ensure compliance with the Canal's published vessel requirements during a suitable maintenance period.



While locomotives are employed for transits through the existing waterway, they will not be used with the new locks

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An unexpected change

Due to extenuating circumstances it has been necessary to replace Craig Jackson, one of our Technical Advisors, earlier than anticipated. Craig explains:

“As a result of a re-organisation in my parent company, my time with SIGTTO has unfortunately been drawn to an premature end. I have thoroughly enjoyed my time with the Secretariat. It has been a particularly exciting time to be at the centre of the gas shipping and terminal industry and this period of dynamic developments in our industry looks set to continue for the some time to come.



Craig Jackson

“I would like to extend my personal thanks to all of you within the SIGTTO membership for your support, advice and friendship during my time with the Society. In many instances it is not what I or my colleagues at St Helen’s Place know that allows us to function successfully but, rather, the ability to call upon the combined knowledge of the membership. Whilst my immediate future is unclear, I hope to remain in the industry and look forward to meeting you again.”

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The LNG STS transfer ends in a photofinish: SIGTTO was pleasantly surprised when Ed Carr, managing director of BGT and a SIGTTO board member, arranged to make a presentation at our offices of a framed print of one of his ships, *LNG Taurus*, carrying out a ship-to-ship (STS) transfer operation in Japan. The print, which was formally handed over by Ed to SIGTTO General Manager Bill Wayne, is one in a numbered series. Ed was accompanied to our offices by Robert Lloyd, the highly regarded marine artist responsible for the print. Lloyd’s work has been described by many in the shipping industry as “the most technically accurate and visually stunning of recent times”. After some experimentation a suitable position was found for *LNG Taurus* in the boardroom where it now highlights an LNG logistics operation which is set to blossom in the years ahead.

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NEW MEMBERS

Trio welcomed

Three companies have joined SIGTTO as full members since the last Newsletter was published. The listing of the three new members below shows their date of joining the Society. The SIGTTO membership now stands at 130 full members, 61 associate members and 20 non-contributory members.

Anadarko Petroleum Corp	1 April	2012
Vitol Services Ltd	1 May	2012
B-Gas Ltd	1 Jul	2012

Based in Woodlands, Texas, **Anadarko Petroleum Corp** is among the largest independent oil and gas exploration and production companies in the world. Discoveries of gas by Anadarko off the coast of Mozambique in recent years have yielded estimated recoverable reserves in the 17-30 trillion cubic feet (tcf) range and the company is leading an initiative to develop this resource by means of an LNG export project.

Anadarko and its partners are currently designing an onshore liquefaction complex with two trains, each with the capacity to process 5 million tonnes per annum of LNG. The facility would be expandable to six trains if required. The company is targeting a final investment decision in 2013 and the first LNG deliveries in 2018. The terminal is likely to represent the largest foreign investment ever made in Mozambique over the life of the project.

Established in Rotterdam in 1966, the **Vitol Group** is now the world's largest independent energy trader. As two of the fastest-growing energy sectors, LNG and LPG represent an increasingly important part of the trading portfolio. Vitol delivered over 2 million tonnes of LNG in 2011, making it the largest independent trader of this product. Customers are supplied on both a long-term and spot basis.



Vitol has the largest fleet of chartered, fully pressurised LPG carriers

Underpinning the group's LPG trading activities is a fleet of 35 LPG carriers built to Vitol's specifications, primarily within the last 10 years. The trader is active in both the refrigerated, long-haul arbitrage business as well as regional deliveries of pressurised LPG. The Vitol fleet includes the world's largest fully pressurised LPG carriers. Vitol Services Ltd is a UK company within the global group.

B-Gas Ltd is the new owner of nine semi-pressurised/fully

refrigerated (semi-ref) LPG carriers acquired from Camillo Eitzen in 2011. The B-Gas fleet also includes five time-chartered, fully pressurised LPG carriers that formerly sailed in the Eitzen fleet. Bergshav Management AS is the principal shareholder in the newly established B-Gas company with a 51 per cent stake. The balance is controlled by two Norwegian investors. The fleet is active in the European LPG and petrochemical gas trades.

PUBLICATIONS

Rollover in LNG carrier cargo tanks

It is generally regarded that the 'rollover' phenomenon is extremely unlikely to occur in the cargo tanks of LNG ships. The conditions which form a necessary precursor for rollover are very specific and cannot occur in normal operations. Nevertheless, rollover has occurred on occasions in LNG ships (see SIGTTO News issue No 22, the Autumn 2009 edition).

As a result of the possibility of an LNGC cargo tank rollover occurrence, however remote, it was thought appropriate to revisit the subject. The fact that earlier advice on the subject issued by SIGTTO had been withdrawn added impetus to the need for action.

Following an initial a document search carried out by the Secretariat to review available information, a new guide was written and reviewed by one of the leading experts in the field. This document has now been approved by the SIGTTO General Purposes Committee (GPC) and Board of Directors for publication as a free guide. Entitled "*Prevention of Rollover in LNG Ships*", it is now available from our website.

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REGIONAL PROFILE

Sub-Sahara LNG and LPG

The gas industry in Sub-Saharan Africa is entering a new development phase. The region's handful of LNG export terminals is set to be augmented by the first import facilities while an initial East African LNG production project is now taking shape. In the LPG sector local distribution networks are being extended to ensure the improved utilisation of a valuable fuel that in the past has too often been flared as an unwanted byproduct.

The current startup of the Angola LNG export project is the most immediate news in Sub-Saharan Africa. The 5.2 million tonnes per annum (mta) plant, built at Soyo in northern Angola, is only the region's third such facility. The other LNG export terminals, at Bonny Island in Nigeria and Bioko Island in Equatorial Guinea, commenced operations in 1999 and 2007, respectively.

As the Soyo plant builds towards full delivery levels over the next few years,

Equatorial Guinea could be constructing a second liquefaction train at its Bioko Island terminal. Preliminary agreement on the construction of a 4.4 mta train has been reached and, as a result of recent discoveries, sufficient gas to justify the Train 2 project has been verified. Equatorial Guinea is targeting a 2017 startup for the second train.

Nigeria LNG is also investigating an expansion of its facilities at Bonny Island. The six-train complex has the capacity to produce 22 mta of LNG but the company has tabled a proposal for a



Equatorial Guinea LNG is considering the construction of a second train

large, seventh train that would raise production potential to the 30 mta level. A second Nigerian LNG export project, the 10 mta Brass LNG scheme, is also under study.

Notwithstanding the LNG developments in West Africa, it is the discovery of large deposits of gas off the coast of East Africa, primarily Mozambique but also Tanzania, that is attracting gas-hungry nations anxious to line up new, future sources of supply. An estimated 100 trillion cubic feet (tcf) of gas has been found off the coasts of the two countries over the past two years, theoretically enough to supply 16 LNG trains.

If this gas is to be brought to market in the form of LNG by the end of this decade, a number of technical and commercial challenges will have to be addressed. Nevertheless, as the Anadarko report in the New Members article on page 11 highlights, that company is pressing ahead with the development of a project that could make up to 30 mta of LNG available to the global market.

Not all African nations are blessed with the gas resources of the countries mentioned. Some, nevertheless, are keen to utilise clean-burning gas as fuel and are investigating LNG imports as a

way of achieving this goal. In recent months Kenya's energy ministry outlined plans for a 450MW gas-fired power plant to be built adjacent to and supplied by a proposed LNG import terminal in Mombasa. The government is looking for an investor to finance the LNG complex on a build/own/transfer (BOT) basis under a 30-year concession. The aim is to commission the facilities by 2015.

South Africa relies on coal for 90 per cent of its electricity generation. As part of a drive to diversify its energy sources

and reduce emissions of harmful pollutants, the country is exploring for gas off its coastline and is hoping to emulate the success achieved by neighbouring Mozambique. The priority in South Africa is developing gas for domestic use rather than export. Weaning the country of cheap coal will not be easy but there is a call for the development of LNG import terminal infrastructure as a contingency in case

the search for offshore gas is unsuccessful.

Both Kenya and South Africa are also seeking to develop LPG import facilities. Kenya's limited LPG production and distribution infrastructure is struggling to cope with the supply of the fuel to urban and commercial centres in the quantities needed. LPG demand has doubled in the past five years and is now approaching the 100,000 tonnes per annum mark.

To tackle the problem Kenya Pipeline Company (KPC) plans to commence construction of 8,700 tonnes of new pressurised LPG storage capacity early next year. Most of the capacity would be centred in Mombasa and Nairobi; the import terminal scheduled for Mombasa will have 6,000 tonnes of tankage and the distribution centre in Nairobi 2,000 tonnes.

In South Africa Sunrise Energy has been awarded preferred bidder status for the construction and operation of an LPG import terminal at Saldanha Port in the Western Cape. The plan is to have the open access facility onstream by the end of 2014 and to handle up to 17,000 tonnes per month (tpm) of LPG in the first phase of operations, expandable to 52,000 tpm at a later date if required.

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