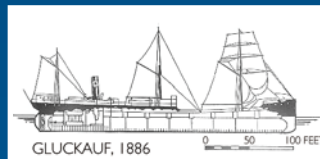


IMARREST Guide to: Tanker classification

in association with

Lloyd's
Register

The 1880s witnessed the beginnings of what was to become, arguably, the most important ship type of all in terms of global industrial development: the oil tanker.



Gluckauf is generally considered to be the first tanker of modern design, where the liquid cargo was contained directly in the hull

As early as the 1870s, three passenger/oil steamers had been built to Lloyd's Register class – *Vaderland* (2,748 grt), *Nederland* (2,839 grt) and *Switzerland* (2,816 grt) – with tank arrangements comparable to those of later more sophisticated tankships. These ships were designed to carry both passengers and oil in bulk (rather than in barrels), but the authorities thought this too dangerous and hence these vessels were only permitted to carry general cargo. However, oil had become an important commodity, and in 1886, the 1,669 grt *Bakuin*, classed with Lloyd's Register as 100A1 'Carrying Petroleum in Bulk', was one of the first tankers built with tanks completely extending to the side shell. The *Gluckauf*, which was launched one week earlier, is generally accepted to be the first tanker of modern design, where the liquid cargo is contained directly in the hull. Purpose-built tankers had arrived and would steadily increase in number over the next 20 years.

THE INTRODUCTION OF LONGITUDINAL FRAMING

Radical changes in construction came in 1906 when Joseph Isherwood, a naval architect who was employed by Lloyd's Register between 1896 and 1907, invented the Isherwood System of Longitudinal Framing. In 1908, *Paul Paix* (4,196 grt) was the first ship to be built to this design and to be classed by Lloyd's Register with the notation "Longitudinal Framing". The following year, Lloyd's Register accorded full recognition to the advent of the tanker by publishing separate *Rules for the Construction of Vessels Intended for the Carriage of Petroleum in Bulk*.

THE ERA OF GROWTH

From the 1950s, tanker size increased substantially as the world demand for oil escalated. The previous 'standard' tanker of 12,000 dwt was superseded, initially by a class of 16,000 to 18,000 dwt vessels, and in 1954 the launch of the Lloyd's Register-classed *Tina Onassis*, 45,230 dwt, continued the rapid growth in ship size. By the end of the 1950s the 100,000 dwt mark had been surpassed. This continued in the 1960s with the arrival of the supertanker. These vast vessels were first developed for the Middle East to Japan route, which placed no physical limitation on size, in comparison to routes to Europe using the Suez Canal. Following the closure of the canal in 1967 for six years, tankers bound for Europe had to round the Cape of Good Hope, so the restrictions imposed by the dimensions of the Suez Canal ('Suezmax') no longer applied. Then in 1973, war in the Middle East, followed by the quadrupling of oil prices by the OPEC countries, brought economic growth to a standstill and new orders of tankers dried up. However, while the supertanker building boom lasted, hundreds of these ships were built to Lloyd's Register class. This was a stimulating period for the industry, and in just a few years tankers grew from 200,000 dwt to 300,000 dwt to 400,000 dwt and finally to over 500,000 dwt. Even ships of 1,000,000 dwt were at the planning stage when the bubble burst.

In the early days of these VLCCs (very large crude carriers) and ULCCs (ultra large crude carriers), structural design and construction experienced a quantum leap forward, encountering certain problems along the way.

LYLOYD'S REGISTER HULL CLASS NOTATIONS

⊗	This distinguishing mark will be assigned, at the time of classing, to new ships constructed under Lloyd's Register Special Survey, in compliance with the Rules, and to the satisfaction of the Committee.
100	This character figure will be assigned to all ships considered suitable for sea-going service.
A	This character letter will be assigned to all ships which have been built or accepted into class in accordance with Lloyd's Register's Rules and Regulations, and which are maintained in good and efficient condition.
I	This character figure will be assigned to: (a) Ships having onboard, in good and efficient condition, anchoring and/or mooring equipment in accordance with the Rules. (b) Ships classed for a special service, having on board, in good and efficient condition, anchoring and/or mooring equipment approved by the Committee as suitable and sufficient for the particular service.

Computer-based frame analysis was in its infancy, and the days of finite element analysis were still far off. These ships pushed the boundaries of shipbuilding knowledge and posed structural problems on a scale never previously experienced, such as the stresses produced within such large hulls by 'hogging' and 'sagging' in waves and 'sloshing' of the liquid cargoes.

INCIDENTS AND REGULATION

With the growth of tankers came the increased risk of large-scale pollution following an incident, and the world began to see catastrophic pollution caused by tanker incidents – an early example being the 1967 grounding of *Torrey Canyon*, resulting in a spill of 124,000 tonnes of cargo which remains the sixth largest oil spill in history.

Over the last 20 years there have been several defining moments when major disasters have resulted in significant legislative actions affecting the technical standards applied in tanker design.

The *Exxon Valdez* incident in 1989 resulted in the Oil Pollution Act 1990 and later IMO Regulation 13G/F mandating the introduction of double hulls for tankers. *Erika* in 1999 resulted in the mandatory phase-out of single-hull tankers and more recently, the *Prestige* in 2002 further accelerated pending legislative changes. These step changes, in addition to many other advances in tanker design and shipping regulation, have brought about a massive improvement in tanker safety since the introduction of the supertanker. This can clearly be seen in the INTERTANKO statistics shown in the chart. But the industry can always do more, and further regulations and advances in tanker design are always being introduced.

COMMON STRUCTURAL RULES

The ensuing industry, political and environmental pressures from the *Erika* incident led to an agreement in 2001 to collaborate on a common Rule set for tankers between the three major tanker classification societies

LYLOYD'S REGISTER TANKER HULL TYPE NOTATIONS

Chemical Tanker, Ship Type () (*)

Designed for the carriage of chemicals (including petro-chemical products) having significant fire hazards in excess of those of petroleum and similar flammable liquids, or significant hazards in addition to or other than flammability (i. e. reactivity, corrosiveness, toxicity). The list of products will be stated on the International Certificate of Fitness. Type 1, 2 or 3 where an IBC Code Certificate of Fitness has been issued by Lloyd's Register. Type 1*, 2* or 3* where an IBC Code Certificate of Fitness has been issued by the appropriate National Authority.

Double Hull Oil Tanker

Designed with integral cargo tanks, for the carriage of oil having a flash point not exceeding 60°C (closed cup test). Except indicated otherwise in the Rules the cargo tanks are to be bounded by side and bottom dedicated water ballast tanks or void spaces constituting a double hull for the ship.

Double Hull Oil and Chemical Tanker Ship Type () (*)

See Double Hull Oil Tanker above. The list of products will be stated on the International Certificate of Fitness.

Oil or Bulk Carrier

Designed to carry oil in bulk having a flash point not exceeding 60°C (closed cup test) or dry bulk cargo alternatively. The structural configuration is similar to a double-hull bulk carrier.

Oil Tanker

Designed as a conventional single-hull sea-going tanker having integral cargo tanks, for the carriage of oil having a flash point not exceeding 60°C (closed cup test).

Ore or Oil Carrier

Designed to carry oil in bulk having a flash point not exceeding 60°C (closed cup test) or dry bulk cargo alternatively. The structural configuration is similar to a double-hull ore carrier.

Lloyd's Register, ABS and DNV, who together class approximately three out of every four tankers in the world.

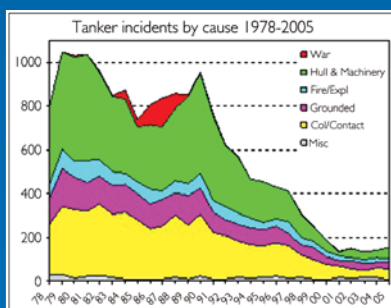
The common Rule objectives were to:

- 1) avoid competition between classification societies on minimum structural requirements as a result of the application of different society's rules
- 2) to raise the standard of robustness by increasing the requirements for strength allowed for ships in operation
- 3) to raise the standard of durability by developing transparent requirements for fatigue assessment and corrosion allowances
- 4) to provide a clear link between design requirements and the requirements for ships in operation.

As of April 1, 2006 any tanker over 150 metres in length carrying crude oil or products contracted for construction with any of the 10 IACS classification societies is required to be designed and constructed in accordance with these common structural Rules. The introduction of these Rules has seen an increase in the total steelweight used to build tankers. This is because the strength models used for scant-

An analysis of the frequency of tanker incidents and their causes shows that tanker safety has improved enormously over the past 25 years.

Source: INTERTANKO



<p>LLOYD'S REGISTER TANKER HULL SPECIAL FEATURE NOTATIONS</p>	<p>Independent Tanks Assigned to tankers where the tanks are independent of each other. It is only used when some of the tanks are not independent.</p>
<p>BLS Bow Loading System Assigned to tankers equipped with bow loading arrangements to facilitate the transfer of cargo oil from offshore loading terminals.</p>	<p>*IWS In-Water Survey Assigned where an In-Water Survey will be accepted in lieu of the intermediate docking between Special Surveys required in a five-year period when the ship complies with the following: rudder pintle and bush clearances and the security of the pintles can be verified afloat. Stern bush clearances can be verified afloat. High-resistance paint applied to the underwater part of the hull.</p>
<p>Carriage of Oils with an F. P. not exceeding 60°C Assigned to non-oil tankers where the ship is suitably constructed and arranged for the carriage of oils with a flash point not exceeding 60°C (closed cup test).</p>	<p>LI Loading Instrument Assigned where an approved loading instrument has been installed as a classification requirement.</p>
<p>Carriage of Oils with an F. P. exceeding 60°C Assigned where only the carriage of oils having a flash point exceeding 60°C (closed cup test) is contemplated.</p>	<p>MARPOL 13G(I)(c) Assigned to double-hull oil tankers not meeting the Rule minimum double side width requirements but which comply with MARPOL Regulation 13G (I)(c).</p>
<p>CR Corrosion Resistant Assigned where cargo tanks are either constructed of, or lined with, corrosion-resistant material. The corrosion-resistant material will be specified in brackets.</p>	<p>Pv (maximum permissible positive pressure/vacuum relief valve setting) Assigned where the maximum permissible positive pressure/vacuum relief valve setting for which scantlings have been approved is greater than 0,21 bar gauge, e.g. pv + 0.4 bar gauge or + 50 kPa.</p>
<p>CSR Common Structural Rules Assigned to double-hull oil tankers which fully comply with the Common Structural Rules.</p>	<p>Sandwich Construction (pt) Assigned when the vessel has been partly built using sandwich construction.</p>
<p>EP (A), (B), (G), (N), (O), (P), (R), (S), (V) Environmental Protection Assigned when the requirements for the arrangement and equipment for environmental protection, covering the major area of concern with regard to operational pollution from shipping, have been complied with. Additional requirements are set down for the assignment of supplementary characters A, B, G, N, O, P, R, S, V. Hull anti-fouling systems – A character; Ballast water management – B character; Grey water – G character; Oxides of nitrogen (NOx) – N character; Oily bilge water – O character; Protected oil tanks – P character; Refrigeration systems – R character; Oxides of sulphur (SOx) – S character; Vapour emission control systems – V character.</p>	<p>ShipRight (ES ()) Assigned when scantlings in excess of the approved Lloyd's Register Rule minimum are fitted at defined locations.</p>
<p>ESP Enhanced Survey Program Assigned to oil tankers, combination carriers, chemical tankers, which are subject to an enhanced survey program.</p>	<p>ShipRight SDA Structural Design Assessment This notation will be assigned when direct calculations in accordance with the ShipRight procedures have been applied. Mandatory for oil tankers over 190 meters in length which are not designed and constructed in accordance with the Common Structural Rules (CSR).</p>
<p>Helicopter Landing Area Assigned where a helicopter landing area is provided.</p>	<p>ShipRight FDA Fatigue Design Assessment This notation will be assigned when an appraisal has been made of the fatigue performance of the structure in accordance with the ShipRight procedures. Mandatory for oil tankers over 190 meters in length which are not designed and constructed in accordance with the Common Structural Rules (CSR).</p>
<p>Ice Class Assigned where a ship is strengthened to navigate in specific ice conditions.</p>	<p>ShipRight FDA plus Fatigue Design Assessment This notation will be assigned when an appraisal has been made for a higher level of fatigue performance than that made for the assignment of ShipRight FDA/CSR - optional for tankers built to both Common Structural Rules and Lloyd's Register's Rules for non-CSR tankers.</p>
<p>Ice Class ID ID = first year ice conditions in areas other than the Northern Baltic. The requirements for Ice Class ID are for ships intended to navigate in light first-year ice conditions. The requirements for strengthening the forward region, the rudder and steering arrangements for Ice Class IC FS are applicable.</p>	<p>ShipRight CM Construction Monitoring This notation which complements the ShipRight SDA, ShipRight FDA and ShipRight FDA plus notations, will be assigned when the controls in construction tolerances detailed in the ShipRight procedures have been applied and verified. Mandatory for oil tankers built to both Common Structural Rules and Lloyd's Register's Rules for non-CSR tankers over 190m in length.</p>
<p>Ice Class IAS FS, IA FS, IB FS, IC FS (+) - draughts xx Power required xx kW, Power installed xx kW Ships that comply with the requirements of the Finnish Swedish Ice Class Rules in force at the time of contract and Section 7, for Ice Class IA Super, IA, IB and IC may be assigned the corresponding notations Ice Class IAS FS, Ice Class IA FS, Ice Class IB FS or Ice Class IC FS. The Finnish Swedish Ice Class Rules may be obtained from the following website: www.fma.fi. The ships are strengthened to navigate: IAS - first year ice conditions equivalent to unbroken level ice with a thickness of 1.0m. IA = thickness of 0.8m. IB = thickness of 0.6m. IC = thickness of 0.4m. (FS) indicates compliance with the requirements of the Finnish Swedish Ice Class Rules in force at the time of midship section approval. (+) indicates with additional powering requirements.</p>	<p>SG () (in) (tanks) Maximum permissible relative density Assigned when the maximum permissible relative density (specific gravity) for which scantlings have been approved is greater than 1.025, e.g. SG 2.0.</p>
<p>Ice Class AC1, AC1.5, AC2, AC3 Arctic or Antarctic Ice Conditions equivalent to unbroken ice with a thickness of 1.0m/1.5m/2m/3m</p>	<p>SLS Stern Loading System Assigned to tankers equipped with stern loading arrangements to facilitate the transfer of cargo oil from offshore loading terminals.</p>
<p>Winterisation H(Tx) Assigned for ships designed with hull construction materials for low temperature operations. Tx denotes the design air temperature.</p>	<p>SPM Single Point Mooring Assigned to a ship provided with additional mooring arrangements which enable it to be moored at a single point mooring.</p>
<p>Winterisation A(Ty), B(Ty), C(Ty) Assigned for ships designed with equipment and systems for low temperature operations. Ty denotes the design air temperature. Winterisation level A denotes ships intended for prolonged duration in low temperatures. Winterisation Level B denotes ships intended for seasonal duration in low temperatures. Winterisation Level C denotes ships intended for short duration in low temperatures.</p>	<p>TLS Submerged Turret Loading System Assigned to tankers equipped with submerged turret loading systems to facilitate the transfer of cargo oil from offshore loading to terminals.</p>

LLOYD'S REGISTER TANKER MACHINERY TYPE- CONSTRUCTION AND ARRANGEMENT NOTATION

✘ **LMC** *Lloyd's Machinery Certificate*
Assigned when the propelling and essential auxiliary machinery have been constructed, installed and tested in accordance with Lloyd's Register's Rules and Regulations.

IGS *Inert Gas System*
Assigned when a ship intended for the carriage of oil in bulk, or for the carriage of liquid chemicals in bulk, is fitted with an approved system for producing gas for inerting the cargo tanks.

LLOYD'S REGISTER TANKER MACHINERY TYPE - CONTROL AND AUTOMATION NOTATIONS

UMS *Unattended Machinery Space*
Assigned when the arrangements are such that the ship can be operated with the machinery spaces unattended. It denotes that the control engineering equipment has been arranged, installed and tested in accordance with Lloyd's Register's Rules, or that it is equivalent thereto.

CCS *Centralised Control Station*
Assigned when the arrangements are such that the machinery may be operated with continuous supervision from a centralised control station. It denotes that the control engineering equipment has been arranged, installed and tested in accordance with Lloyd's Register's Rules, or is equivalent thereto.

ICC *Integrated Computer Control*
Assigned when the arrangements are such that the control and supervision of machinery and cargo services are integrated and computer based. It denotes that the control engineering equipment has been arranged, installed and tested in accordance with Lloyd's Register's Rules, or is equivalent thereto.

IFP *Integrated Fire Protection*
Assigned where an integrated fire protection system is fitted to provide control and monitoring of all active fire protection and fixed fire extinguishing systems from a centralised fire control station. It denotes that the integrated fire protection system has been arranged, installed and tested in accordance with Lloyd's Register's Rules, or is equivalent thereto.

LLOYD'S REGISTER TANKER MACHINERY TYPE - NAVIGATIONAL SAFETY NOTATIONS

NAVI (-IBS) *Navigation Arrangements, Integrated Bridge System*
Assigned when the bridge layout and level of equipment are such that the ship is considered suitable for safe periodic operation under the supervision of a single watchkeeper on the bridge. It denotes that the navigational installation has been arranged, installed and tested in accordance with Lloyd's Register's Rules, or is equivalent thereto.

PM *Positional Mooring System*
Assigned when a positional mooring system is fitted. It is intended to apply to vessels which have station-keeping capabilities, but which are not required to remain on station in adverse weather conditions. This notation can be supplemented by a Thrust Assisted notation.

PMC *Positional Mooring System for mooring in close proximity to other vessels or installations*
Assigned when a positional mooring system for mooring in close proximity to other vessels or installations is fitted. It is intended to apply to vessels which have station-keeping capabilities, but which are not required to remain on station in adverse weather conditions. This notation can be supplemented by a Thrust Assisted notation.

LLOYD'S REGISTER TANKER MACHINERY SPECIAL FEATURE NOTATIONS

PMR(*) *Propulsion Machinery Redundancy*
Assigned when the ship complies with the requirements for arrangements necessary to maintain availability of propulsion capability in the event of a single failure in equipment. The supplementary character * is assigned where propulsion machinery is installed in separate compartments such that, in the event of the loss of one compartment, the ship will retain availability of propulsive power.

SMR(*) *Steering Machinery Redundancy*
Assigned when the ship complies with the requirements for arrangements necessary to maintain availability of manoeuvring capability in the event of a single failure in equipment. The supplementary character * is assigned where steering machinery is installed in separate compartments such that, in the event of the loss of one compartment, the ship will retain availability of manoeuvring capability.

PSMR(*) *Propulsion and Steering Machinery Redundancy*
Assigned when the ship complies with the requirements for arrangements necessary to maintain availability of propulsion and manoeuvring capability in the event of a single failure in equipment. The supplementary character * is assigned where propulsion and steering machinery is installed in separate compartments such that, in the event of the loss of one compartment, the ship will retain availability of propulsion power and manoeuvring capability.

ling determination in the new Rules explicitly take into account a wider range of actual load effects, while at the same time enhancing the design standard for ship life and durability. One of the most notable step changes is the introduction of new fatigue criteria which require vessels to be designed to withstand 25 years of operation in the North Atlantic – one of the harshest trading environments in the world. This compares to the previous minimum for tankers of a similar size, which was 20 years on an average world-wide trading pattern.

FUTURE REGULATION/STANDARDS

In the future, the development of regulations and standards aimed at improving the level of safety on tankers shows no sign of slowing.

MARPOL Annexes I and II

Effective on January 1, 2007 the recent amendments to MARPOL 73/78 Annexes I and II and the IBC Code will have a substantial effect on tanker operations.

The carriage requirements of many chemicals will change and a new four-category pollution

Eleo Maersk, classed with Lloyd's Register, was the world's first double-hull VLCC.



LLOYD'S REGISTER TANKER HULL DESCRIPTIVE NOTES	ShipRight (PCWBT (Date)) Assigned when the ship's water ballast tanks are coated and that the coating remains effective.
Centralised operation station for liquid cargoes Assigned to oil tankers at owner's request and provides additional information about design/operational use.	ShipRight (SEA (Hss (2) (4) (6) (, (L) (M) (N) (VDR)))) Assigned when the ship is fitted with a hull surveillance system that monitors the hull girder stresses and motions of the ship.
COW Crude Oil Washing Assigned when crude oil washing installed. With (LR) postfix if certified by Lloyd's Register in accordance with MARPOL 73/78.	ShipRight (SERS) Assigned when the ship is registered with Lloyd's Register's Ship Emergency Response Service
Effective tank cleaning less than x% Assigned to oil tankers at owners request and provides additional information about design/operational use. Shadow diagram submitted to Lloyd's Register for information. Percentage indicates cargo remaining after tank cleaning operation.	Specified Design Anchorage Depth .. metres. Assigned following satisfactory completion of windlass/anchoring trials for a specified design anchorage depth.
ETA Emergency Towing Arrangements Assigned when Emergency Towing Arrangements and supporting structure complies with Rule requirements.	LLOYD'S REGISTER TANKER MACHINERY DESCRIPTIVE NOTES
(EP) Environmental Protection Assigned when a vessel is classed with another IACS member and the requirements of the Lloyd's Register Rules for environmental protection are met.	ShipRight (MCM) Machinery Condition Monitoring Assigned when an approved Planned Maintenance System (PMS) is operated as part of the Continuous Survey Machinery (CSM) cycle and monitoring techniques and equipment are used to record the condition against agreed acceptable limits. The ship must be operating an approved machinery PMS (MPMS). Condition records are examined by a Lloyd's Register Surveyor at the annual audit to verify that they are within specified limits and confirmatory readings may be taken to compare with the ship's records. The operator decides the number of machines to be included in the scheme.
Green Passport Assigned when a vessel meets the requirements of the IMO guidelines on Ship Recycling, IMO resolution A.962(23)	ShipRight (MPMS) Machinery Planned Maintenance Scheme Assigned when an approved PMS is operated as part of the CSM cycle and procedures and documentation are in place to control and record the inspection and maintenance routines of all machinery and equipment on the ship. Chief Engineers can carry out the examination of selected machinery items, without the need for a Lloyd's Register Surveyor to be present. An annual audit is required, at which time a Lloyd's Register Surveyor will undertake confirmatory surveys on those items to be credited which have been examined by the Chief Engineer during the preceding year.
HRS Level (1)(2)SS (Months/Year) 1SS - the hull has been assessed under the Condition Assessment Scheme and found at, or restored to a condition which might be expected of a five-year-old ship after its first Special Survey 2SS - the hull has been assessed under the Condition Assessment Scheme and found at, or restored to a condition which might be expected of a 10-year-old ship after its second Special Survey	ShipRight (RCM) Reliability Centred Maintenance Assigned when an approved PMS is operated based on the use of Reliability Centred Maintenance as part of the CSM cycle.
LMA Lloyd's Manoeuvring Assessment Assigned when a ship's manoeuvring capability has been established by assessing its characteristics in conjunction with engine and propulsion performance. It does not apply to high-speed craft.	ShipRight (SCM) Screwshaft Condition Monitoring Assigned when equipment and procedures are in place, in order to determine the physical and operational condition of that equipment. With the SCM procedure, the screwshaft need not be withdrawn from the stern bearing at the normal survey intervals subject to the attending surveyor's satisfaction with the condition monitoring data and other survey requirements.
Part Higher Tensile Steel Assigned when higher tensile steel is incorporated in principal hull structural members.	ShipRight (TCM) Main Steam Turbine Condition Monitoring Assigned when equipment and procedures are in place, in order to determine the physical and operational condition of that equipment. With the TCM procedure, the turbine top casings need not be lifted for examination of the rotors and diaphragms subject to the attending surveyor's satisfaction with the vibration measurements and performance trial indicating satisfactory condition.
PL Protective Locations Assigned when Protective location arrangements exist. With (LR) suffix if certified by Lloyd's Register in accordance with MARPOL 73/78.	
SBT Segregated Ballast Arrangements Assigned when Segregated ballast arrangements exist. With (LR) suffix if certified by Lloyd's Register in accordance with MARPOL 73/78.	
ShipRight (BWMP (T) (F) (S) (S+F)) Ballast Water Management Plans Assigned when the ballast water management plans have been assessed according to ShipRight BWM procedure.	

categorisation system will be introduced to replace the current five-category system.

Improvements in ship technology, such as efficient cargo tank stripping systems, have made it possible to significantly lower permitted discharge levels of certain products which have been incorporated into Annex II. For ships constructed on or after January 1, 2007 the maximum permitted residue in the tank and its associated piping left after discharge will be set at a maximum of 75 litres for products in categories X, Y and Z - compared with previous limits which set a maximum of 100 or 300 litres, depending on the product category.

Alongside the revision of Annex II, the marine pollution hazards of thousands of chemicals have been evaluated by the Evaluation of Hazardous Substances Working Group, giving a resultant GESAMP2 Hazard Profile which indexes the substance according to its bio-accumulation; bio-degradation; acute toxicity; chronic toxicity; long-term health effects; and effects on marine wildlife and benthic habitats.

One result of the hazard evaluation process and the new categorisation system is that vegetable oils, which were previously categorised as being unrestricted, will now be required to be carried in chemical tankers.

Oil fuel tank and pump room bottom protection

These regulations extend the double-hull principle to oil fuel tanks (which on large tankers can contain thousands of tonnes of oil fuel) and cargo pump rooms. The cargo pump room regulation is aimed at preventing the cargo pump room from becoming inoperable in the event of a grounding so that the vessel retains the ability to pump/transfer cargo from one tank to another to minimise the impact of a grounding and the scale of any resulting pollution.

The regulation applies to the cargo pump rooms of oil tankers of 5,000 dwt and above constructed on or after January 1, 2007.

The pump room shall be provided with a double bottom of a height not less than:

- $h = B/15$ metres (B = breadth) or
- $h = 2$ metres

whichever is the lesser. The minimum value of $h = 1$ metre.

The fuel oil tank protection regulation applies to all vessels (not just tankers) with an aggregate oil fuel capacity of 600 cubic metres and above delivered on or after August 1, 2010 as defined below:

- building contract placed on or after August 1, 2007 or,
- if no contract, keels laid on or after February 1, 2008 or,
- the delivery of which is on or after August 1, 2010.

It will also apply to vessels which undergo a major conversion in accordance with the above dates.

The regulation will apply to all oil fuel tanks except those designated as 'small' oil fuel tanks (i.e. those having an individual capacity of less than 30 cubic metres), provided that the aggregate capacity of such excluded tanks is not greater than 600 cubic metres. Individual oil fuel tanks shall not have a capacity over 2,500 cubic metres. Ships can comply by satisfying one of two criteria.

The first of these requires that tanks shall be located inboard of the bottom and side shell plating, creating a double hull around the tanks. Alternatively, ships may satisfy the second criterion by meeting an accidental oil out-flow performance standard, which aims to limit the potential for fuel loss.

Access to shore-based emergency response

Following the grounding of the *Sea Empress* in Milford Haven and the resultant pollution, the UK Government recommended to IMO's Marine Environment Protection Committee (MEPC) that regulations be brought into force to help ensure that remedial actions such as lightering could be carried out in a rapid and controlled fashion following a grounding or collision without compromising structural strength or stability. MEPC subsequently adopted a new regulation 37(4) which will enter into force on January 1, 2007. The regulation states that: "All oil tankers of 5,000 tons deadweight or more shall have prompt access to computerised, shore-based damage stability and residual strength calculation programs."

Tanker operators can comply with the new regulation by enrolling their ships with Lloyd's Register EMEA's ship emergency response service (SERS), which has earned a reputation as the leading provider of marine emergency response worldwide. The number of ships enrolled in the service recently passed the 2,000 mark, which includes approximately 1,000 tankers.

Emission regulations and SECAs

MARPOL Annex VI entered into force on May 19, 2005. Regulation 14 requires that the sulphur content of any fuel used onboard ships does not exceed 4.5% by mass. The sulphur content of any fuel used onboard ships operating in a sulphur emission control area (SECA) must not exceed 1.5% by mass.

Two SECAs are currently identified by Annex VI: the Baltic Sea area, which became effective as a SECA on May 19, 2006, and the North Sea area, which will become effective on November 22, 2007. EU directive 2005/33/EC will enforce sulphur emission controls in the same areas, as well as introduce some additional measures on the use of low-sulphur fuel. The directive will apply to all ships, regardless of flag.

As an alternative to using fuel with a 1.5% sulphur content, ships may use an exhaust gas cleaning system or other technological method to limit the emission of sulphur oxides. Such systems and technologies must be approved to the IMO standard contained in MEPC.130(53).



Coatings

In May 2006, the 81st session of IMO's Maritime Safety Committee (MSC 81) drafted amendments for SOLAS regulations II-1/3-2 and XII/6.3 with a view to their being adopted at MSC 82. The major thrust of this work was the drafting and agreement of the Performance Standard for Protective Coatings for Dedicated Seawater Ballast Tanks ('the Ballast Tank Standard') in all ships and the double-side skin spaces of bulk carriers.

The Ballast Tank Standard provides technical requirements for protective coatings in steel seawater ballast tanks at the new construction phase, aiming to give coatings a target life of 15 years. The standard addresses several stages: coating system approval; surface preparation and application requirements; inspection; maintenance of records; and verification. If adopted at MSC 82 in December 2006, compliance with the Ballast Tank Standard will be mandatory where any of the following is satisfied:

- newbuild contracted on or after July 1, 2008 (but see below)
- in the absence of a building contract, keel laid on or after January 1, 2009
- delivery on or after July 1, 2012.

However, compliance with the Ballast Tank Standard will also be mandatory for tankers over 150 metres in length that are contracted on or after the date of adoption and built in accordance with the common structural Rules.

Tempera and *Mastera*, both Lloyd's Register class, are the world's first Aframax ice-class IAS oil tankers; they are also the world's first double-acting tankers. Pictured here, *Mastera*.

FUTURE CHALLENGES FOR THE TANKER INDUSTRY

Operating in arctic environments

In recent years there has been an increasing demand for tankers to navigate in cold regions. One reason for this is the emergence of new trade routes in cold regions, such as Sakhalin, which pose new design challenges. Many features fitted to these ships to combat low temperatures and icing are in addition to ice-class requirements, and these are based on experience of operations. Not all owners and builders have experience of designing for cold and ice environments. Such knowledge is generally experience based and dependant on the ship arrangement, trade route and ship size. For example, the ship size and hull form will dictate the ship motions and the amount of spray and, hence, the amount of icing on the deck.

Additionally, the trade route will determine the sea states encountered and the level of spray. There is a need to capture this knowledge and ensure that it is applied to new designs. Accordingly, Lloyd's Register's winterisation Rules have been developed to provide a standard of protection against cold temperatures and the effects of icing on the operation of the ship (see **Winterisation H(Tx) and Winterisation A(Ty), B(Ty), C(Ty)** notations).

Human element

As may be noted from recent tanker casualty statistics, a large proportion of all tanker incidents continue to be 'operational', i.e. collision or grounding and arguably a much greater percentage have a human element within their root cause. Therefore, possibly the greatest challenge facing the tanker industry today is the recruitment, training and retention of the officers and crew onboard tankers who are collectively responsible for delivering a large proportion of the world's energy.

The global world tanker fleet continues to expand, with the world orderbook over the current decade maintaining levels of around 25% of the existing tanker fleet.

Working against this are a number of factors:

1. It continues to become more and more difficult to attract people from both developed and developing nations to a career at sea.
2. The growth of the world LNG fleet is seeing some of the most experienced tanker officers leaving the tanker fleet and joining the gas fleet.
3. The continuing increase of regulatory, quality system and third-party inspections by oil majors, flag states, port states, charterers, terminals, consultants and class societies

Lloyd's Register was chosen in 2002 to class the first ULCC to be constructed for over 20 years, the 440,000 dwt *TI Asia*, owned and managed by Euronav.

adds to the work load of all onboard and leads to increased fatigue.

The International Labour Organisation will shortly introduce new minimum requirements for seafarers on ships and minimum conditions of employment, including minimum hours of rest. So not only is the number of crew members required to man the world's tanker fleet increasing but so also is competition for the existing supply of experienced and qualified tanker officers and crew.

Lloyd's Register is helping to address these issues by working with the Nautical Institute, among others in the industry, to raise awareness about the importance of the human element through research and development projects and publications such as *Alert!*, circulated within *MER* on a quarterly basis for the last three years. Publication of *Alert!* will continue over the next three years, beginning in January 2007.

As the tanker sector moves forward, it has become unavoidably apparent that if we are to continue to make measurable safety improvements, the focus will have to expand to include the human element, as well as the technical aspects of the ship.

For further information contact Nick Brown,
Business Manager - Tankers, Lloyd's Register
Email: nicholas.brown@lr.org

