THE NAVAL ARCHITECT

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Published by:
The Royal Institution of Naval Architects
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8-9 Northumberland Street
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Telefax: +44 (0) 20 7245 6959
E-mail editorial editorial@rina.org.uk
E-mail advertising advertising@rina.org.uk
E-mail production production@rina.org.uk
E-mail subscriptions subscriptions@rina.org.uk

Printed in Wales by Stephens & George Magazines.

A 2014 subscription to *The Naval Architect* costs:

	12 Months	24 Months	36 Months
Inland	£167	£290	£419
Europe	£175	£306	£436
Overseas	£187	£327	£470

Average Net Circulation 10,933
1 January to December 2013
ISSN 0306 0209

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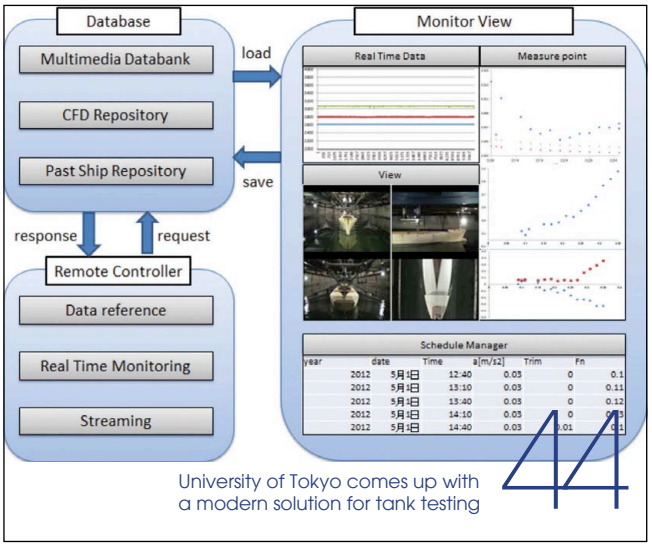

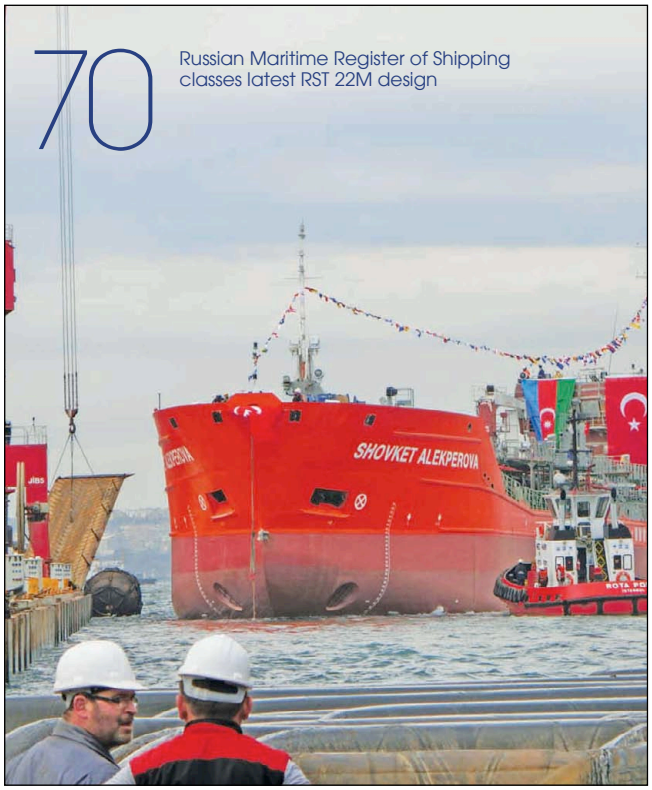

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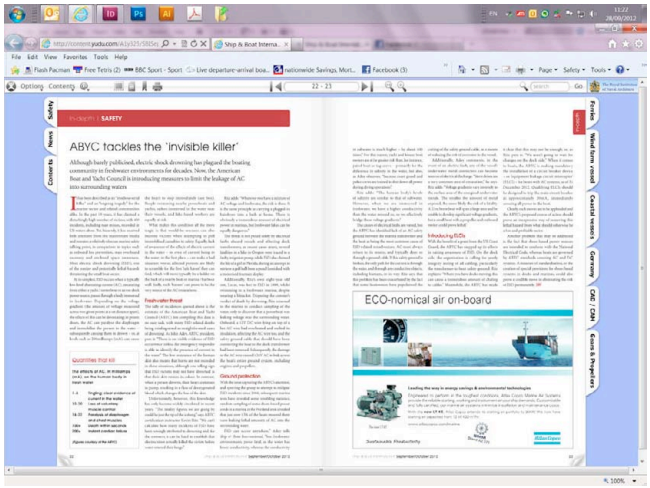

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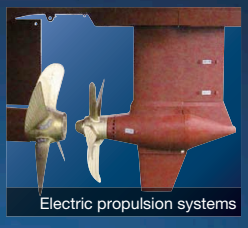
Electric propulsion systems


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Sea trials

IMO sea trial data debate continues

Amendments to ISO 15016, the standard for verifying speed and power performance by analysis of sea trial data were rejected by five countries, Germany, Greece, Italy, The Netherlands and the UK during the last ISO voting last April and following discussions within the expert group, which took place in London in late June.

Changes to the standard were required by IMO following the discovery that the present system allowed for discrepancies in sea trial data which IMO wants to use to verify the Energy Efficiency Design Index (EEDI) values.

The ISO standard was introduced in 2002 and was evaluated by the Dutch testing tank MARIN in 2011, who found that sea trials carried out by yards could depend on the methods employed.

MARIN evaluated ISO 15016 and reported to IMO that it: "Introduces errors and an inconsistent result of the speed trial analysis. Therefore, out of a single speed trial, multiple speeds and multiple EEDIs can be calculated. It allows for arbitrary wave directions during sea trials, whereas correction methods are only reliable for head waves and following waves; and in the wind correction, several inconsistencies have been proven in the ISO standard."

In its conclusion MARIN and STA-group found that "since it [ISO 15016] was issued, major improvements in speed trial analysis have been achieved and more advanced and reliable correction methods for wind and waves have been developed and validated."

On the basis of the method, "The International Towing Tank Conference (ITTC) Recommended Procedure: 2012" (ITTC-RP) has been developed. Almost at the same time, the ISO expert group had been studying the standard and wanted to remove any ambiguities from the existing "ISO15016:2002".

As a result, the ISO/DIS draft was developed through collaborative efforts between ISO and ITTC and had already reflected most of the ITTC-RP into it. The difference between ISO and ITTC is proposing an additional form of analysis, the iterative method for the current correction against only the 'Mean of means' method in the ITTC RP.

During the IMO/MEPC66, ISO and ITTC were asked to allow time for all stakeholders to have increased confidence in the application of the new proposed 'Iterative' method. Essentially, the expert group that revised ISO 15016 agreed to look at again and will now vote again in the autumn.

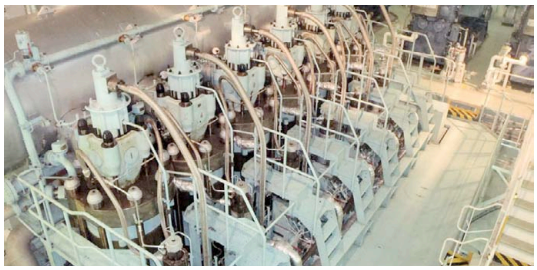
Further details of the ISO expert group's deliberations will be published in the September issue of *The Naval Architect*.

Software

Engine monitor adds efficiency

SeaEngine is an engine performance monitoring tool launched by Danish engineering company FORCE Technology.

The software, developed with a group of shipowners, is a module that can be added to SeaSuite, which is already used onboard more than 500 vessels.



SeaEngine an engine monitoring programme has been developed by FORCE Technology and ship operators to improve engine efficiency

"The SeaEngine solution includes onboard data collection software guiding the engineers through an effective performance test protocol, taking all the relevant parameters for engine performance into account. Usability and intuitiveness have been the main criteria for developing the user interface for the onboard software module," says Force Technology.

Data from the monitoring system is fed to a web-based portal which can be analysed by onshore technicians who will be able to establish whether key components are becoming worn and are operating inefficiently.

"In addition to the web reports, a full review of the engine condition with suggestions for additional adjustments or improvements is provided quarterly by FORCE Technology's team of engine experts," says the company.

SeaEngine has been tested on 12 different vessels, across the range of ship types. The system development programme is part of the Energy Efficient Operation of Ships (EEOS) project, which is partially funded by The Danish Maritime Fund.

Safety

Sewol loaded to twice limit

An interim report into the loss of the Korean ferry *Sewol* on 16 April has suggested the cargo load on the ferry was twice the permissible level when the ferry sank.

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The double ended ferry *Samsø Færgen* will be the first ferry to operate on biogas

South Korea's National Assembly has launched its own inquiry into the loss of *Sewol* which cost the lives of 304 people, many of them school children. An initial report by the Government's Audit and Inspection Board suggests that the ferry operator's licence to operate, issued by the Korean Register, was gained by falsifying paper work. No further details have been issued.

The political fallout from the ferry disaster has seen Dr Chon Young-kee resign from his position as Chairman and CEO of the Korean Register, with Yung-jun Jung, the executive vice-president of the survey division, installed as the acting CEO and chairman.

In addition, the Korean Coast Guard has been disbanded amid claims that the organisation was slow to react to the disaster while the crew are now standing trial on a number of charges, including homicide through wilful negligence, and negligence and abandoning ship.

Government has also come under pressure as anger has spilled over among, not only the relatives of the victims, but amongst the general population. The search for Yoo Byung-eun the former chairman of Cheonghaejin Marine Company, the company that owned *Sewol*, continues he is accused of tax evasion, embezzlement and professional negligence. Yoo's sons reportedly owned the parent company of the Cheonghaejin Marine Company, while their mother has been arrested and their sister, Yoo Somena, remains in jail, awaiting an extradition hearing in France, due to take place in September.

Ferries

SAM wins Danish ferry contract

The latest 100m double ended ferry currently under construction at the Remontowa Shipyard in Poland will be fitted with automation, navigation and communications systems supplied by the Hamburg-based SAM Electronics.

Due to enter service in September this year between the Danish island of Samsø and Hou on the mainland, *Samsø Færgen* will have a capacity of 600 passengers and 160 cars.

The company says: "The NACOS Platinum integrated navigation system to be supplied by L-3 MSI's Lyngsø Marine division, comprises S- and X-band radars linked to a series of five Multipilot multifunction consoles and associated conning units for control of all main radar, ECDIS, automatic steering and voyage planning functions. Subsidiary sensors consist of AIS, VDR, DGPS, Doppler logs, echosounders, gyros, rudder steering and indicators, wind/weather navaids and BNWAS"

Samsø Færgen will be powered by four 850kW azimuth thrusters, each driven by an asynchronous motor and a speed-controlled, low-voltage PWM converter featuring the latest active front-end (AFE) technology. The vessel's power generation configuration will include the installation of two 690V, 60Hz propulsion switchboards, four gensets, including 1,275kVA synchronous generators, and dual-fuel diesel/LNG engines.

Initially the vessel will be powered LNG and will later transfer to locally produced biogas, says the company. *NA*

Technical paper

Free IJME paper

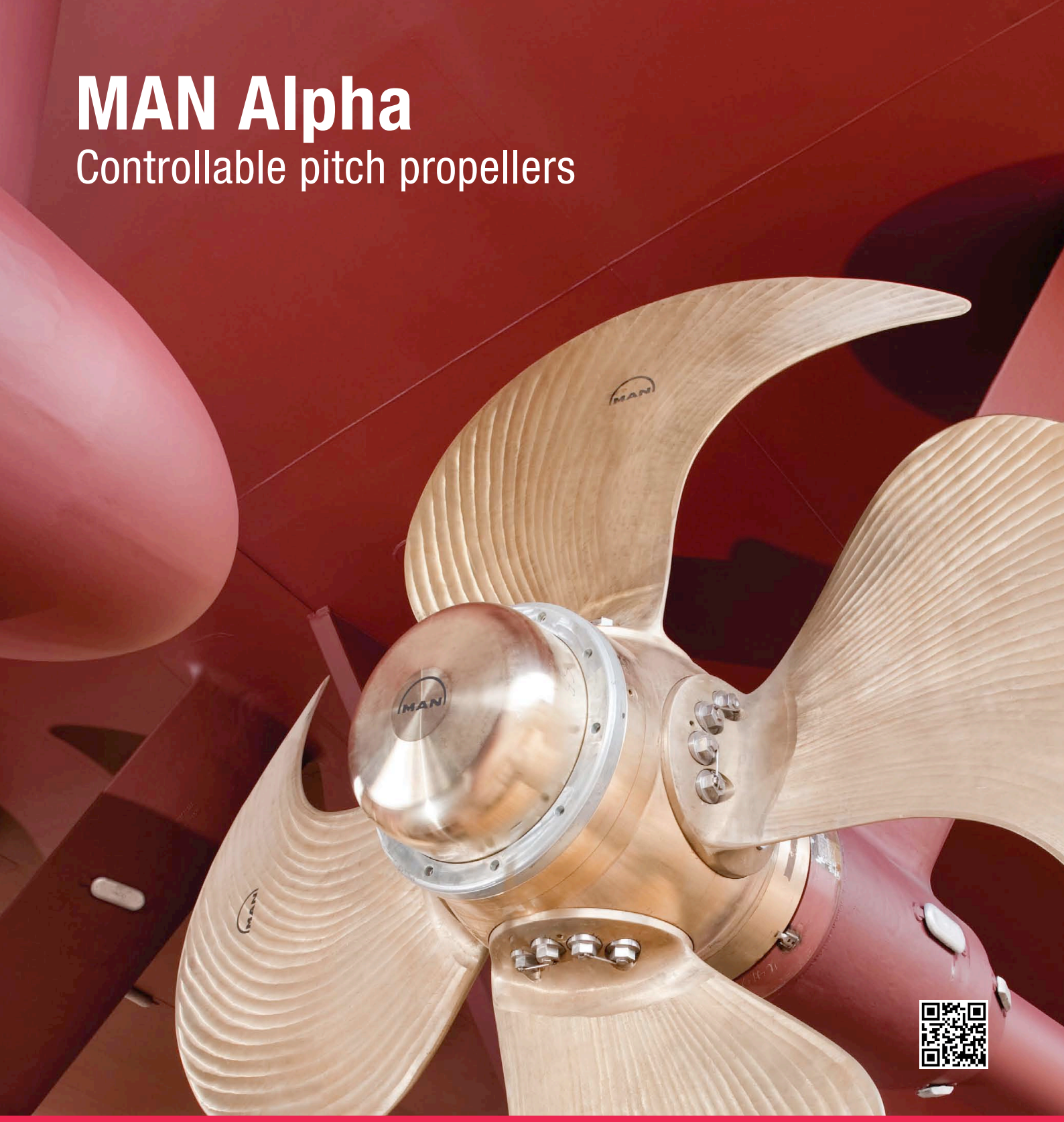
The technical paper entitled "Enabling Technology and the Naval Architect 1860-2010", by Dr Ian Buxton originally published in the International Journal of Maritime Engineering (IJME) can now be can now be downloaded as a PDF (10.5MB) or viewed on-line from the RINA website at: www.rina.org.uk/feature-articles.html.

Correction

In the May issue of *The Naval Architect* in the BWMC: IMO versus USCG story story, the second to last paragraph should have read "New vessels, those with keel laid dates on or after 1 December 2013, must to comply on their first visit to the US." Also, to clarify the caption refers to the regulations in place. We would like to apologise to the USCG for this error.

MAN Alpha

Controllable pitch propellers



Diesel-Mechanical Systems Diesel-Electric Systems **Propellers** Gearboxes Propulsion Management Systems

MAN Diesel & Turbo's Alpha propeller programme has been extended with two new larger hub sizes (VBS 2060 and VBS 2150) – offering power transmission of up to and beyond 40,000 kW. Today's high-efficient CP Propellers are created on the basis of state-of-the-art design tools and the accumulated experience from more than 7,000 units. Full pitch ahead!
Find out more at www.mandieselturbo.com and www.manalpha.com

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LNG

SKF launches cryogenic pump solution

SKF has announced the launch of its latest cryogenic bearing solution for LNG pumps for the marine industry. The cryogenic bearing solution for LNG pumps, will meet the needs of the global LNG carrier fleet by providing increased flexibility, availability and reliability in the handling of valuable cargo, the company has said.

The bearings, which can be specified with a new pump or applied as an upgrade when replacing existing cryogenic bearings, use a specially heat-treated variant of the SKF high-nitrogen, super-tough stainless steel to enhance cryogenic temperature stability, hardness and fatigue resistance. The rolling elements are made of silicon nitride bearing-grade ceramic and the bearings are lubricated by the liquefied gas itself.

SKF Blohm + Voss Industries has also developed its next generation SC3 lip sealing ring for SIMPLEX-COMPACT stern tube seals, which will be able to handle differences in pressure better, the company claims. The SC3 has been given a shorter lip, which allows the pressure-loaded area to be reduced, while a new self-aligning annular spring makes the ring better able to adjust to the actual pressure.

www.skf.com

Environmental

Alternate energy from Seanergy

The trend for electric propulsion is being driven by the needs of the civil marine industry to demonstrate that it is sustainable and energy efficient. This means it has to adapt fast to meet ever tighter environmental regulations that aim to reduce both emissions and noise nuisance while increasing efficiency.

Saft has launched its Seanergy range of lithium-ion (Li-ion) battery modules that it has developed to offer the safety, performance and reliability advantages of Li-ion Super-Iron Phosphate (SLFP) chemistry in a fully integrated solution designed specifically for civil marine propulsion installations, the company claims.

The range includes a variety of Energy and Power modules that offer the flexibility and adaptability to create highly efficient, cost-effective battery systems to power full-electric and hybrid electric applications for a wide variety of vessels including work boats, ferries, offshore support, cruise-liners and cargo ships.

New concepts in ship architecture are now incorporating advanced battery technology for both pure electric propulsion and hybrid systems, where the batteries work in conjunction with diesel generators, or possibly gas turbines, and electric motors.

www.saftbatteries.com

Seanergy power offers flexibility using battery systems for both hybrid and full electric power

Cargo handling

Scanjet caters for the masses

Scanjet Marine AB and Scanvent are combining product ranges to create the most comprehensive in-tank equipment package available for tankers and FPSOs.

Scanjet's current product range consists of tank cleaning equipment, tank management solutions with monitoring, control and alarm systems for cargo and service tanks, while Scanvent offers a range of volatile organic compound (VOC) efficient dual nozzle high velocity valves, ranging from barges to VLCCs and floating production storage & offloading, and MSC/Circ. 1324 flame screen upgrade kits spares for most existing pressure/vacuum (p/v) valves.

The combined product ranges will cover all in-tank equipment bar cargo pumps. Scanjet's factory in Sweden will assume manufacturing of Scanvent p/v valves next to its tank cleaning machine production line. The two sales and R&D organisations will integrate with Scanjet's sales network becoming a single point of contact for customers over the course of the next months.

www.scanjet.com

Bridge systems

Hatlapa steers ahead

MacGregor, part of Cargotec, has launched Soteria, its latest alert system designed to complement its Hatlapa and Porsgrunn range of steering gear. The system has been designed to offer a series of benefits for both shipowners and shipyards.

The Soteria system consists of a control cabinet with a touch-screen control panel located in the steering gear compartment, and two further touch-screen panels in the engine control room and on the bridge.

If a steering problem occurs, visual and audio warnings indicate one of three classes of alert.

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Alarm, displayed in red, indicates a serious problem that needs to be resolved immediately to avoid serious damage to the steering gear.

Warning, displayed in yellow, indicates a problem that requires attention but does not present the risk of immediate damage.

Caution, displayed in blue, indicates that the stand-by pump has started. It also indicates why the pump has started. The alert system does not affect the function of the steering gear and has been class-approved by DNV GL.

www.hatlapa.de

Paints & coatings

It's a wrap!

The Dutch maritime technology company Micanti has designed Thorn-D to be an environmentally friendly antifouling foil. The coating is based on small fibres, which make it very unattractive for organisms to attach to the hull of a ship.

Thorn-D (left) is a self-adhesive foil that uses short fibres to stop the settlement of organisms on the hull, the right side is untreated

The Thorn-D foil is made from millions of tiny fibres or hairs on the foil which are resilient and vibrate constantly through the water movement. The company explains that the combination of prickliness and swaying of the fibres makes the surface unattractive for organisms to settle. The nylon fibres are similar to spiky hairs that organisms have to combat fouling. With Thorn-D, it is possible to prevent all sorts of macro-growth from settling, the company claims.

The company says that with a lifespan of at least five years shipowners save a lot on time and cost, as a ship saves fuel because the fouling stays away as does the need for coating. In addition, the antifouling foil works as the ship sails, but also when it is moored.

www.micanti.com

Power generation

Yaskawa Electric Corporation acquires The Switch

Yaskawa Electric Corporation has announced that it has signed a definitive agreement to acquire The Switch, a supplier of megawatt-class permanent magnet generators and full-power converter packages for wind power and other renewable energy applications.

The Japan-based Yaskawa System Engineering Division has been focusing on growing its market share in renewable, marine and industrial applications over the past few years. In autumn 2013, the two companies entered a strategic collaboration agreement whereby Yaskawa gained access to The Switch's proven capability in megawatt-class power generation and The Switch was able to develop its presence in Japan.

Both companies highlighted that the product portfolios of The Switch and Yaskawa complement each other well for applications in renewables, marine and industry. Permanent magnet (PM) machines and low-voltage converters from The Switch range from 500kW to 8.0+MW, whereas Yaskawa offers medium-voltage converters that extend the offering to large wind turbines and other applications. Yaskawa's global network will be used to promote The Switch's products in wind power, marine and industrial applications.

www.theswitch.com

Cargo handling

iMinds develop container tracker

Scientists of iMinds-Ghent University in Belgium are now piloting a standardised new system for monitoring containers' location and status as part of the control and management of constrained devices (COMACOD) project. Sensors integrated into the containers will relay GPS data to the users, as well as other information such as temperature and humidity, providing unprecedented levels of monitoring and security, said the company.

The goal of COMACOD is to develop enhancements that make tracking and monitoring systems more efficient, flexible, manageable, automated and reusable for different markets and applications with minimal effort.

www.iminds.be/en/projects/2014/03/03/comacod

Bridge & communications

NautoScan hits the waves

The German navigation system manufacturer Raytheon Anschütz announces the launch of its latest generation navigation radar, NautoScan NX. The radar features two latest innovations on the transceiver: Network technology

Raytheon Anschütz launches its latest radar NautoScan NX

replaces analogue data transmission, and a pedestal which is newly constructed electrically and mechanically reduces cost of ownership and simplifies service.

The latest NautoScan NX radar transceivers are based on modern hardware- and software infrastructure to achieve the highest reliability on a high performance level. The new radar transceivers network technology replaces analogue data transmission through expensive and complex special cables. Radar status and raw video is generated in the transceiver, shared through a digital interface and distributed through Dual Gigabit LAN to an unlimited number of PCs without any analogue losses.

Raytheon Anschütz has said that the advantages are that through the digital technology the latest radar can provide high-quality raw data and at the same time, applications on the bridge are given great flexibility in processing the radar signals.

All workstations can access and use the radar video, if needed, which supersedes the current "slave" type of configuration. The radar also comes with a number of further improvements, such as an improved signal processing for better performance, a built-in-test for easy service diagnosis, an integrated and automated performance monitoring or an innovative "Sleep Mode" to save Magnetron lifetime when the radar is on standby.

Raytheon Anschütz has said that its NautoScan NX will become an essential component of the new generation Synapsis Radar. Besides the new radar transceivers, the new generation Synapsis Radar consists of a display selectable from a range of different sizes, a newly introduced standard PC with solid-state drive and a fan-less, compact design, the Radar software, and flat-profile antennas with size of 6ft, 8ft or 12ft.

www.raytheon-anschuetz.com

Environmental

VEEO manages the emissions

TechnoVeritas has announced that it has installed its ship energy and gas emissions management system, voyage energy and emissions optimiser (VEEO), on the vessel *Insular* from Transinsular.

The VEEO system will allow the shipowner to comply with MARPOL VI, sending real-time energy consumption data to shore and also 'key performance indicators', such as energy used per nautical mile to carry a tonne of load.

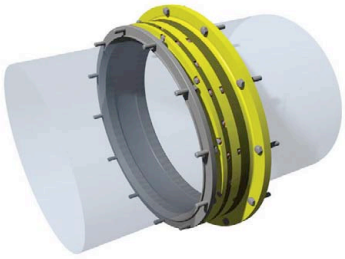
The company has said that VEEO system also makes data management and automatic reports, producing all the information required for a SEEMP online, which is also available on a platform installed on the 'cloud', allowing the shipowner to access the performance of the ship through the internet. With VEEO, a torque meter for shaft torque, thrust, speed and power, Optipower, was also supplied to INSULAR.

www.technoveritas.com

Ancillary equipment

Wärtsilä seals EPA requirements

Wärtsilä has received an important service level recognition for its Wärtsilä Airguard and Wärtsilä Oceanguard propeller shaft sealing systems from Lloyd's Register, which confirms that the sealing systems meet the US Environmental Protection Agency's (EPA) requirements.



Wärtsilä Airguard and Oceanguard get US EPA approval

Wärtsilä announced earlier this year that its Wärtsilä Airguard and Wärtsilä Oceanguard seal products can continue to utilise mineral oil since they meet the guidelines set out in the US Environmental Protection Agency's 2013 revised Vessel General Permit. As the Wärtsilä Airguard and Wärtsilä Oceanguard seals meet the defined regulatory prerequisites, owners and operators of commercial vessels of over 79ft (24m), sailing within US waters with either of these systems installed are not required to change to an Environmentally Acceptable Lubricant (EAL).

During a desktop review which showed that the Wärtsilä Airguard and Oceanguard propeller shaft seals are able to be used with mineral oils and a range of environmentally acceptable lubricants as defined within the US EPA VGP 2013. Furthermore, it was stated that the Wärtsilä Airguard and Oceanguard propeller shaft seals are unlikely to leak mineral oils into the sea during normal operating conditions, the company claimed.

www.wartsila.com

Food for thought: COMPIT goes loco

The 13th International Conference on Computer and Information Technology Applications in the Maritime Industries (COMPIT) was held from 12-14 May 2014 in Redworth, UK. Amongst the regulars were a large number of new faces from Europe, USA and Japan making this one of the largest COMPIT conferences yet. Pat Couser reports

As is always the case at COMPIT the papers and presentations were diverse and interesting, covering topics from autonomous, unmanned vehicles [Bibuli] to energy flow simulation [de Vries]; augmented reality [Matsuo] to QR (Quick Response) codes [Morais]; and interactive data-driven documents (http://d3js.org) [Gaspar] to ship operations planning [Siwe].

The three days of the conference were split into general thematic areas, and without parallel streams, keen attendees were able to enjoy all the presentations. Although the common thread running through all COMPIT conferences is computer application, the participants, often with diverse backgrounds and different perspectives of the marine industry, always provides a rich forum for cross-fertilisation of ideas.

COMPIT was held in Redworth, UK, this year, but returns to Germany in 2015

Within the broad range of topics discussed, two common themes could be observed: firstly a broadening of the scope during initial design to encompass a more holistic solution and secondly increasing the level of detail to which the design is examined. In some ways these themes are driven by the significant cost and performance benefits which may be realised by improved initial design leading to fewer, potentially, costly changes later in the design cycle. These trends are facilitated by the ever increasing sophistication of analysis and optimisation techniques and IT developments resulting in improved computer performance and increased availability of cheap, high-performance hardware (delivering: readily accessible raw computing power, telemetry, tracking, remote sensing, measurement, sophisticated computer/human interfaces –tablets, hand-held devices, virtual and augmented reality, etc.) [Eckstein, Glotzbach]. In recent years, developments providing miniaturised, low cost, yet reasonably high performance hardware that can find applications in remote data logging, autonomous controllers etc., have really been quite remarkable [Eckstein] (e.g. Arduino, Electric Imp, Raspberry Pi, BeagleBone Black). There were many very interesting papers on diverse subjects; some of the papers and topics of particular interest are discussed here.

As mentioned above, one key theme was that of a holistic approach to analysis and optimisation [Barbarin, Baumgart, Elg, Kakalis, Nagel, Puisa, etc.]. As the cost of computer processing performance continues to decrease, it is now possible to consider more and more aspects of the ship design (or operation) using models of greater detail, containing ever-more complete simulations of the systems being considered to obtain more accurate design optima.

Software vendors are starting to adapt their analysis codes to fully exploit developments in distributed, parallel computing hardware which are now much more accessible for day-to-day use in the design office: at the lower end of the scale, even desk-top computers have had multi-core processors, which can greatly enhance computational speed, for several years now; in an office environment often there are many machines which are idle for a significant proportion of the time and this computational potential can be exploited with appropriate software (for example Friendship Framework [Zeitz]); and at the other end of the scale dedicated high-performance computing clusters (some with many hundreds, or even thousands, of cores) and "computation in the cloud" are available [Ignatius, Schrooyen]. As these emerging technologies mature, the potential for extremely sophisticated and encompassing analysis really becomes a

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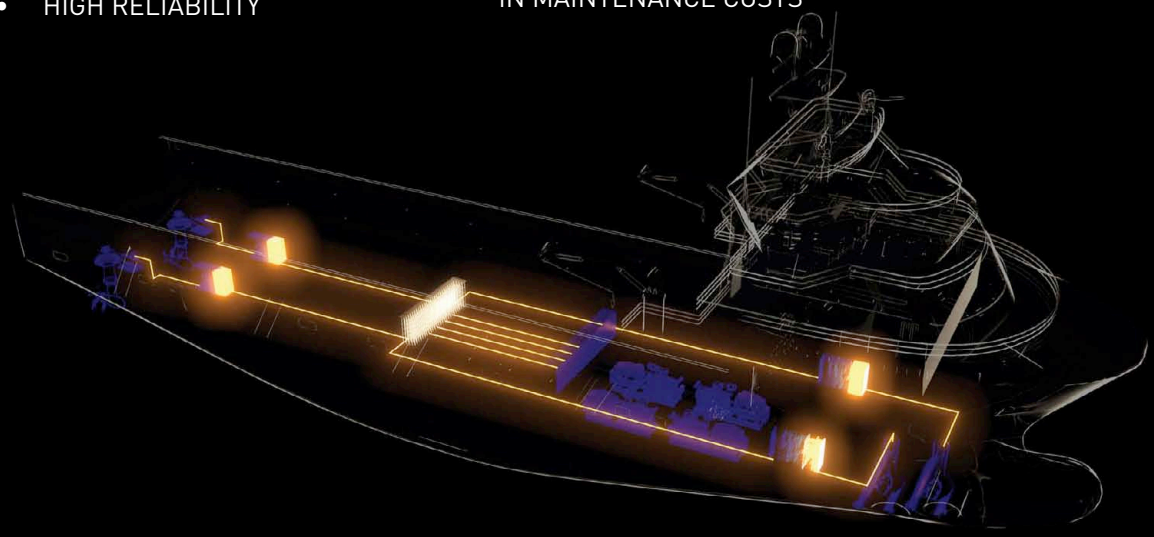

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viable proposition and within a relatively short period of time one may expect these complex analyses to become routine. The holistic design approach was found to be particularly relevant during initial and concept vessel design, as well as energy flow analysis to improve ship performance with respect to emissions and fuel consumption. The requirement to include as many of the ship's systems as possible in the simulation was found to be desirable since optimisation of the systems individually may not necessarily lead to the best performance overall, especially when considering vessel operation at off-design points.

One interesting aspect that was touched upon by several speakers was that of flexibility [Ignatius, Kakalis, Sciberras]. There is perhaps a growing trend of arriving at a final vessel design where the optimisation has been driven by specific, unpredictable external factors. For instance the trend for larger and larger container ships is somewhat driven by increasing operating costs (fuel and crew) and the relatively fixed cost of construction (per unit volume) irrespective of size. The required freight rate per item being transported is, therefore, reduced by increasing the size of the vessel; the detrimental effects of weather and seaways as well as specific-resistance in calm water also tend to reduce with increasing vessel size. However, should the cost of fuel or crew change significantly, these large vessels may well turn out to be sub-optimal. Ship design is always a compromise of competing objectives, many of which pull the design in opposite directions, when considering formal optimisation it is interesting to look at the "robustness" of the chosen optimum design. Robustness can be assessed by determining how sensitive the solution's objective function is to perturbations of the external parameters. It may be prudent to choose a slightly sub-optimal solution, but one that is less affected by changes in external parameters (such as sea conditions or cost of fuel, crew, etc.) than one which is more highly optimal but whose performance will rapidly drop off should the external parameters that drive the design change even by a small amount [Stopford].

Augmented reality is where computer-generated data is overlaid on a real scene. Hand-held devices such as tablet computers and smart-phones make this technology readily accessible. In a similar way that Google SkyMap can tell you which stars and constellations you are observing, these augmented reality systems are able to determine the actual physical location and orientation of the device within the virtual 3D CAD model by using various sensors (GPS, RF markers, camera, etc.). Once the location and orientation of the device has been determined, data about the view can be extracted from the CAD model and overlaid on the view; equally the operator can use the system to add observed information or notes to the model [Halata]. Several examples of this technology were shown; including a tool to assist during manual plate-forming by line-heating. This system used a laser scanner to measure the partially shaped plate and then compare it to the required 3D shape form the CAD model. Suggestions for the heat-application paths (for the workman to follow) were then computed and displayed in the augmented reality environment [Matsuo]. Another similar tool was able to determine the pipe geometry required to connect two pipe ends identified by the operator. Similar technology can be used for interference checking and verification of adequate space for manoeuvring assemblies around the production facility. The use of QR (Quick Response) codes (http://en.wikipedia.org/wiki/QR_code) and how these can be used to concisely provide information and facilitate data collection was also highlighted [Morais].

Computer game engines have been used to develop sophisticated simulations, which are particularly useful for training crew and reviewing ergonomic aspects of designs. Modern game simulations are extremely realistic allowing individual or multi-user interaction (for team training); "players" can also interact with non-player characters (those controlled by the computer) providing additional levels of sophistication. These game engines have quite sophisticated physics simulations, which can be used to model effects such as fog, fire and explosions, providing heightened realism and challenges to the scenarios.

Advantages of virtual reality-based training include: objective and consistent assessment of task completion; ability to train crew in simulated dangerous situations without real risk to personnel or equipment; ability to virtually modify the training environment; and train remotely without bringing the vessel or platform out of service. With the cost of virtual reality hardware ever reducing (e.g. Oculus Rift immersive headset display http://www.

Singing for their supper: delegates attended an authentic medieval dinner, which included having to sing for the next course

oculusvr.com/) this type of crew training and vessel layout evaluation making use of immersive, virtual environments is now easily accessible.

Examples were shown for crew training on an existing offshore platform, but with simulated hazardous situation and also for the ergonomic evaluation and initial crew training for a submarine which was still in the design phase and had not yet been built [Venter].

Safety is always a very important aspect of ship design and operation. Several papers looked into ship safety, especially the design and reliability challenges that would need to be met to make unmanned, autonomous ships a viable proposition. This also introduced the idea of land-based monitoring stations (for autonomous vessels) as well as land-based "Sea Traffic Management" centres [Porathe, Siwe]. Other safety issues including decision support for crew watch and shift planning were presented [John].

One characteristic of COMPIT is the venues which are always a little out of the ordinary adding to the atmosphere of the event (in fact there is an unofficial selection criteria for delegates: being able to find the venue, though this is now less of a challenge since GPS technology has become so readily available). Over the last 10 years the qawriter has been fortunate enough to be able to participate in four COMPIT conferences; the first being held in Siguenza in Spain, in a restored castle in a fairly remote part of Spain some distance north of Madrid. There are still many familiar faces regularly attending COMPIT as well as plenty of new ones. It was nice to see COMPIT regular, Marcus Bole receive the prize for best paper this year "Regenerating hull design definition from poor surface definitions and other geometric representations"; the prize was presented by Stefan Harries (another COMPIT regular since the early years).

Marcus Bole receiving his award

The final evening of the conference proved to be the most memorable conference dinner to date: an "authentic" medieval banquet with a requirement to sing in order for the next course to be served. Judging by the noise and general hilarity, a good time was had by all! For next year, COMPIT moves back to Germany: full details may be found on the COMPIT website. In order to keep us all busy and motivated to continue our research and write more papers for COMPIT, Volker teased us with the venue short-list for future COMPITS – Long Live COMPIT! *NA*

Foran users want more

Bi-annual FORUM meetings to discuss the Foran CAD/CAM/CAE system aim to provide an opportunity for users and developers to get together to discuss their experiences and how the system is changing to meet customer needs. Eric Tupper reports

Much of the change taking place with Foran is due to developing technology and regulations, coupled with the growing power and capabilities of modern computers. This year the FORUM meeting was held in Segovia, Spain, between 11 and 13 June. Compared with previous conferences, less time was devoted to formal presentations allowing more time for users to discuss their experiences and for users and developers to discuss future needs.

The 88 delegates, from 14 countries, were welcomed by Rafael de Góngora, General Manager of SENER's Marine Engineering Strategic Business Unit. He said that, although many miles from the sea, Segovia had naval connections in that several important naval treaties had been signed here. In spite of the general economic problems in Europe, SENER had a successful year in 2013. SENER has a clear vision of the way ahead for Foran. With many users, producing significantly different ships and/or structures, with interest in different stages of design, construction and maintenance, the core systems must be flexible. The linking of Foran with other shipyard systems can be done locally with help from SENER.

Miguel Roji, Navantia, described efforts to develop an integrated information system including the integration of design and production, whilst exploiting the advantages of 3D (electronic) modelling. Elements of the Navantia Engineering Ecosystem are the F MODULES of FORAN v70r2.0. These are being developed with fewer/easier interfaces.

Kevin Duckworth, BAE Systems, Maritime Submarines, described the design and engineering of the UK RN Astute Class submarines and the successor programme – the replacement for the current ballistic missile submarines. BAE are building on their experiences in using Foran in the large carrier project. The successor programme requires the use of Foran concurrently across many sites and several hundred users. Delivery of the new FHULL moulded line capability for steelwork has been a big advance. Now, working with SENER, BAE will introduce submarine specific structural modelling capabilities, authoring of weld information across all discipline objects within Foran and improved cable management. However, he saw the most significant enhancement to be the bidirectional Foran/PLM (Project Lifecycle Management) integration leading to a configuration controlled bill of materials.

Rafael de Góngora welcomes delegates at this year's Foran Users Meeting in Segovia, Spain

Igor Shaposhnikov, Severnoye, emphasised that the life cycle support for a ship requires the CAD system to be linked to other management systems. He described what Severnoye are doing to meet these needs by creating links between Foran and these other systems to adequately control documentation release.

Aleksei Shadrov described the Vyborg Shipyard's experiences in using Foran for 21 years starting with Version 30 and now using Version 70 leading to it becoming one of the most competitive companies in the domestic shipbuilding market. He described the design of a combined transport pontoon/floating dock, linked with the build and launch of ships, specifically icebreakers. The project illustrated the cooperation between design bureau and shipyard in creating a 3D model of the ship and the release of documentation – nesting plans and workshop drawings.

Jim McLauchlan, BAE Systems, Naval Ships, discussed the challenges faced in sharing the Foran model between many people in many locations. Several new initiatives have been undertaken to promote sharing and optimisation of the business/CAD/CAM model for the RN's Type 26 Global Combat Ship (6,400 tonnes). Foran V60, R3.0 has

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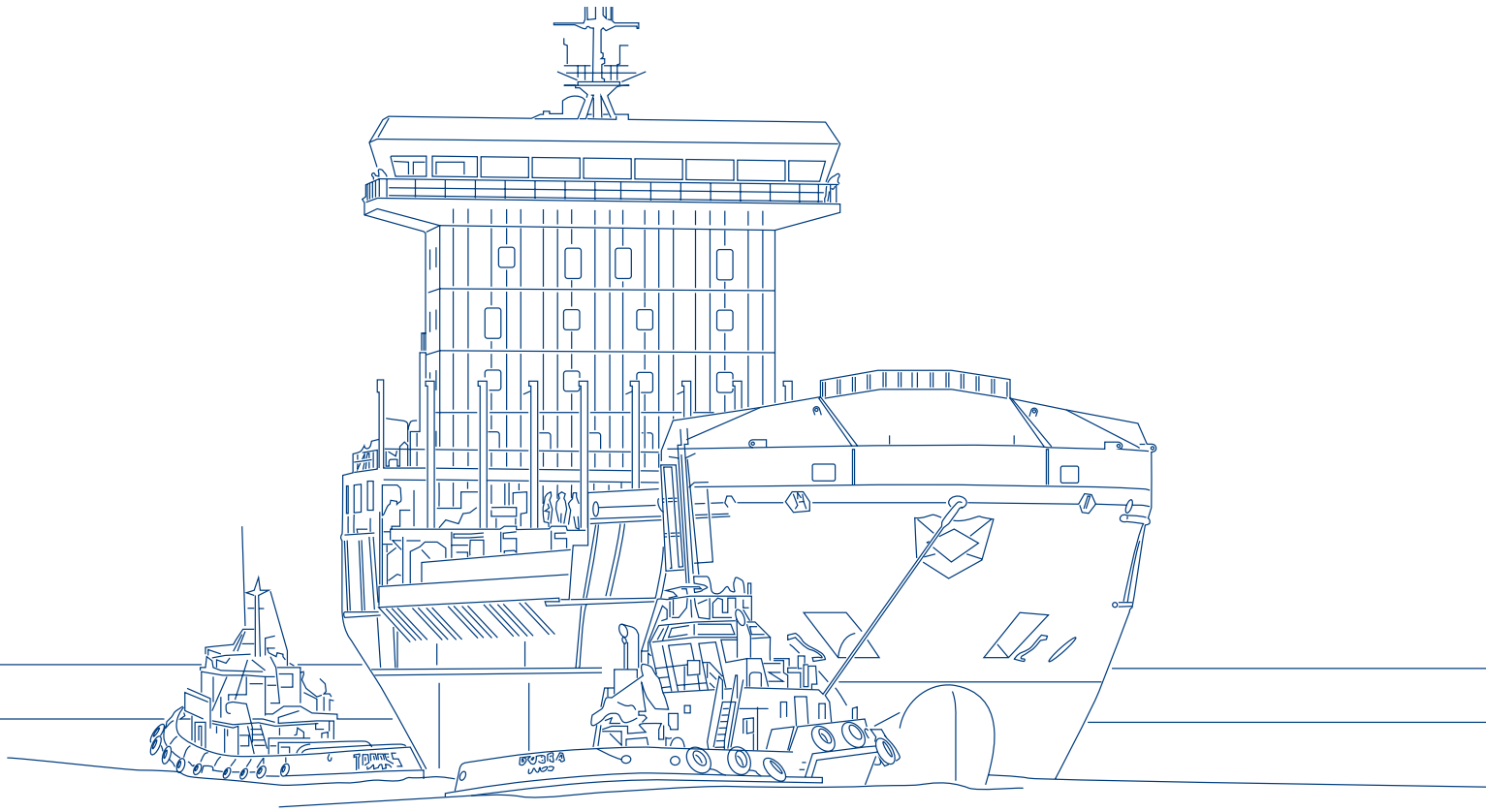

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been used for the carrier, but Foran V70, R2.0 is used for the T26 and the T45 (AAW) projects. The T26 has 300 Foran users dealing with the advanced initial design phase (schematics, scantlings, etc) and starting the detail design phase. BAE adopted FSYSD Jan 2014. It has a modern feel and initial user perception is that it is easier to use than PIGRAM (e.g. moving data is easier, all symbols can be viewed before insertion and equipment 3D Models can be viewed). Challenges now faced include the fact that PIGRAM Core Dependant Functionality is unavailable in FSYSD and 3D Model/Diagram links are too inflexible. FSYSD is being gradually modified to fix the issues. BAE find that visualisation brings to life complex design and product information and is an ideal platform for non-CAD users to view model & PLM data in one place. It enables real-time networking both internally and with customers/suppliers.

Prabjot Chopra, Seatech Solutions International, dealt with the integration of early design with production design for concurrent engineering. He described Seatech as a happy Foran user having used Foran since 2000 and currently using V70. Having discussed various projects and the use of laser scanning to create data on existing designs for reverse engineering, he said that the ability to convert 2D CAD to 3D modelling in Foran could streamline the design phase by 25%, allow easy modification of hull lines and speed up the process of production drawings. Reverse engineering would benefit from a processor for converting laser scan data into a 3D Foran model.

Ricardo Rozados, ABANCE, said that shipyards must use modular construction, with some pre-outfitting to shorten delivery times and improve overall efficiency. He spoke of a Working Island (WI) Philosophy in which the 3D model is split into modules. WI is applied where services can be grouped in units that are totally independent from a functional point of view and allows a simplification of surrounding areas. WI once performed allows total flexibility in future projects. The final number of modules used in a space depends on the complexity of that space.

Juan Soto, ASMAR, said Foran software can be used in studies of electromagnetic compatibility. Equipment locations and emission patterns must be accurately known. The worst case scenario will be when all equipment is working. The application of Foran has contributed to better development of detail engineering and improved the installation of electronic equipment, helping to solve the EMC problem. This has increased the efficiency of the work onboard, reducing the costs of materials and labour significantly.

Yiqi Song described the China Ship Development and Design Centre's experience with Foran, first used in 2008 for the design of a civil ship. Results were very satisfactory, the design being completed in four months. Now, Foran is used as the main 3D software in the design of civil ships, the modelling and 2D drawing being more convenient than with CADDS5. Foran has been used in the design of military ships since 2008. Some instances were quoted of developments of Foran by CSDDC to meet China's specific needs

Fernando Alonso, of SENER, spoke of SENER's current work to improve the integration of CAD and PLM systems. The aim is integration rather than interfacing, using the most advanced PLM products which are commercially available. The results will be released progressively over the next two years.

Mun-Seob Cho, SENER, Korea, said Foran has been in use since 2011 and experience indicated that one year is adequate to adapt Foran to a specific shipyard environment. Advantages found were reduced design costs, earlier start to production and better overall design consistency.

Rodrigo Pérez, SENER, discussed developments related to the initial design stages, which is when the most important decisions are made and the greatest costs committed (although not then spent). The current use of 2D models in early design which feed into 3D models for production can lead to inconsistencies, extra time and cost. The aim is to use 3D modelling from the start with common software in all disciplines leading to a single software in all design stages, quick evaluation of design alternatives, efficient management of modifications and seamless transition to detail design. Extensive use of virtual reality is envisaged.

Augusto Gómez, SENER, said the expansion of Foran in the offshore industry is one of the main goals set out in the Strategic Plan for 2014-2016. Although offshore engineering detailed needs (e.g. the use of tubular structures) differ from those of traditional shipbuilding the basic philosophy and approach of Foran fits smoothly with the underlying needs. V70, R3.0 with many improved features is due to be released in July.

Rafael Martinez-Abarca, SENER, outlined the capabilities of V70, R3.0 and future developments leading to V80. In V70, R3.0 FBasic (the naval architectural modules) is being improved with new lightship definition and customisation of stability criteria. In December Flood, FSubd and Launch modules will be available. A wide range of improvements should meet user stated needs and improve user friendliness – in pipe systems, air conditioning, electrical systems and in FViewer.

V80, due for release in the latter half of 2015, will incorporate changes to assist the offshore industry, introduce new functionalities to cover Asian shipbuilding procedures and standards and a new approach to welding. SENER continues to increase its investment in Foran and is committed to improving it in the future. The driving forces are SENER's vision of the future, client needs and SENER Ship Design Department requirements.

One could summarise the general situation as one where clients felt they had been provided with a very good system – but, like Oliver Twist, they would like more. This desire for more capability is due to the success of the system so far and SENER can take it as a compliment not as a criticism. Its general success and acceptance is shown by the fact that Foran is licensed to more than 150 shipyards and SENER has design offices in 30 countries. *NA*

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Making every vessel a showcase of the sea

Taizhou Kouan Shipbuilding endured the market crisis by changing its way of thinking, focusing on meeting the real needs of vessel owners, shifting from "merely taking orders" to "grooming the market to generate orders", writes Li Jian Hua

In 2013, upholding the long-standing culture of Taizhou Kouan Shipbuilding Co., Ltd (Kouan), which aims to "value and deliver each order with integrity and for a win-win result", and focuses on "market development, structural adjustment and landing orders", the company's sales and marketing team actively developed markets for Kouan. It secured 53 new vessel orders with tonnage totalling 3.5 million DWT with production lined up till 2017. According to the company's chairman Wang Jun Ze Kouan has ridden out the market crisis.

Senior executives of the company's sales and marketing team talked about their experiences and methods for riding out the storm.

Kouan's focus is to develop overseas markets says team head Chang Qiau Hua. Kouan earns customer acclaim because of its emphasis on finding 'win-win' situations. The company had orders in hand for more than 40 vessels when the financial crisis hit in 2008, however, none of them were withdrawn, a rare phenomenon given the prevailing market environment. In 2009, knowing that shipbuilders would not be the only ones hit by the financial crisis, but ship owners also, Kouan staff led by Chairman Wong Jun Ze visited shipowners and offered to share with them the company's profit from the drop in steel panel prices. The offer did not fall on deaf ears.

Disagreement between shipbuilders and shipowners is common in the shipbuilding process. This is exactly why Kouan staff took on its bridging function and looked at things from the shipowner's perspective. Chang said, "We always analyse a shipowner's request carefully and, if it is reasonable, we will do our very best to oblige. When it is unreasonable, we will explain and relate our rationale to the shipowner and, in most cases, they understand. We have not had an unresolved issue so far."

Kouan's service to shipowners does not stop after delivery. For example, the owner of a vessel delivered some years ago needed the vessel's design plans for another shipyard to help with the repair of the vessel.

The company at the 2012 SMM show in Hamburg, Germany

Chang said: "On learning about the owner's need, we immediately asked our technical team to make arrangements. For us though, that was no big deal, just us showing respect to shipowners taking seriously even their smallest needs, and that helps us leave a good impression in their minds," he said.

"Trophies can't beat the words of mouth of shipowners, 90% of our returning customers are shipowners. In 2006, when the market was booming, orders flooded in and, with shipways in demand, we set our priority and took orders for four 27,000 multi-function vessels from COSCO Group and earned its trust with 'operational as well as quality integrity'. In 2008, when the global financial crisis hit and orders were few and far between, COSCO Group asked Kouan to build six 27,000dwt multi-function vessels, a 'return favour'. Of course, many of our new ship owner customers come to us because of the good words they heard from our long-time customers," Chang added.

Sales on the frontline

Facing a harsh and complex market environment, the company came up with the strategy of "adjusting both its markets and product portfolio". In November 2012, it established a second sales and marketing team to help it grow the domestic market.

Head of the new team Qiao Han Jiang said, it is like "a room with two windows", allowing more information to come and enhancing the company's ability to process and handle that information. The team though young has achieved a lot. In a year or a little more, it has landed for the company contracts for 15 bulk carriers each of 38,500dwt, eight ro-ro passenger ships, five marine engineering vessels and three deep-sea fishing vessels. As a result of the hard work of the team, new products have been added to the company's range of standard bulk carrier products and two heavy- weights, namely CNOOC and China Railway Construction Group, joined the Kouan client list.

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According to Qiao, members of his team have been seconded and from different functions of the company do not have prior experience in sales and marketing, hence they have to learn by doing the job and to hasten their understanding of the team's roles and responsibilities, the company regularly organises visits for them to advanced shipyards and design companies that they may acquire essential knowledge including different special shipbuilding techniques and how tenders are properly prepared. The team, Qiao said, with down-to-earth long-time workers and super-charged young workers, has worked as one complementing each other, tackling every job with tenacity, following up on intentions, preparing tenders on receipt of required information and, after a contract is secure, making sure of satisfactory delivery.

The team has recently closed the deal with a domestic ship owner on four 55,500dwt multi-function vessels. Qiao explained that his team members had maintained communication with the customer starting from learning about the intention and contacting the customer to sign the contract, phone calls were exchanged with the customer several times a week and meetings were held regularly and as needed. At the tireless effort of the team, the company can expect down-payments from the customer soon and the contract to take effect right after.

In the first half of 2013, SDARI told Kouan that an American shipowner wished to order several 38,500dwt bulk carriers. At the tip-off, the company's assistant general manager Yang Chun Xie and the team's deputy head Yu Wai Li contacted the intermediary right away to invite the shipowner to come visit. The shipowner was impressed by the production capabilities and technological knowhow of the company as well as the attentive reception given by the shipyard and, in subsequent negotiations, the team, which displayed precision and professionalism in its grasp of the technical specifications and contract terms, won for Kouan a contract for the 15 bulk carrier order.

Qiao said: "The team is the striker at the front, but they cannot win the game without a substantive backend buttress. It is critical for the company's management to stay true to its grand plans and objectives, for the technical arms to render support and the production regime to guarantee delivery, giving our sales colleagues the foundation and backing to win customers."

Creative thinking

Taizhou CATIC Shipbuilding Heavy Industry Limited is a joint-venture holding company set up in 2007 by Kouan and AVIC International Beijing Company Limited. Its sales team is responsible mainly for bringing in large-size shipbuilding contracts. There is a division of labour among it and the two Kouan teams, but resources are shared and the three work together. Deputy General Manager Teng Shiang, who looks after the team, is on the road three quarters of the time in a year attending to sales responsibilities.

> "Trophies can't beat shipowners' words of mouth, 90% of our returning customers are ship owners"

Teng said the team is valuable to the company not so much in landing orders in an up market, which is easy, but in securing orders that can help the company through difficult times when market circumstances are harsh. To do that, sales personnel have to change their way of thinking from "merely taking orders" to "grooming the market to generate orders". He thinks, while the old and new thinking are both what sales personnel should do, they represent two rather different approaches in the former scenario the team waits for things to happen, whereas the latter requires one to be proactive.

Teng explains how the sales team grooms the market: "Firstly, we must have an in-depth understanding of the market and the true needs of shipowners. After the financial crisis subsided, between 2011 and first half 2013 in particular, the market was in a general slump and going through its toughest times. That, however, was the time for us to continue our marketing efforts despite knowing that they might be to no avail.

In the latter half of last year, Kouan and a German shipowner signed a contract for eight 208,000 bulk carriers. The negotiation was smooth. While market conditions to some extent were factored into the deal, credit also goes to previous promotions. Teng said, Kouan started discussions with the shipowner three years ago after its Chairman led a delegation to SMM 2012 in Hamburg, Germany to meet and introduce the company to shipowners including the now new customer and intermediaries in the country.

He said: "There are shipowners who want to build ships even when the market is at its worst, thus it is essential for us to understand the market and also shipowners. Some shipowners wish to build new ships, but cannot place orders right away because of financial difficulties or a lack of shipping business. Pinpointing their specific situations and problems, we provide them with value-added services to help them resolve their problems. In July 2012, we took orders from two domestic shipowners for two 38,000dwt multi-function vessels and two 39,000dwt multi-function vessels respectively and, knowing that the shipowners had financing difficulty, the yard leveraged its relationship with a major shareholder, AVIC International Beijing, and with help from banks provided the shipowners with added credit and they were able to commit to the contracts." To further ease financing for ship owners, Teng has also actively explored different financing modes and introduced them such as buyer's credit and rental financing.

Kouan's Chairman Wong Jun Ze said: "We delivered on our pledge made five years ago to 'not be the first to fall in the crisis and now we are very much inspired to push towards the goal of 'transforming and upgrading our business and becoming a top-notch corporation'. We have a corporate culture that stresses 'honouring the contract with integrity and striving for shared benefits with customers, valuing technological knowhow and practising stringent management to effect development, and putting people first including our employees and those in the larger community." *NA*

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Demystifying CFD

One often repeated mantra about Computational Fluid Dynamics is that it is revolutionising the marine industry. While this isn't quite the over-statement it used to be, the complete and unbiased story is still more complex. Dr. Richard Korpus, chief scientist, CFD, ABS, explains

Like many new technologies, it's easier to use Computational Fluid Dynamics (CFD) for collecting data than it is to benefit from that data in a practical business environment. CFD is very good at generating huge amounts of detail, but it isn't trivial to ensure the quality of that detail; nor is it easy to distil the detail into something useful for the decision-makers in the executive suites.

One might even say that there's both good news and bad news with regard to what CFD offers in the 21st century. The good news is that it's easy and inexpensive to use. The bad news is that it's too easy and inexpensive to use.

As recently as 10 years ago, generating a high-quality CFD simulation required so much expert knowledge that the users themselves practically had to be code developers. Commercial CFD providers have largely negated this problem, and also dramatically reduced the amount of time required. But, this is a mixed-blessing in that it's now easier to train engineers to run a CFD programme than it is to make them good fluid-dynamicists, or good designers, or experienced decision-makers. It might even be argued that CFD has had the opposite effect: that there's so much detail in a flow simulation that a user easily loses the "big picture". Differentiating between a good solution and a bad one (or even a wrong one) has not gotten easier, and being good at using a computer programme doesn't guarantee high-quality solutions every time. The old adage of "garbage in/garbage out" is very much alive.

Dr. Richard Korpus, chief scientist, Computational Fluid Dynamics, ABS, explains how CFD has revolutionised marine design

The complexity of extracting practical information from a CFD solution also should not be under-estimated. A single simulation generates tens of millions of data points, but practical design or operational decisions can take into account only a few dozen variables. Sometimes the step towards practicality is obvious, such as when the only important 'measure-of-merit' is vessel drag or shaft horsepower. This becomes more complicated when one considers a vessel-design study where hundreds of shape variables have to be considered and each combination has its performance quantified over a multitude of operating conditions. Even greater complexity arises when a design has to be optimised to satisfy multiple performance objectives, or when fluid/structure interactions are taken into account. The list goes on and on, and the process of using CFD data to support design, construction and operational decisions can become every bit as complex as generating the CFD data in the first place.

The bottom line is that to be truly successful integrating CFD into a marine business, a user needs to be both intimately familiar with a detail-oriented, state-of-the-art technology, and simultaneously sensitive to much broader business issues such as performance, schedules, economics, classification, regulation and customer satisfaction. The pool of candidates qualified in both areas is very small indeed, clearly dictating that good CFD practice needs to be an investment, not only in computer hardware and software, but expert personnel as well.

Figure 1: Bulb shape candidates

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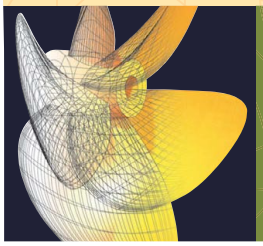

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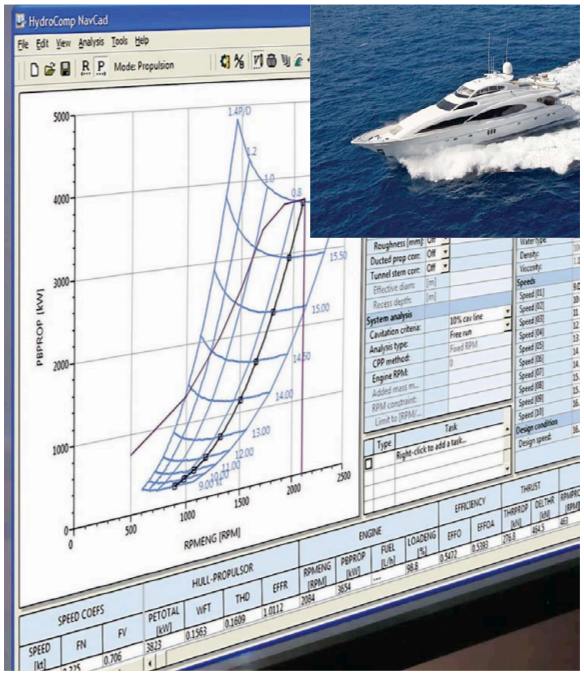

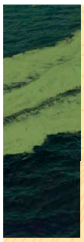

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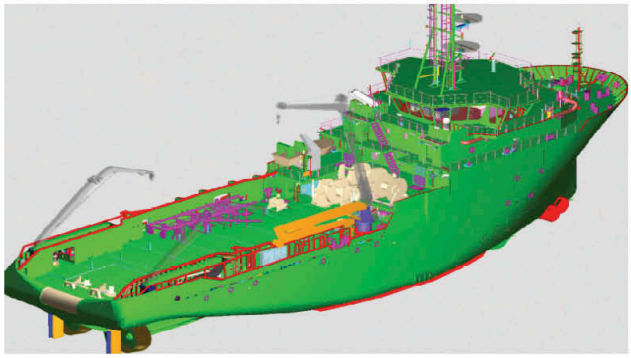

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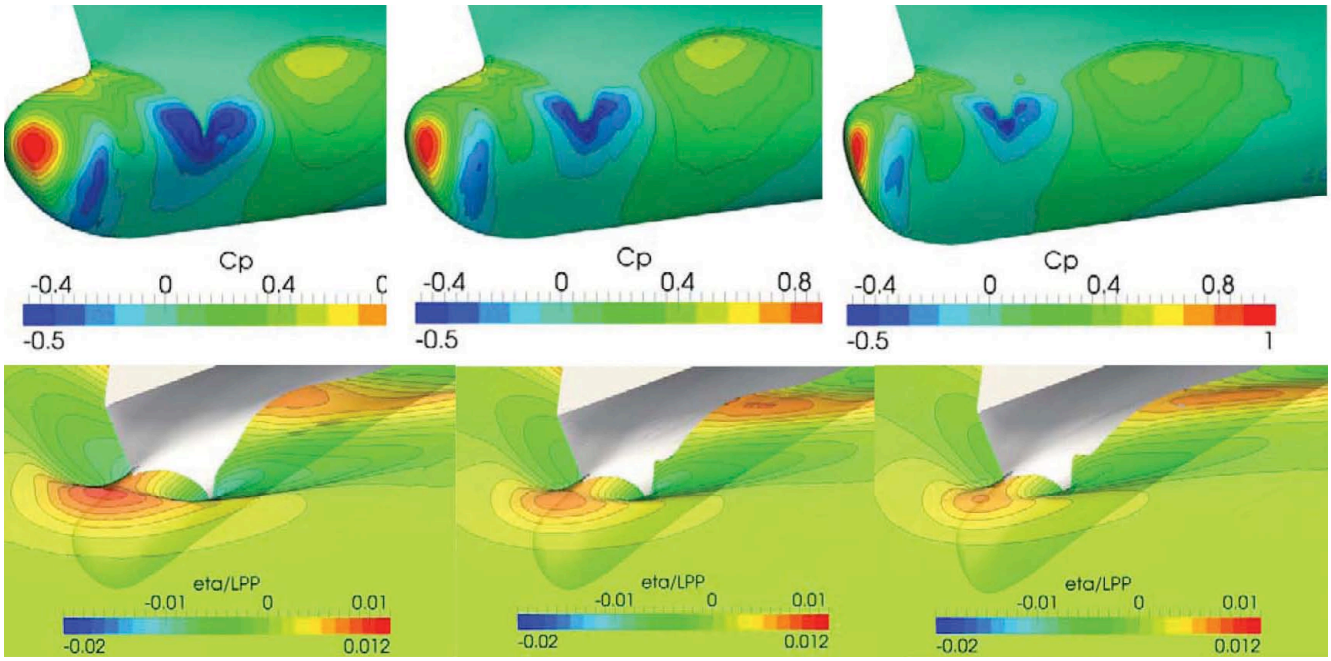
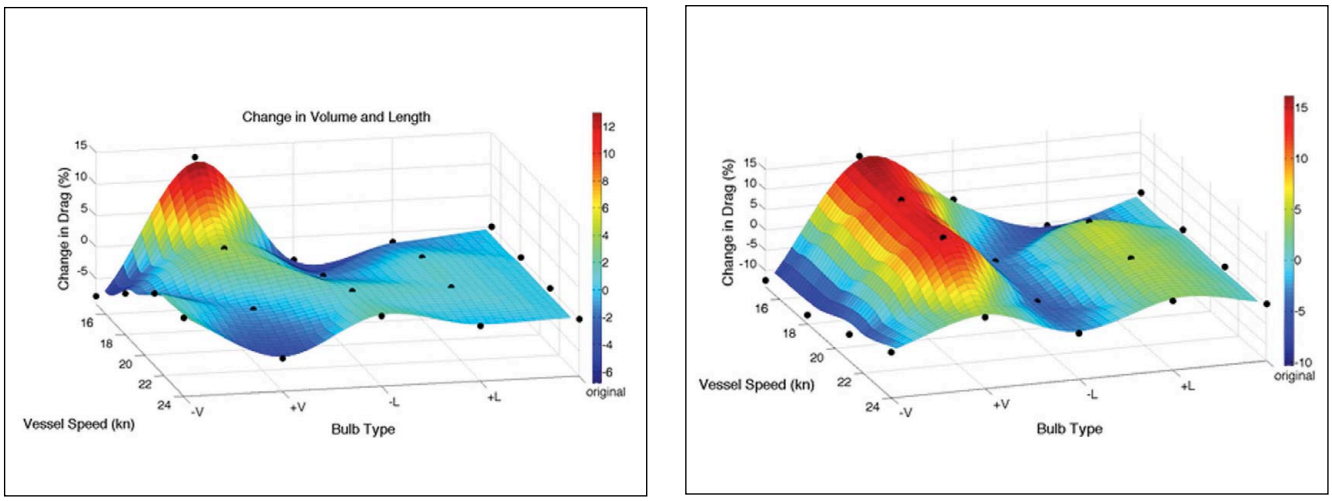


Figure 2: CFD results, pressure on top; free surface on bottom

However, if a business embraces CFD, even with all its shortcomings, the benefits can be staggering. For example, traditional ship-design practices typically allow only enough time for two or three passes around the "design spiral". Proper application of CFD allows for dozens - or in some cases hundreds - of design options to be compared. Adding to the efficiency is the level of detail provided by CFD. Model tests provide a single number: e.g. drag, or shaft horsepower. This means that a single towing tank experiment (supporting one pass around the design spiral) provides a very small amount of data for a relatively large investment in time and money. A designer can compare the performance of his or her creation to previous ships, but the tests provide no guidance as to why one design is comparatively better or worse. CFD allows the designer to look at the flow in any location around the hull and propulsor (including velocity, pressure, vorticity, streamlines, separation and even turbulence), therefore, allowing a performance problem (or improvement) to be related back to the specific design attribute that causes it. The design process is no longer evolutionary, but revolutionary.

Operators can embrace CFD with similar expectations. Model tests might tell an owner what his or her projected fuel savings will be for a given design or operational change, but CFD can analyse a broader range of changes in a smaller amount of time. CFD is regularly used to quantify fuel savings derived from slow steaming, changing a bulb, optimising trim, adding an energy-saving device (ESD), or from redesigning a propeller. It identifies where an operator's resources are best allocated to provide the greatest return, lowest up-front investment, or shortest payback period.

Figure 3: Comparison of design performance



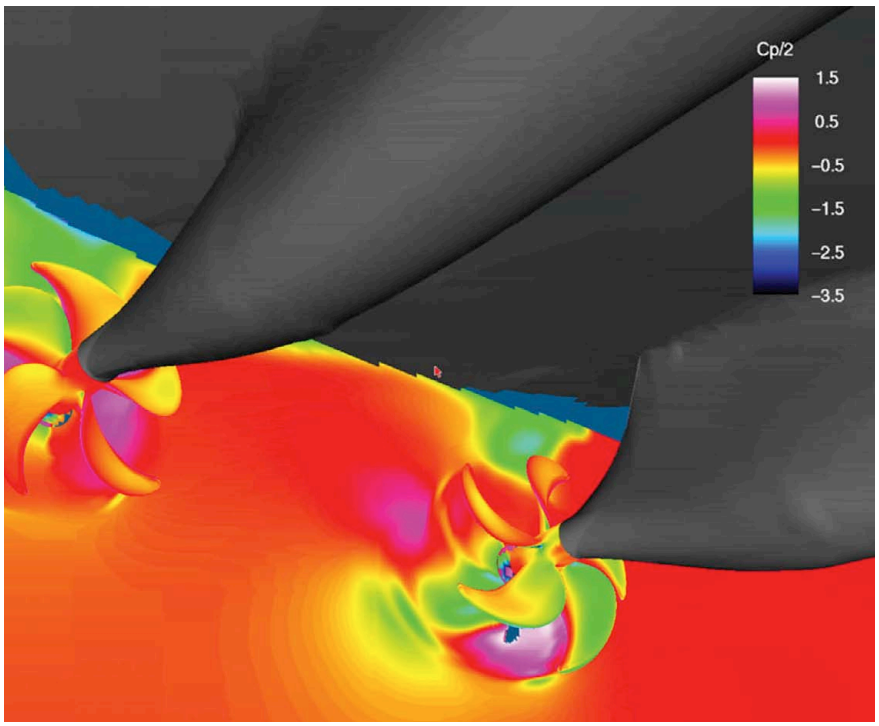


Figure 4: Propeller pressure during a crash turn

There are two more advantages to CFD that often escape non-practitioners. The first is that CFD, if properly applied, can obtain a greater level of repeatability than the tank. While both methods have small levels of inaccuracy, the components that are random are more easily controlled in the computer than the towing basin. This makes CFD the better tool for identifying the small improvements and subtle trends designers and operators seek to improve the bottom line. This is not to say CFD is always more accurate than the tank in terms of absolute value, but just that it can be more easily trusted to identify trends in small performance changes.

The second, seldom-heard advantage is that CFD can eliminate uncertainties from the effects of scale. Towing tanks are obviously limited to using very small-scale models. Over the decades experimentalists have gotten very good at extrapolating their results, and one might even argue that for traditional applications (bare-hull resistance tests, self-propulsion tests, etc.), tanks yield more accurate predictions of full-scale performance than CFD. But, for non-traditional applications such as ESDs, where little previous experience is available and the model scales are even smaller, first-principles approaches such as CFD build experience faster, and with fewer uncertainties.

Here, a case study of how CFD can be used to improve a business will prove instructive, and the American Bureau of Shipping (ABS) is an excellent example. With the onset of the International Association of Classification Societies (IACS), organisations such as ABS have had to look for new ways to increase their comparative ability to help keep people and the environment safe by supplementing and improving their traditional rules-based businesses. For example, class customers might want to reduce their scantlings, but predicting the loads for some of the more limiting design cases (severe sea states, for example) has always proven difficult. CFD provides a first-principles, physics-based approach, for estimating those loads, yielding a safer way to assess a customer's request. New regulations, such as the Energy Efficiency Design Index (EEDI), also pose new challenges for class because reliable methods are needed to predict what those indices might be. An owner may want to reduce total installed power to meet EEDI, but will need to check that adequate sea margins still exist. Again, CFD provides the perfect tool.

ABS realised CFD would help to improve the maritime industry's safety and environmental standards, but was realistic enough to know that integrating it into their mainstream business would not be trivial – that good news/bad news scenario again. We started by identifying the most significant roadblocks to CFD, and put a plan in place to address the most common and time-critical problems first. The list included obvious requirements like software, hardware and qualified staff; but it also addressed essential technical and implementation-related

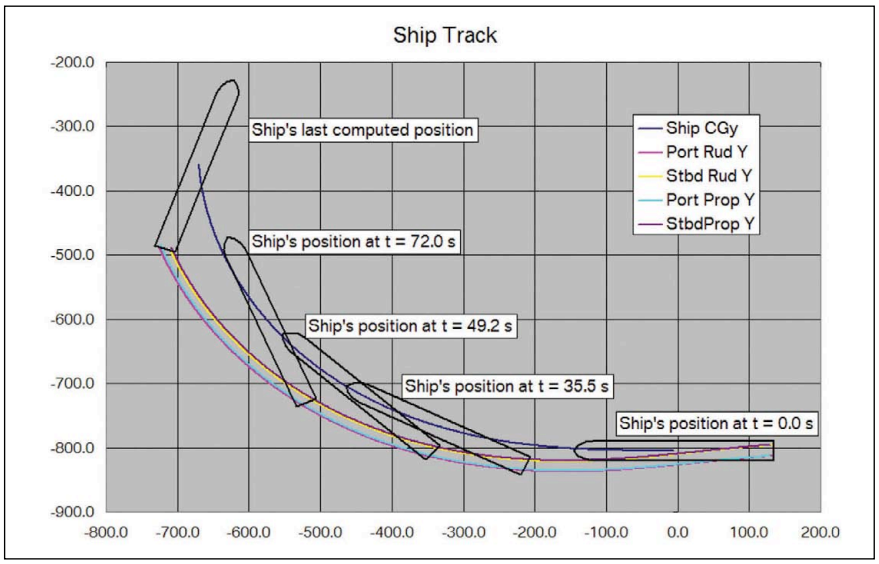


Figure 5: Ship trajectory during a crash turn

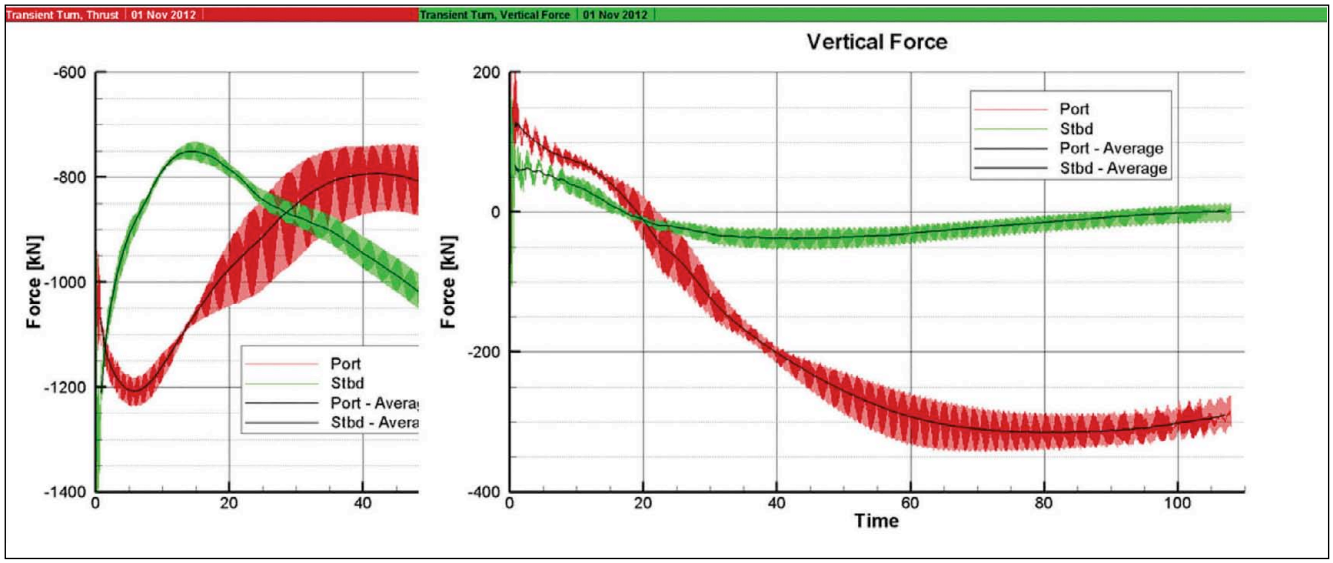


Figure 6: Representative hub force time histories during a crash turn

requirements. Some of these capabilities could be acquired and some had to be developed. In either case, time was allotted to build up sufficient experience, establish quality controls and create best-practice standards. Examples of some of the technical areas where the development of new capability was required include performance optimisation, hull-form modification, fluid/structures interaction and the prediction of extreme loads.

Implementation issues prove just as important as technical ones for ABS, because standard procedures for "best practices" are essential to enable fast turnaround times and reliable standards of quality for solutions. A high level of automation is also essential for applications where large numbers of simulations are required. For example, optimising a hull or propeller requires hundreds to thousands of CFD simulations. This is simply not practical (or possible) with traditional "man-in-the-loop" engineering. Everything from design generation, to CFD model creation, to run-time control and monitoring, to post-processing has to be completely automatic, including feeding the ultimate performance predictions back to an optimisation process. The best CFD technology in the world won't be much use to designers, builders and operators unless essential requirements for turnaround time and quality control are met.

A few examples from ABS's service offerings for assisting industry will help to demonstrate the huge potential of CFD to this sample business sector, using a case study from each of the three stages in a ship's life: design, construction and operation. In the first example, a customer wants a design house to customise a standard containership to improve its EEDI over a route's specific set of operating conditions. The design brief restricts changes to just the bow, so a range of bulb shapes is analysed with the goal of minimising resistance (propulsive efficiency is known to be insensitive to bulb shape). Figure 1 shows how just two of a myriad of bulb-shape parameters (length and volume) can be used to morph the bulb into a range of design options.

Each design is tested using CFD over the owner's range of operating conditions (three displacements and four speeds) and the total resistance post-processed from each simulation. A typical set of designs is compared at one speed and draft in Figure 2 (surface pressure at top, free surface elevation at bottom). Figure 3 shows the comparison of total resistance for each design at each speed and each draft and depicts how a design choice impacts upon each part of the operating envelope. Finally, a design "measure of merit" is built up from the resistance at each condition by weighting the resistances according to the percentage of time spent operating at that condition. The designer selects the lowest overall measure of merit, but can also study changes in total resistance (and therefore fuel costs) for various combinations of operating conditions.

An example more pertinent to ship construction addresses the alignment of propeller shafts and milling of stern-tube bearings. This has always proven a tricky bit of engineering due to extreme off-axis loads acting on a propeller during manoeuvring. But, even more demanding challenges are now appearing due to higher powered ships and minimum ballast steaming. CFD can assist here as well by simulating the ship and propeller operating through a turn and then extracting the hub loads to apply to the shaft structural design. Stern tube bearings support the predicted structural loads, so CFD is called upon a second time to predict oil film performance according to a fluid/structures interaction (FSI) approach.

Figure 4 shows a snapshot in time from the first step of this process: simulating the flow around a twin-screw container ship executing a crash turn. Colours on the propeller blades and a wake cutting plane depict values of pressure coefficient. Figure 5 shows the predicted trajectory, while Figure 6 shows a subset of the propeller hub forces. Note that the time histories contain both low frequency components (unsteadiness commensurate with the rate of turn) and high frequency components (blade rate).

Intellectual Property Rights & the Small Craft Designer

One Day Seminar

16th September, RINA HQ, London, UK

Following the success of the first Intellectual Property Rights (IPR) and the Small Craft Designer Seminar held in 2012, RINA will be holding a second Seminar on 16 Sep 2014, in London.

Intellectual Property Rights (IPR) are an increasingly important part of a company's value. As developed countries increasingly move to knowledge based economies, protection of IPR becomes both more difficult and more important for the small craft designer and builder, particularly in a more competetive market. In a global marketplace, international protection of IPR is complex and generally not well understood by the small craft designer and builder.

The one-day Seminar on will provide designers and builders of small craft with an understanding of IPR law and the extent to which it protects inventions and designs. The seminar will consist of a number of sessions in which presentations on various aspects of IPR will be given by experts and practictioners, followed by discussion. The Seminar will also include case studies giving examples of IPR battles won, lost or in progress. For more information, please visit our website.

Registration Fee
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www.rina.org.uk/IPR_Seminar_2014

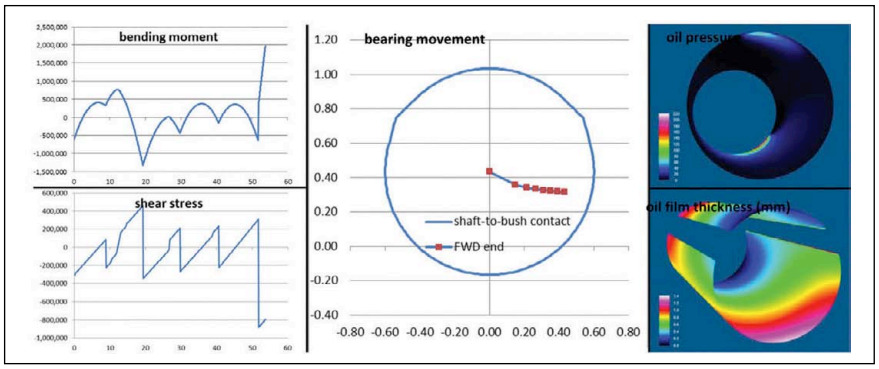

Figure 7: Shaft performance (left); displacement (centre); and oil film performance (right)

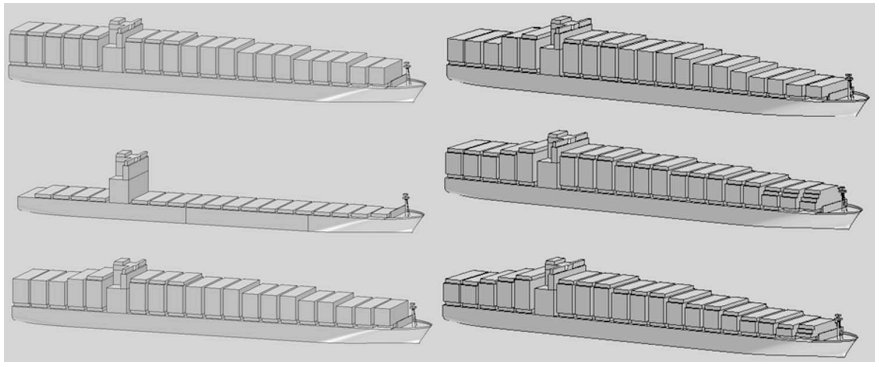

Figure 8: Container loading scenarios

The predicted forces and moments are applied to "drive" an FSI simulation of the propeller shaft and supporting bearings. The shaft deflects under load, changing its position and angle inside each bushing. The bearing oil channel loses its symmetry, and thereby creates supporting forces and moments. An FSI simulation can be made using CFD to predict bearing oil pressure and finite element analysis to predict shaft displacements. Results from one instance in time are shown in Figure 7, where shaft structural behaviour is shown at left and bearing performance (oil film pressure and thickness) at right. The centre part depicts the trajectory of shaft movement and indicates whether metal-to-metal contact occurs (i.e., the trajectory and outer limit circle intersect). A similar FSI is made for each instance in time and the collection of all such instances interrogated to find worst-case bearing movements. If shaft-to-bushing contact occurs, the bearing oil CFD model can be changed until a new design is found that negates or minimises contact. This example is particularly striking in that it uses one of the most advanced engineering tools available today (literally, rocket science) to impact the job of the hardhat aligning ship bits in the bottom of a dry dock.

The final example pertains to the use of CFD in ship operation and summarises a study to develop container-stacking strategies for minimising an operator's fuel bill. Air resistance is normally responsible for only a small portion of a ship's total propulsive power, but in the case of fully loaded containerships this value becomes more substantial. Figure 8 shows a number of scenarios for loading, while Figure 9 compares the wind drag from each scenario. The headings in each graph depict headwind angle and speed. Experimental results are included to highlight that the two don't always agree, but that they at least trend similarly. It can be seen that huge savings are possible just through careful positioning of containers.

CFD is obviously a versatile tool for design, construction and operation; in the right hands, it can provide enormous benefits to a maritime business. Some caution needs to be exercised because implementation is not as easy as merely running a canned computer program. Experience and establishment of best practices are essential; both require patience, qualified personnel and time. Businesses that do not require CFD on a full-time basis might be better advised to avoid these problems and seek out qualified consultants. Businesses that do anticipate CFD being a core part of their offerings should be aware that the seamless integration of "high-tech" and "customer-oriented" service offerings is not trivial, or easy. But, regardless of how large the role of CFD in a company's offerings, there is no doubt it will vastly improve a business's reputation and help to lower its operating costs. *NA*

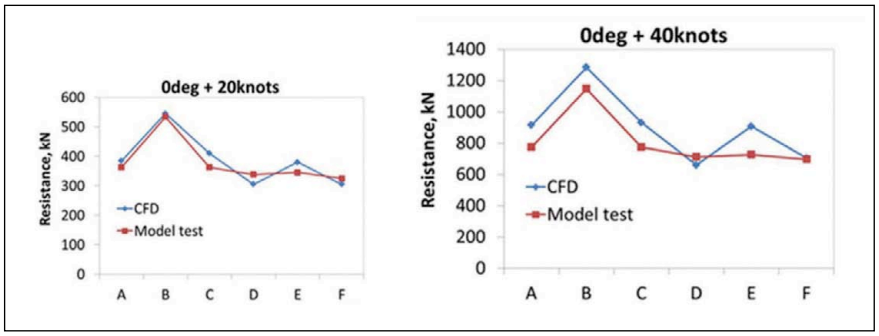

Figure 9: Wind resistance due to loading

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Robo-tank offers measured response

Students from the University of Tokyo put forward proposals for the Robot Tank System combined with a data management system by using an RDF metadata set

Since 2013, regulations on energy efficiency for ships using the Energy Efficiency Design Index (EEDI) have been introduced. In calculating EEDI, it is necessary to plot the precise power curve, as a result of this regulation more accurate tank tests will have to be made.

Improvements in accuracy and efficiency of the tank tests can be realised by robotic technology. In addition, a platform will be necessary which can manage measured data from tank tests, CFD codes and real-ship operations. Currently, there are various formats of data such as time-series data, image data and so on. Few efficient methods have been introduced for data analysis, which will enable multimedia data management. Many challenges still remain in the data management of tank tests.

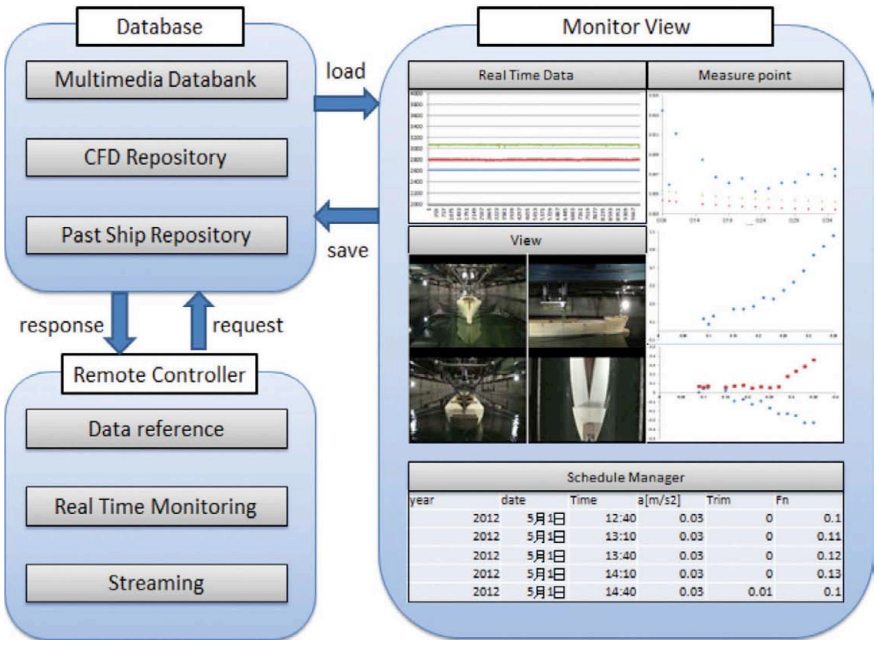


Figure 1: Conceptual schematic for 'Robot tank system (RTS)'

Robot tank system concept

The Robot Tank System (RTS) is a concept which can do tank tests automatically using robotic technology, CFD. The results of tank tests and CFD are recorded by RDF (Resource Description Framework) database, which can retrieve the results of past data efficiently. From a view point of software, this whole system accumulates various measured data in tank tests and stores it with other data such as results drawn by CFD and the results of past tank tests. With some interfaces, users can search, refer and contrast these stored data easily. From the other point of view, hardware, actuators and sensors will need to ensure a real playback of experiments and save labour, which have been spent on conducting experiments.

Data management system

An integrated management system for various measured data has been developed. This developed system is a part of the RTS concept that enables the input, search and analysis of the information from tank tests.

As written above, there are various data such as time-series data, image data, and the attributes of the tank test and so on. However, the current data management system is not suitable for retrieving tank test data. Therefore, this system manages the various measured data in tank tests with RDF metadata. The merit of RDF metadata is it is easy to change the database structure. It is considered that users want to add new items in to the database or to change the database structure on applying this system to EEDI regulation, new type of ship design and new experiments. For handling RDF metadata, SPARQL (SPARQL Protocol and RDF Query Language) and Apache Jena is used in this system. SPARQL is a computer language for working with data described with the structure of RDF. Apache Jena is a toolkit for the utilisation of RDF data in the Java Runtime environment.

Interface for search results

Figure 2 shows the interface for searching the results of tank tests. This interface includes a search box, the plotted graph and the list of experimental results.

Users can search on the top right of this page by inputting their query in the blank fields for the date, type of tank test, draft condition, and so on. This search box can be called from all interfaces in this system.

The tank test results can be collected by narrowing down the search and are plotted on the graph. The horizontal axis expresses the Fn (Froude number) and the vertical axis expresses the Ct (Coefficient of total hull resistance). In the list below the graph contains the date of the experiment, the type of experiment, Fn, water temperature, Ct,' and links to the web pages on which experimental results of tank tests are displayed. Each result is linked to the interface for displaying results by hyperlink.

Experimental conditions, measured data, recorded videos and other multimedia data are shown in the interface for displaying results of tank tests as provided in Figure 3. This interface can visualise voltage data from resistance dynamometers, potentiometers and current meter, image

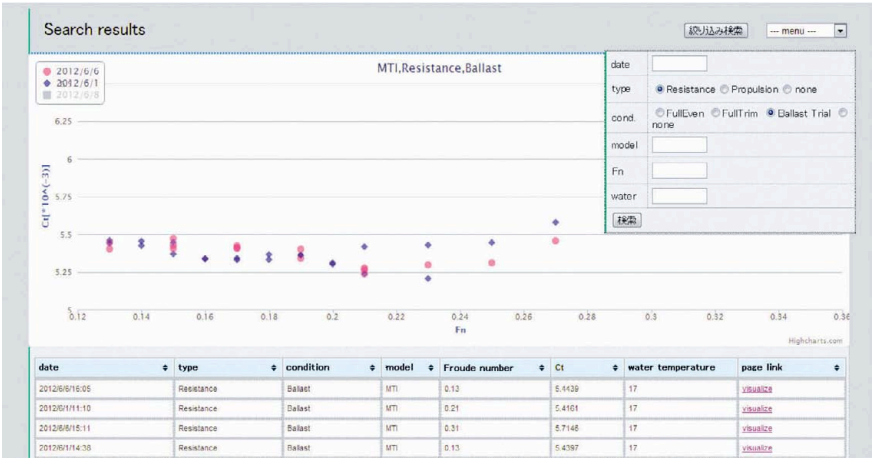
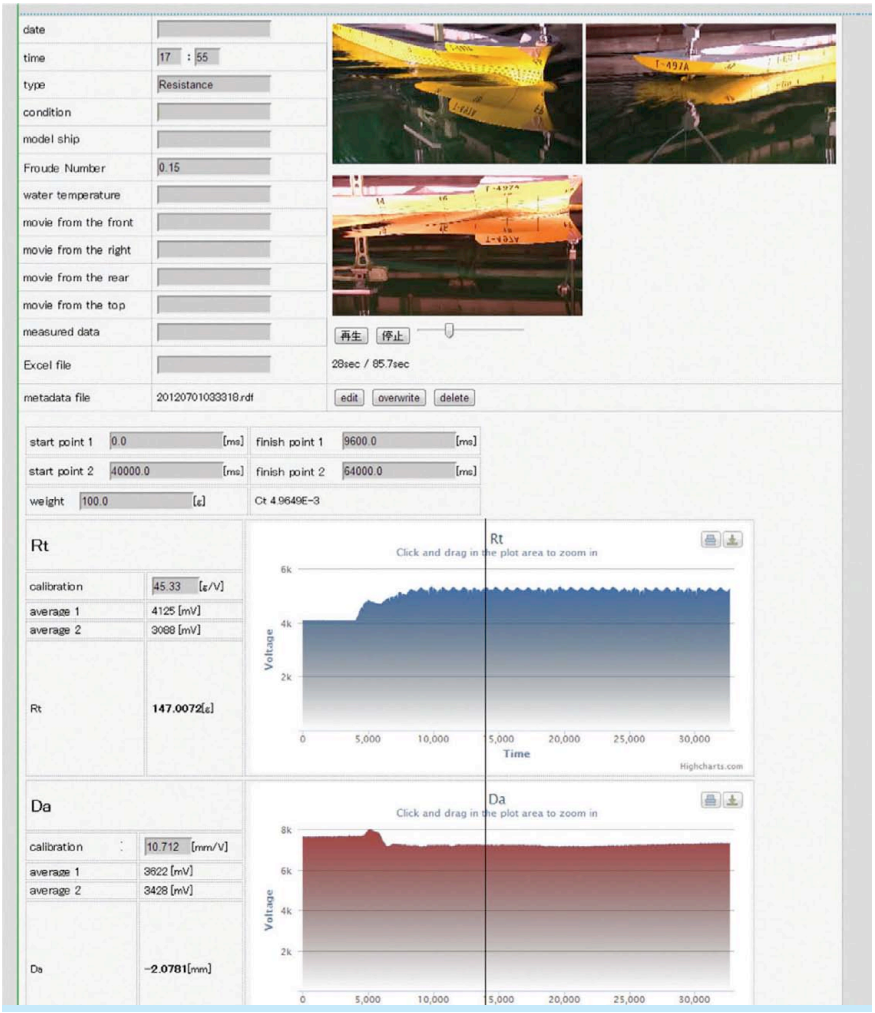


Figure 2: Search results of tank tests

and movie data such as wave height and videos filmed in tank tests.

Measured data, which contains time-series data, is shown in graphs. These graphs display a time on their horizontal axis and voltage values on the vertical axis. On the graphs the black lines show the position of which represents the playback position. Users can compare and contrast the graphs and videos pertaining to the line.

The contents of referred metadata are listed in the table on the right. These fields can be edited and the modified values can be saved.



Other interfaces

In this paper, two interfaces are explained in detail. However, there are some interfaces and functions for managing the experimental data of tank tests in this system. For example, the interface for model ships is developed. Each model ship has its individual character, such as Lpp (length between perpendiculars), displacement, wetted surface area, etc. An interface for model ships information tells these draft conditions and also notes about model ships written by other workers and experimenters.

In addition, this system is related to a schedule management system using Google Sites. This system can support the collaborative management of tanks for many researchers and administrators by sharing the information with others.

Conclusion

This paper proposed the concept of RTS. RTS is a concept which helps automated tank tests using robotic technology. The RTS concept can be realised on a platform, which can manage various measured data in tank tests, CFD codes, and real ship operations.

To realise this concept, a data management system was developed as a part of the RTS by using an RDF metadata set. This system contains several interfaces for managing the data of tank tests. Users can search the past data of tank tests efficiently by using the search interface. The interface displays the results of tank tests and can visualise the synchronised experimental data of tank tests. Other interfaces for model ships, laboratory notebooks and schedule coordination are also available for comprehensive data management.

The authors Hiroyuki Yamato, Kazuo Hiekata, Taiga Mitsuyuki, Yu Kawano, Masakazu Enomoto, Yoshihiro Tsuchiya, Shinnosuke Wanaka are students at the University of Tokyo. *NA*

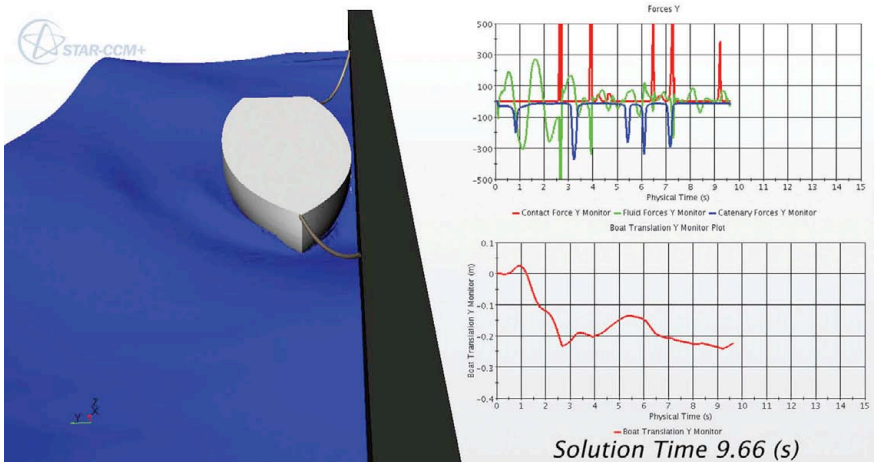
Figure 3: Interface for displaying results of tank tests

CD-Adapco launches STAR-CCM+ v9.04

Simulation solutions provider CD-Adapco has launched the latest version of its software, claiming new benefits for the user

Customers can expect to see reductions in overall time-to-solution and dramatic gains in productivity using STAR-CCM+ v9.04 workflow improvements, parallel meshing and optimisation capabilities. The addition of new physics models allows users to perform increasingly realistic CFD and CAE simulations that more closely represent the real world conditions under which the product will operate.

"With STAR-CCM+ v9.04 we have continued to add new modelling capabilities to our software. This allows users to easily simulate applications that were recently in the realm of intractable research projects, while simultaneously improving the accuracy of results for existing applications," said senior VP of Product Management, Jean-Claude Ercolanelli. "The development of the STAR-CCM+ v9 release cycle remains completely focused on increasing the realism and accuracy of CFD and CAE simulations while delivering optimal results for customers in the shortest amount of time."



The contact coupling model used with the catenary coupling model in this example of a moored boat

DFBI Contact Model

The dynamic fluid body interaction (DFBI) model for simulating the motion of floating vessels is a known tool in the STAR-CCM+ package. The DFBI model is a six degree of freedom (6DOF) solver that calculates the motion of a moving body from the fluid forces and moments acting upon it, while overset mesh allows bodies to freely move in response to those forces and moments without tying the mesh in knots.

The latest addition of the DFBI Contact Coupling Model would be of particular interest to naval architects and marine engineers, says the company. This model for the DFBI solver, allows users to directly model contact and collisions between moving bodies and boundaries. The DFBI Contact Coupling joins the existing Linear Spring and Catenary coupling models for modelling additional (non-fluid) forces acting on DFBI bodies.

While the DFBI approach allows for the simulation of multiple floating bodies, until now interaction between those bodies was limited. With the release of STAR-CCM+ v9.04, marine engineers and naval architects can now model contact between DFBI objects - such as the collision between two vessels, or between a vessel and a harbour wall.

CD-Adapco explains that in the modelling process the normal contact force is based on a spring and damper model, which acts once the DFBI body comes within a specified distance from boundaries. The further the body travels over this line, the greater the repulsive force, a bit like an aircraft carrier trap, allowing objects to be stopped before impact.

In addition, the latest update also includes further features such as concurrent Per-Part Meshing that allows users to mesh large and complex assemblies by assigning each part to a separate parallel processor. This allows users to leverage as much computing power as they have available to wrap and mesh (or remesh) the geometry. This is particularly useful for aerodynamic wake simulation of large vessels, which require the full complexity of the geometry to be captured by the computational model.

STAR-CCM+ v9.04 also has the option to perform a CAD robustness study. This study, performed before the full analysis, allows engineers to quickly check the robustness of their design ensuring that time is not wasted performing simulations that may fail due to problems with geometry regeneration.

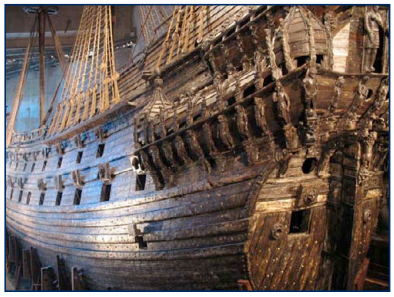
Another feature, the adjoint solver provides information about how changing the shape, flow field and boundary conditions for your vessel design will influence your cost functions which represents your engineering objectives (i.e. to minimise hydrodynamic drag). In common with parametric optimisation, engineers will often want to look at a combination of different objectives and how sensitive they are to their designs. The new expression cost function available in STAR-CCM+ allows you to mathematically combine cost functions into arbitrary formulas, providing you with both individual and combined sensitivities that can be used to more precisely guide the evolution of your design.

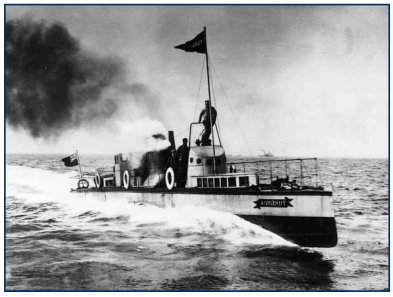
Enhancements to the field function editor allow you to identify dependencies between variables and create conditional expressions. It can be used to set up your physics (by specifying initial or boundary conditions) and to assess the quality of your solution (with monitors and reports). *NA*

The Royal Institution of Naval Architects

Historic Ships

25-26 November 2014, London, UK





Call for Papers

From the trader junks of China to the battleships of WW2, historic ships are an important link to our seafaring past. And as the skills and techniques used to construct and operate our historic ships fade out of living memory, now is an important time to highlight the struggles of researchers, enthusiasts and engineers as they preserve and restore our maritime heritage.

RINA's Historic Ships conference returns for a fourth instalment that will not only focus on the restoration and preservation of historic vessels, but also the research and investigation into the engineering and efficiency of historic designs through modern naval architecture techniques.

Papers are invited from naval architects, academics, and enthusiasts on all related topics, including:

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Cutting the drag

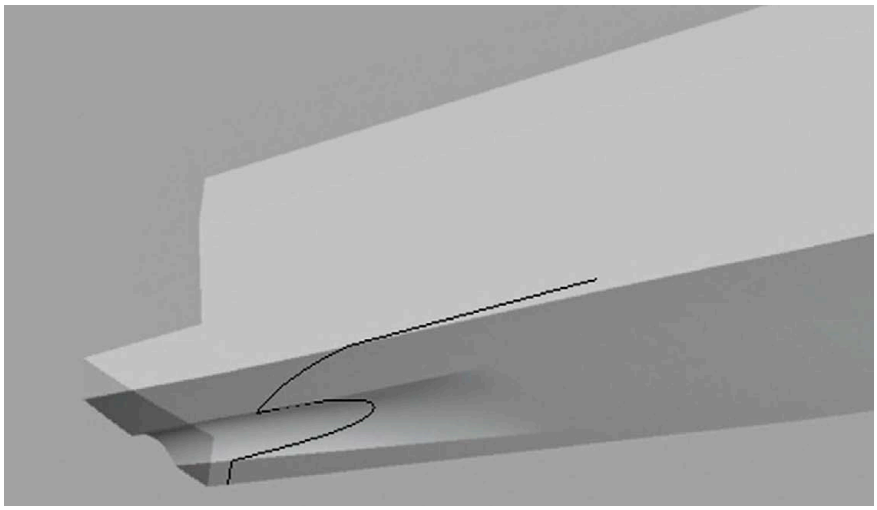
HydroComp has developed its latest Prismatic Wave Drag module for the prediction of ship resistance

The prediction of ship resistance can be accomplished in a variety of ways, from statistical parametric algorithms to computational CFD methods to model testing. The choice of which is best to use for a particular task depends on the nature of the task and the benefit-to-cost measure of the method.

Parametric methods are the technique of choice for analysis of entire physical systems, but their data set does not fully describe the shape of the hull. Model testing and CFD rely on full hull surface geometry, of course, but at significantly higher financial cost with specialised computational and man-power resources. This cost is without question justified for many projects, but for some tasks, computational methods using longitudinal distributions of hull data can offer very high benefit-to-cost and be successfully used for the prediction of ship resistance. These techniques can take many forms and go by different names, such as thin-ship theory or linear wave-making, but all are some form of wave theory analysis.

Familiar names such as Havelock, Mauro and Michell are associated with these techniques. HydroComp has developed its latest resistance prediction code based on comparable wave theory analysis but, with a unique twist the company says. Unlike other methods, HydroComp's Prismatic Wave Drag uses distribution of the sectional area (leading to the name "prismatic") rather than waterline cuts of the hull surface. In other words, it treats the distribution of the immersed volume rather than the wetted surface. According to Donald MacPherson, HydroComp's technical director, using immersed volume as the basis for this new code is appropriate for two reasons.

"We feel that definition of the hull by surface points is not in keeping with the order of a problem that can be reliably solved with these types of wave theory analyses. Small changes in the surface do not dependably show a corresponding effect in resistance except on a macro scale. Further, one of the important characteristics with all of our products is consistent behaviour, and analysis by sectional area gives users that expected HydroComp usability."



The Prismatic Wave Drag module will allow users to have detailed hull descriptions for tunnel thrusters and propeller pockets

The detailed hull description that comes with surface offsets is cancelled by the practical matter of how irregular changes in offsets, for things like tunnel thrusters or propeller pockets, cause significant inaccuracies in the calculations. The only response available is to alter the geometry so that the data for the calculation is no longer the real geometric representation of the hull.

MacPherson also explained that prediction of wave-making drag alone is insufficient for a complete ship resistance prediction. "Accurate prediction of wave-making drag is significant only as a component of the correct prediction of total resistance. We have engaged in extensive in-house R&D for the viscous components of frictional drag and form factor, and also into the correlation functions that are needed to make our Prismatic Wave Drag analysis reliable for a very broad range of non-planing vessels. We are very pleased with the results of our validation studies, and are excited about putting this new capability in the hands of our customers."

A variety of code-specific correlation functions have been developed, including consideration of the influence of viscous effects (such as an effective body length to better model flow line convergence), boundary layer thickness, transom immersion, dynamic trim, and low-speed pressure drag. A proprietary algorithm was developed to estimate the proper suppression of transverse wave amplitude. The underlying viscous prediction employs the Grigson CF friction line with Reynolds number based on effective viscous length. Form factor is predicted using a proprietary algorithm that is specific to the Grigson CF foundation.

Enabling the correlation functions is by selecting a HydroComp-defined Standard set or individually as a Custom definition.

The Prismatic Wave Drag module is one of a collection of latest modules that will be available as part of HydroComp's new Premium license. Upgrading to the Premium license will allow users to access scripting capability so the Prismatic Wave Drag calculation, which can be shelled as a solver from third-party software such as CFD or simulation tools. *NA*

Direct Strength Analysis System meets CSR

Oshima Shipbuilding, Japan Marine United and TechnoStar have jointly developed the Direct Strength Analysis System for ship structural design in full compliance with Common Structural Rules. Y Miyoshi and T Fujii of Oshima Shipbuilding, M Maki and S Hirakawa of Japan Marine United and D Fujita and Y Kamimaru, Technostar explain further

The Direct Strength Analysis System has the world's highest performance of quick-response, fully-automatic and stream-lined analysis system, applicable to the whole phase of ship structural design, from the optimisation study in the schematic design phase to the design definition via a feed-back design change loop in the detailed design phase.

These capabilities are achieved by the unique parametric computer aided engineering (CAE) modelling technology (TCAD), which is composed of templates with the topology information and xml data for design variation of ship structural arrangements and scantlings.

TCAD-Design Strength Analysis (DSA)/ Common Structural Rules (CSR) has been applied practically to the design of bulk carriers and tankers and verified for the full analysis-cycle time that has been reduced from hours to minutes.

Background development

International Association of Classification Societies' (IACS) CSR requires evaluation of the comprehensive structural strength for all load conditions encountered in a vessel's whole life by utilising more extensive direct calculations than ever. This resulted to a considerable increase of design period time required.

Meanwhile, the study of optimum structural design for cost in full compliance with the CSR should be inevitable. This required further case studies as the trial & error design change. That is why the TCAD-DSA/CSR has been developed.

The primary aim of TCAD-DSA/CSR development is to drastically reduce the structural design period time, which is directly dependent on the performance of the DSA.

The secondary aim is to minimise the human error during the structural design process, which might be caused by complicated procedures due to the CSR requirements.

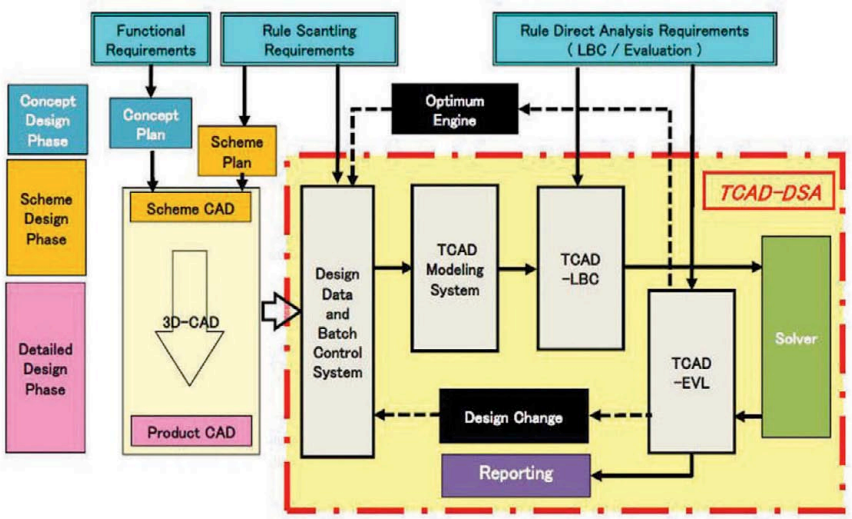


Figure 1: Stand point of TCAD-DSA in total ship structural design flow

Application of TCAD-DSA

The TCAD-DSA system is to be developed so as to be fully applied to the total ship structural design flow in the concept design, scheme design and detailed design phase, in compliance with the ship functional requirements, the Rule scantling requirements and the direct analysis requirements, as shown in Figure 1.

In order to accomplish the aims discussed above, the following functional requirements for a TCAD-DSA system are assigned.

- Full compliance to CSR requirements
- Total batch control of programme (One–push-run System)
- Easy modelling and fully automatic meshing
- Easy design change variation for parametric study
- Automatic creation of LBC
- Automatic extracting and evaluation of results
- Automatic design and design change
- Automatic output reporting of analysis results
- Minimisation of the total period of time for DSA.

The comprehensive TCAD-DSA/CSR system controls the following 5-functions, so as to be automatically executed along the streamline flow, with no manual input being required, as shown in Figure 2.

(1) TCAD-BCH (Data management for batch run)
(2) TCAD-MDL (FEM model creation by TCAD)
(3) TCAD-LBC (Creation of LBC)
(4) TCAD-EVL (Evaluation of Strength)
-YLD (Yield)
-BKL (Buckling)
(5) TCAD-OUT (Analysis results output)
-CHG (Design change loop)
-RPT (Analysis results reporting)

System function of TCAD-BCH

The main function of TCAD-BCH is the total data management of the ship structural design data for the analysis modelling and the analysis condition data

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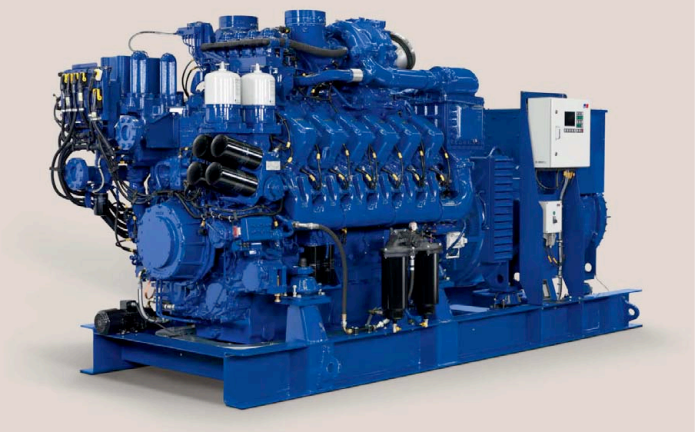

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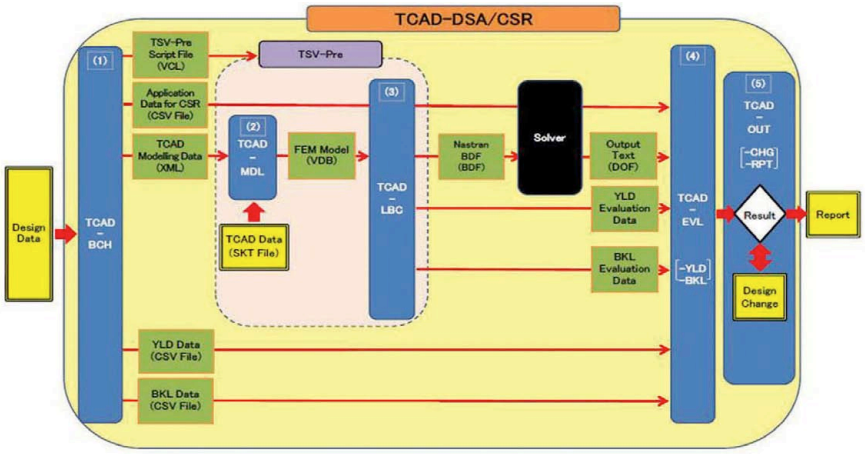

Figure 2: Total system flow of TCAD-DSA/CSR

for application of the requirements in compliance with CSR.

After being imported, the design data, which defines all ship structural modelling data is to be automatically converted to xml data for TCAD modelling.

The design data has on files all of the necessary data for CSR analysis, such as the load condition analysis data including the hull girder adjust load, the strength assessment criteria data, the application of corrosion margin reduction and the material properties (yield stress, etc.)

After importation of design data, the FEM model is to be created by the following procedure.

1) Make-up Template with sketch file
2) Import TCAD xml data for structural dimension & scantlings
3) Assembly of 3D-TCAD model
4) Creation of FEM mesh model on TSV-Pre platform .

The LBC requirements are the most major part of CSR, which requires the verification of the structural soundness for any members against any condition of loads and load combination, and the total analysis time for DSA depends mainly on this LBC analysis.

Analysis results for the yielding strength and buckling strength are to be evaluated, in compliance with the assessment criteria and requirement of CSR.

After evaluation of strength assessment for all members, necessary design changes and/or reinforcement is automatically defined by the design change loop flow, so as to satisfy the assessment criteria as per CSR.

The results of final design definition meeting with the Rule requirements information is automatically distributed in the Excel sheet, as per any format of the user's request.

The TCAD-DSA/CSR system has been applied to the practical design for tankers and bulk carriers, for the purpose of the optimum design and the detailed design and the outstanding results have been confirmed.

Generally, the total time for the direct strength analysis applied to CSR needed more than three months, up to that time by using the conventional software.

Meanwhile, the application results of the TCAD-DSA/CSR newly developed here substantiates the outstanding achievement to reduce the time for the direct structural analysis, from two months to one week per one hold for the actual result on a bulk carrier, as shown Figure 3.

This results to minimise with sharp cut the total period time and work load for the actual structural design phase, and makes great contribution to quickly prepare so many variation case data for the optimisation study.

Secondary effectiveness by application of TCAD-DSA/CSR

The quick-respondent, full-automatic and stream-lined capability of TCAD-DSA system makes great contribution on avoiding the human error caused by the complicated design procedure and simple repetition design work such as manual transcription.

In comparison with the analysis results by using software from class societies ClassNK and ABS, the precision analysis by TCAD-DSA/CSR have been confirmed to be within a 2% error range on the stress estimations.

In order to reduce the design period time for the ship in compliance with CSR, the unique Direct Strength Analysis system TCAD-DSA/CSR has been developed, jointly by JMU, OSY and TS.

The supreme performance and capability of TCAD-DSA/CSR was confirmed by the application results to the actual design of tankers and bulk carriers.

The excellent success of this development can be taken advantage on application for promising development of TCAD-DSA / HCSR (Harmonised Common Structural Rules). *NA*

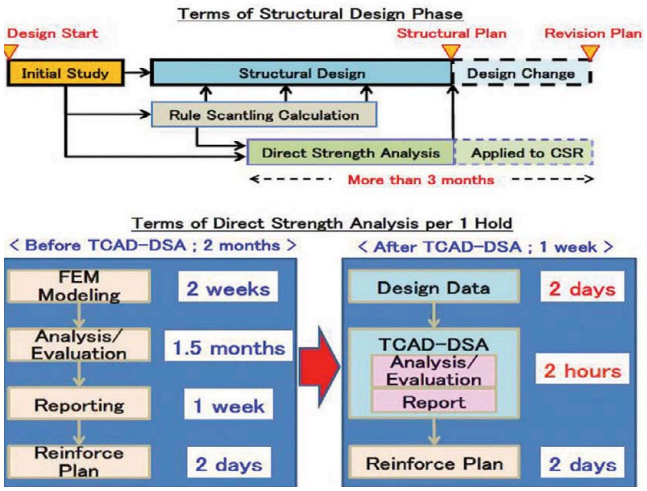

Figure 3: Time-reduction effectiveness of TCAD-DSA

Ultimate strength performance of tankers with various corrosion additions

Do Kyun Kim, senior lecturer at Universiti Teknologi PETRONAS (UTP) and Jeom Kee Paik, president at The Korean Ship and Offshore Research Institute (KOSORI) investigate the effect of corrosion additions on the ultimate strength performance of tankers

In ship and offshore structural design, age-related problems are important factors to be considered in building a robust structure as they have a significant influence on the residual structural capacity. In shipping, corrosion addition methods are widely adopted in structural design to prevent structural capacity degradation.

The historical trend of corrosion addition rules for ship structural design and their effects on ultimate strength performance is considered in this report Three types of standards or rules based on corrosion addition models, including historic corrosion rules (pre-CSR), common structural rules (CSR), and harmonised common structural rules (CSR-H) are compared with two other corrosion models - one suggested by the Union of Greek Shipowners (UGS) and the Paik's corrosion models.

To identify the general trend in the effects of corrosion damage on the ultimate strength performance, four representative sizes of double hull oil tankers, e.g., Panamax, Aframax, Suezmax, and VLCC, were applied and ALPS/HULL and the ALPS/ULSAP computer simulation code were adopted for evaluation of ultimate strength performance.

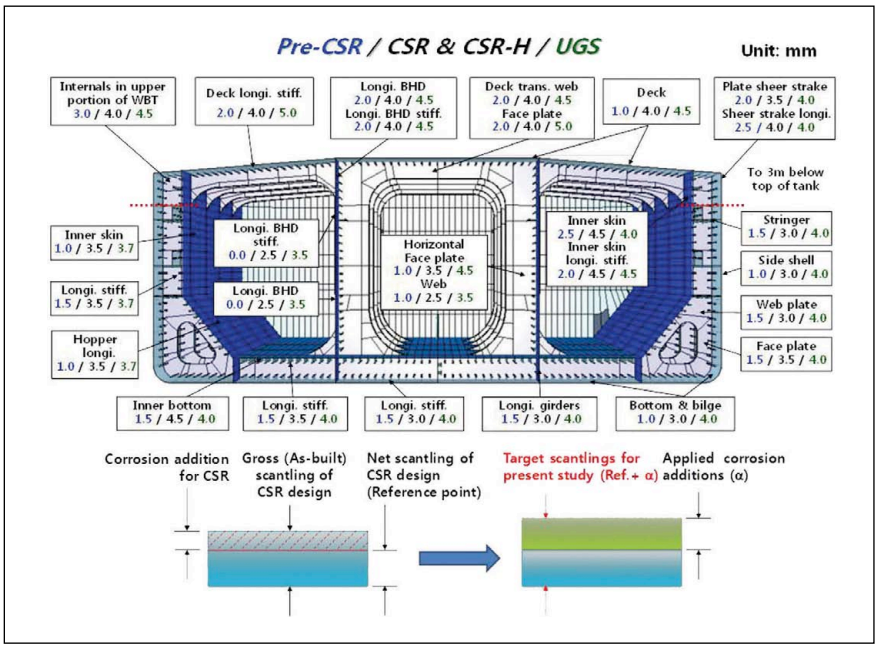

Figure 1: Various corrosion addition models with structural reference scantlings

Overview of corrosion addition rules

Traditionally the rules about corrosion addition were developed and maintained by individual classification bodies, a period known as pre-CSR. In June 2003, the International Association of Classification Societies (IACS) decided to prioritise the development of CSR for double hull oil tankers and bulk carriers, and also set up two project teams to complete the CSR. In January 2006, IACS formally released the CSR for double hull oil tankers and bulk carriers, and it went into effect on 1st April 2006 [1, 2].

The CSR for corrosion additions were specified with regard to the following:

- To reflect the experience and resources of all the classification societies (IACS members) in a set of unified rules.
- To remove the confusion surrounding the corrosion additions of different classification societies.
- To achieve a 25-year design life.
- To apply the net thickness approach to ultimate strength analysis for stiffened panels and the half corrosion addition approach for hull girders.

The CSR for oil tankers and bulk carriers were developed independently by different teams using different technical approaches. During the review of the CSR, industry stakeholders urged IACS to harmonise the key technologies used to derive the rules. IACS agreed and committed to develop a harmonised version of the rules [3]. The new structural rules are known as harmonised common structural rules (CSR-H).

The historical trend in corrosion additions for each structural member for oil tankers is presented in Figure 1. The figure shows that there is no difference between the CSR and CSR-H, but the CSR corrosion additions are much greater than the pre-CSR corrosion additions. It seems that the specified CSR corrosion additions are sufficient, and thus the same additions have been included in the CSR-H. Of course, the approach between pre-CSR and CSR differ from each other. In the pre-CSR the net-scantling approach has been adopted for the ultimate strength analysis of the stiffened panels and half corrosion addition deduced scantling approach for ultimate strength analysis of hull girders.

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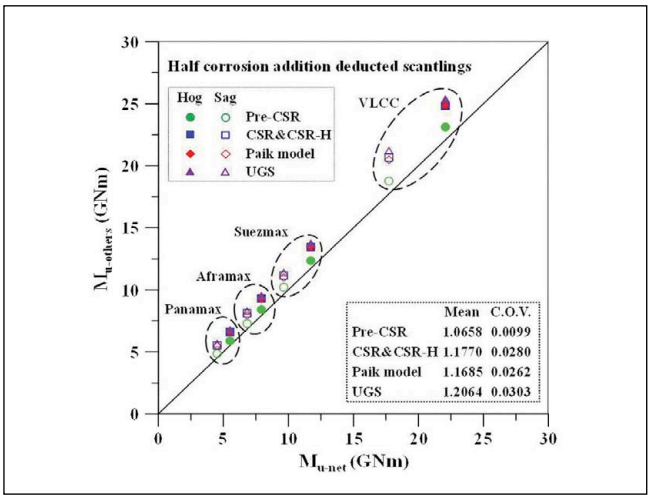

Figure 2: (a) Hull girders

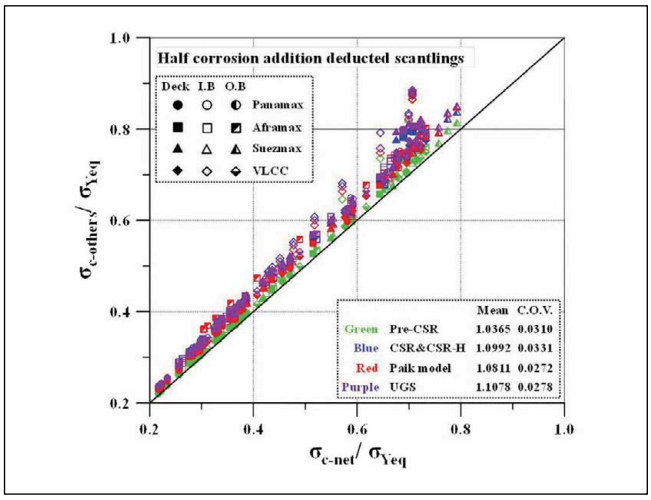

Figure 2: (b) Stiffened panels

performance were investigated. Five types of corrosion addition models are applied and the ultimate strength performance of hull girders and stiffened panels are investigated in terms half-corrosion addition deducted scantlings.

The ultimate strength capacities of the oil tankers can be specified in the following order.

Pre-CSR< Paik model< _CSR&CSR–H<UGS

The net scantlings in the CSR designs are set as the reference scantlings from which the minimum required strength thickness is obtained and to which the additional corrosion margins of each corrosion models are added. The results should prove helpful in evaluating the effect of corrosion additions on the ultimate strength performance of double hull oil tanker structures and to understand the history of structural design rules on corrosion.

Acknowledgements

This study was supported by The Lloyd's Register Foundation (LRF) Research Centre of Excellence (The Ship and Offshore Research Institute) at Pusan National University, Korea. This article is the summarised results of Kim et al. [5, 6]. *NA*

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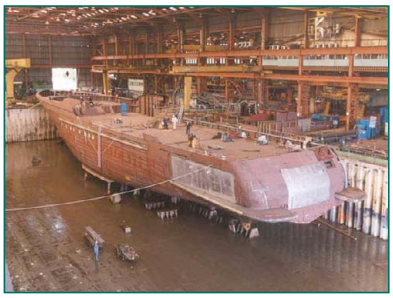

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The international maritime industry faces new challenges as it emerges from the global financial crisis. It is therefore understandable that the industry's priority and attention is on consolidation and continued survival. However, at such a time it is all the more important for the industry to look ahead in order to respond to the continuing challenges it will face from the increasing demands of operators, regulators and society for greater efficiency, safety and the protection of the environment, as it emerges from the current crisis. This response will require innovative thinking from all sectors of the maritime industry, and particularly those involved in ship design and construction.

The 3rd RINA International Conference on Ship & Offshore Technology in Indonesia will take "Developments in Ship Design & Construction" as its theme, and will bring together members of the international maritime industry to present and discuss the latest developments in the ship design and construction process which will provide the improvements in productivity and cost-competitiveness necessary to respond to the demand for lower cost of ownership and greater environmental sensitivity. Whilst covering developments in all ship types, it will look particularly at developments in those vessels which are essential to the economies of countries in the region, e.g. fishing vessels. Papers are invited on the following topics for all ship types:

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An innovative approach for Korean CADres

Rodrigo Perez, SENER Ingeniería y Sistemas S.A., Spain and Doo-Jin Lee, SENER Korea Engineering and Systems Co., Ltd., Korea explain how Korean shipyards are tackling more complex ship designs

Korea´s great economic achievements promote its shipbuilding industry, which ranks as one of the world's largest shipbuilders. The challenges in front of the Korean shipbuilding industry, the new philosophy and the merits of modern shipbuilding using CAD/CAM technology are investigated in this article and are expected to benefit the Korean shipbuilding industry.

This paper explains how applying FORAN core technology can help Korean shipbuilders realise designs. Different in its own way and based on a well-engineered developmental approach, mature technological foundations and a solid single database frame, SENER's system integrates basic calculations, progressive multidisciplinary modelling, class approval drawings, interface with finite element method analysis and the generation of accurate production information.

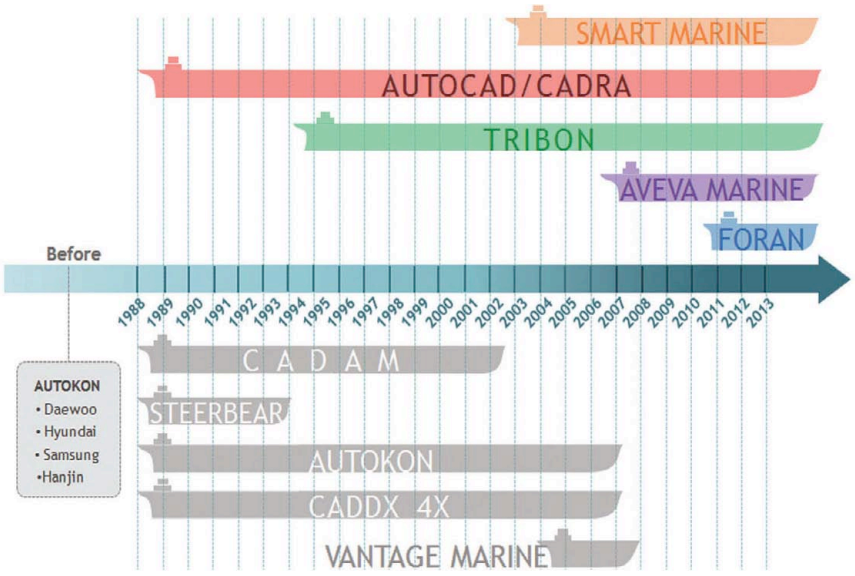

Figure 1: Evolution of CAD Systems in Korea

Capability of the Korean industry

Facing worldwide competition, Korea is encouraging ship production and related developments in several categories. The current mode of design and construction with old tools would not be enough to meet these requirements.

From the advent of computer technology in shipbuilding, most shipbuilding systems have been focused on their use for production drawings as the most effective use. However, there are limitations to using one seamless concept from the early model (concept, detailed design) to production model (production design) because of the fixed design process and fundamental system architecture, which is set early.

FORAN was developed with this in mind, the concept, detailed design model, to production model has been streamlined into one seamless arrangement. The system has been re-designed to use the top to bottom concept.

State of the Korean art

The development of the Korean domestic computer aided shipbuilding technology is more than 25 years old. The utilisation of information technology in the shipbuilding area in Korea can be traced back to the early 1980s. Research on mathematical lofting started in the 1960s and ship-hull construction and piping systems was developed in the 1970s. Integrated computer aided shipbuilding systems integrating performance calculation, final calculations and drawing functions was formed in the 1980s. Since 1989 more improvements in the development of CAD systems have been seen. These achievements are shown in figure 1.

There are many other domestic shipbuilding CAD/CAM systems in Korea. However, many of them only cover a few aspects of shipbuilding. So, many companies imported foreign shipbuilding software.

Evolution of CAD/CAM systems in Korea

Some of the main FORAN characteristics that improve the evolution of CAD/CAM Systems in Korea are:

- The proven Oracle database can be easily used to interface commercial enterprise resource planning (ERP) or product lifecycle management (PLM)
- Control management is a basic technology for collaboration work, which FORAN have introduced throughout the whole system
- The 2D drawing system is higher level than any commercial 2D specific CAD system and supports various compatible formats when it is required
- Auxiliary Structure parts not attached to the hull structure data can be used directly for nesting without converting to the hull model. This reduces time and effort during modification
- Easy parametric libraries definition like end-cut, hole, cut-out, clip and notch can be made easily without a requirement on the software supplier to develop further
- Schematic drawing (P&ID) is integrated with the outfitting application, in a specification driven way, and developed with internal tool without using third party system or in-house development
- Dynamic clash detection run in one single database can reduce design error and cost.

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Whereas, due to the language restrictions and differences of production ability levels, production organisation and construction mode, there exists unsatisfied aspects in the application of foreign software systems as below.

- High price. Due to the currency exchange rate, the price of introducing foreign 3D shipbuilding software into Korea is very high
- Imperfect information integration. Although comprehensive shipbuilding CAD/CAM systems have already started the development of the interface with management systems.

Anticipation of CAD/CAM systems

The Korean shipbuilding industry expects excellent shipbuilding CAD/CAM systems, both foreign and domestic systems, which can promote its competitiveness by:

- Promoting the shipbuilding technology and shipbuilding industry
- Implementation of a new shipbuilding philosophy and shipbuilding mode based on IT technology
- Development of new types of ship (ocean engineering vessels) and equipment with proprietary intellectual property rights.

Korean shipyards have different production requirements due to the different proprietary development in automation and work methodology used.

Modern shipbuilding technology is a process integrating construction, outfitting and painting. Accordingly, ship design in Korea can be divided into the following phases, figure 2.

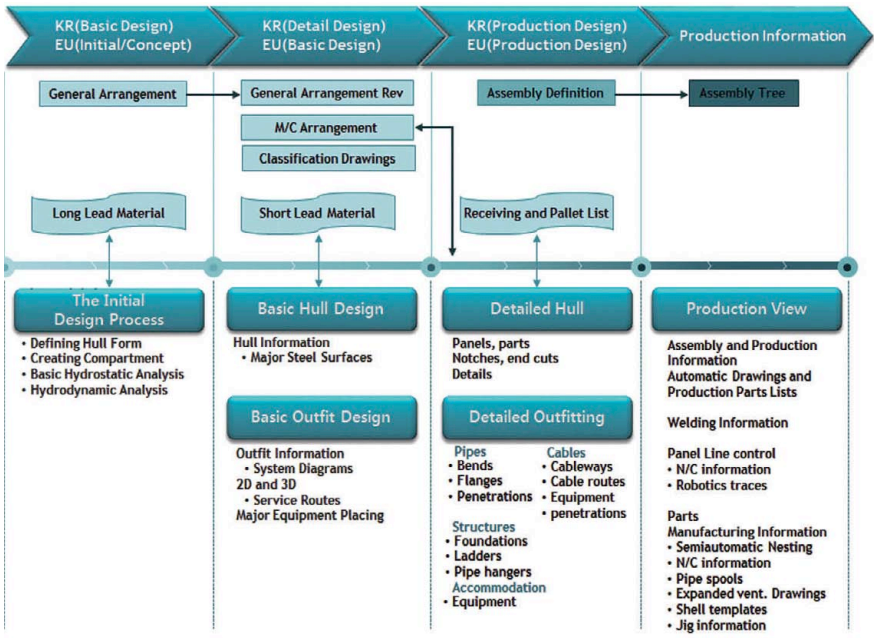


Figure 2: Comparison of project shipbuilding stages between Europe and Korea

Initial/concept (basic) design

At this phase, calculations on the main principles, general arrangement, main performance, structure, outfitting, machinery, electricity, ventilation, remote control, and automation, etc. should be carried out taking into account the shipowner's requirements.

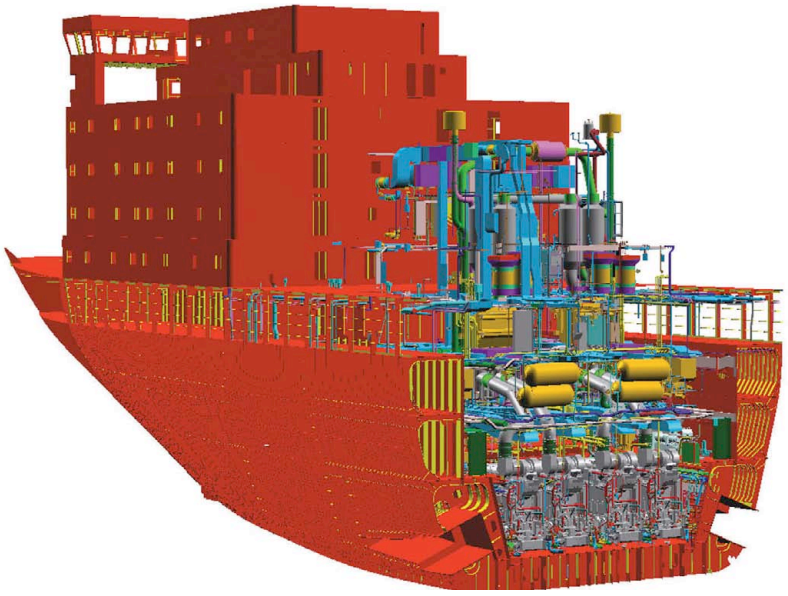
Design in detail about the design scheme should be carried out at this stage, including detailed drawings generation and compiling calculation documents.

All the production drawings for ship construction, working schedules, technical procedures and related technical documents are created according to the yard's conditions where the ship is going to be constructed.

At this stage, completion drawings are made according to the arrangement, structures, material and equipment employed in practice.

The proposed FORAN solution is based on a 3D ship product model; see an example in figure 3, in which the geometry and the attributes of the elements of the ship are stored.

Figure 3: 3D representation of a ship by use of a clip plane in FORAN



Recommendations to Korean software

CAD/CAM systems in the Korean shipbuilding industry have been focused on drawing and production model information mainly. In this respect, FORAN can be useful to meet most Korean shipbuilders' needs, but

the following are some of the necessary extras required:

- Full training and maintenance service. Due to the competitiveness of software, CAD/CAM software companies offer their products to Korean shipyards/ design institutes with very low prices in order to enter the Korean market, even without training fees and maintenance fees
- Provide good self-learning material with complete examples
- Easy operation with built-in user friendly interfaces not only reduce design time but costs
- Classification drawings like general arrangements, mid ship, shell expansion, construction profile, machine arrangements and other detailed structural drawings can be done from the early model stage
- One single model from the early design stage can be used for production design without using a different model
- Direct model interface to CAE system and classification rule interface can reduce design time and increase design confidence
- Built in PLM solutions can interface any commercial PLM solution and new user requirements can be easily implemented.

Conclusions

Facing the global financial crisis and shipbuilding industry crisis the Korean shipbuilding industry must take full advantage of modern CAD/CAM technology in order for the industry to transform its design philosophy which will consolidate its worldwide competitiveness.

To maintain its position as a leading shipbuilding nation the Korean shipbuilding industry must achieve the following:

- Improve technological capabilities and develop high value-added and highly sophisticated ships and relative equipment rapidly
- Implement the most advanced shipbuilding CAD/CAM software
- Fulfil the requirements of integrated hull, outfitting and painting and integrated design and construction technology
- Set up a whole integrated digital shipbuilding platform based on the PLM system applying open CAD as an upstream design tool and manufacture process management software as a downstream manufacturing tool. *NA*

Authors

Rodrigo Perez holds the current position of FORAN Project Manager and Business Development.

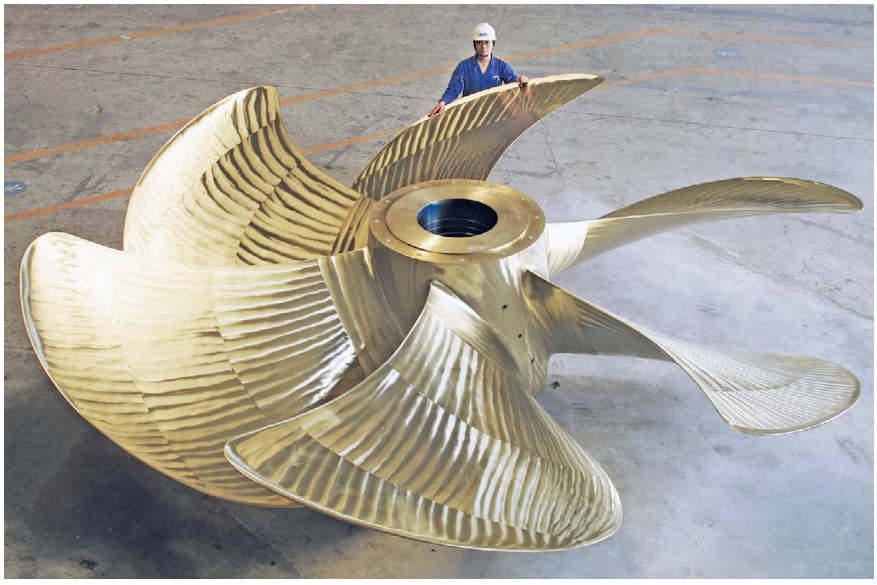
Doo Jin Lee holds the current position of Technical Manager at SENER in Asia.

Opting in to dynamic design

Computational Fluid Dynamics is changing the face of vessel design and Wärtsilä has taken the plunge using computer power to create a fixed pitch propeller that can be modelled to fit the needs of each vessel. Piet van Mierlo, project manager application engineering Wärtsilä, The Netherlands, describes its evolution.

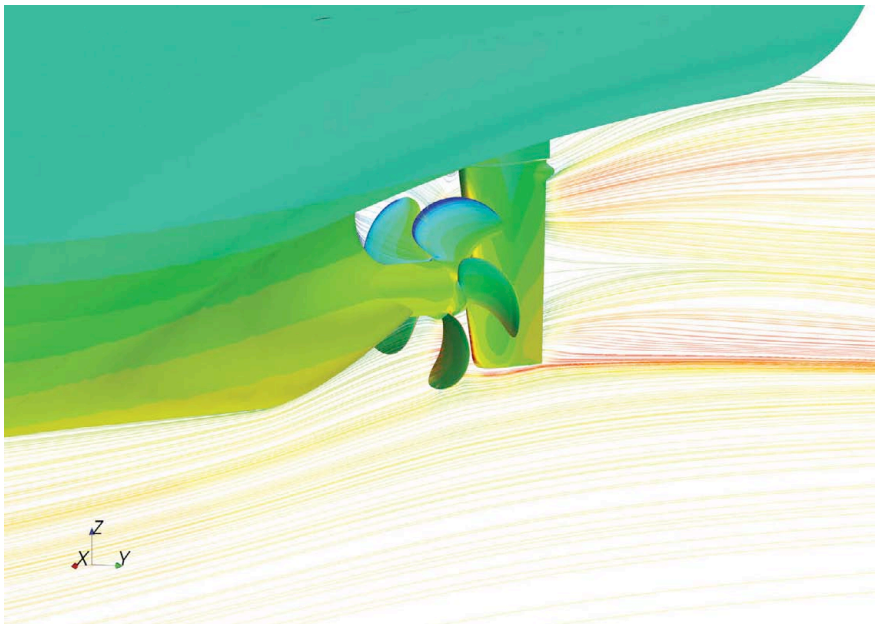
Instant fuel savings do not ordinarily just present themselves to shipowners, but propellers are one area of vessel design that has, perhaps surprisingly, been taken for granted in the past, but is now becoming an area of increasing focus for vessel designers looking to save energy.

Pressure to reduce fuel costs and greenhouse gas emissions have created a paradigm shift for the industry, which is replacing speed and load optimisation with fuel efficiency and environmental concerns. Advances in computer power are again revolutionising design. Computational Fluid Dynamics (CFD) is allowing ship designers to develop highly efficient vessels optimised to improve the hydrodynamics of the hull decreasing fuel consumption and in turn polluting emissions.



Wärtsilä Fixed Pitch Propeller, ready for delivery.

It is in this design environment that Wärtsilä has developed its OPTI Design fixed pitch propeller (FPP). OPTI Design is, in fact, not a single propeller design, but a tailored propeller for a particular vessel operating in a particular trade.



CFD analysis for OPTI Design; propeller operating in behind ship conditions.

In the present day context the increase of computer power and the development of software and CFD methodologies have created the conditions for OPTI Design to be developed. A FPP has in the past been tailored to a ship, but now that tailoring is completed by extensive CFD modelling using top of the range computations rather than in a testing tank using scale models.

In the past ship modelling would take place at a test basin with hull designs having a standard propeller added to the model and the data from these tests would be passed to the propeller designer. The propeller design is based on scaled up data derived from these tests. The actual designed propeller was to be tested in a self-propulsion test, generating performance data, including the propeller's interaction with the hull,

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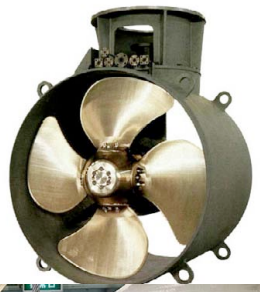

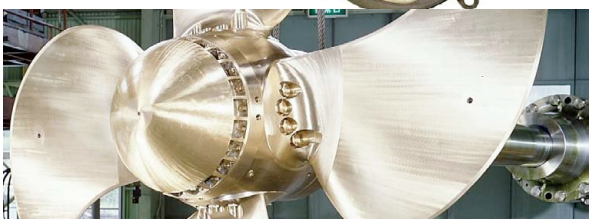

Products:

Controllable Pitch Propeller (CPP)
Bow/Stern Thruster
Fixed Pitch Propeller (FPP)
Shafting Arrangement
Control System
- Optimum Propulsion Control System
- Joystick Control System

K-7 Rudder (High-Lift flap Rudder)

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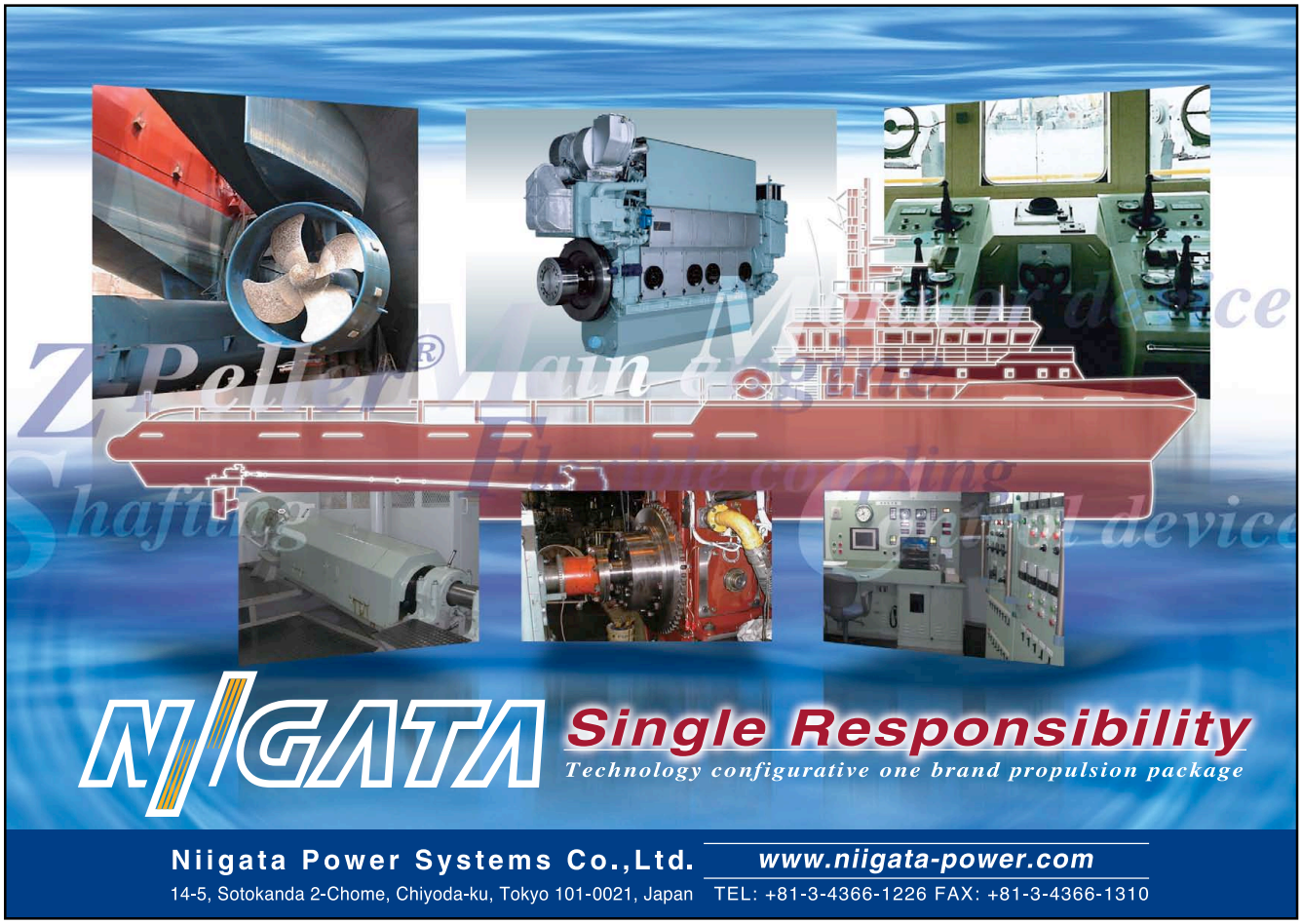
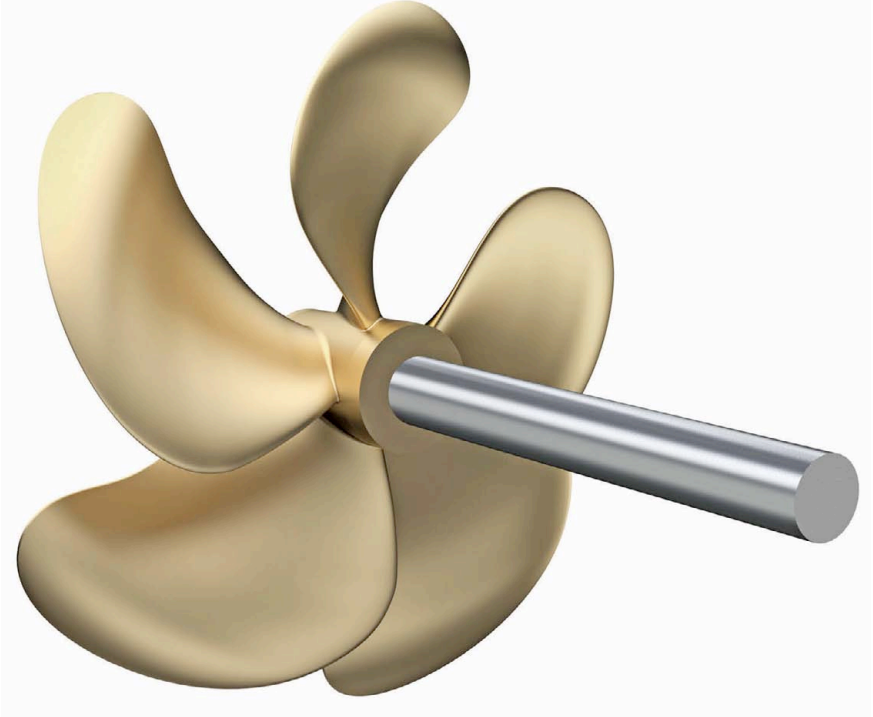


Wärtsilä efficiency optimised 5 bladed fixed pitch propeller.



and scaled up to produce a performance prediction for a vessel.

Iterations of the propeller design on a scale model are expensive and time consuming and therefore hardly ever done. And even if they were to be done it does not imply the most efficient solution for the actual situation, due to scale effects that are relevant.

Under Wärtsilä's OPTI Design process there is no scaling up of data and the data marriage is a virtual experience, but it allows the propeller designer to see in 3D the interaction of the screw with the hull design in full scale and while the propeller is actually working behind the ship.

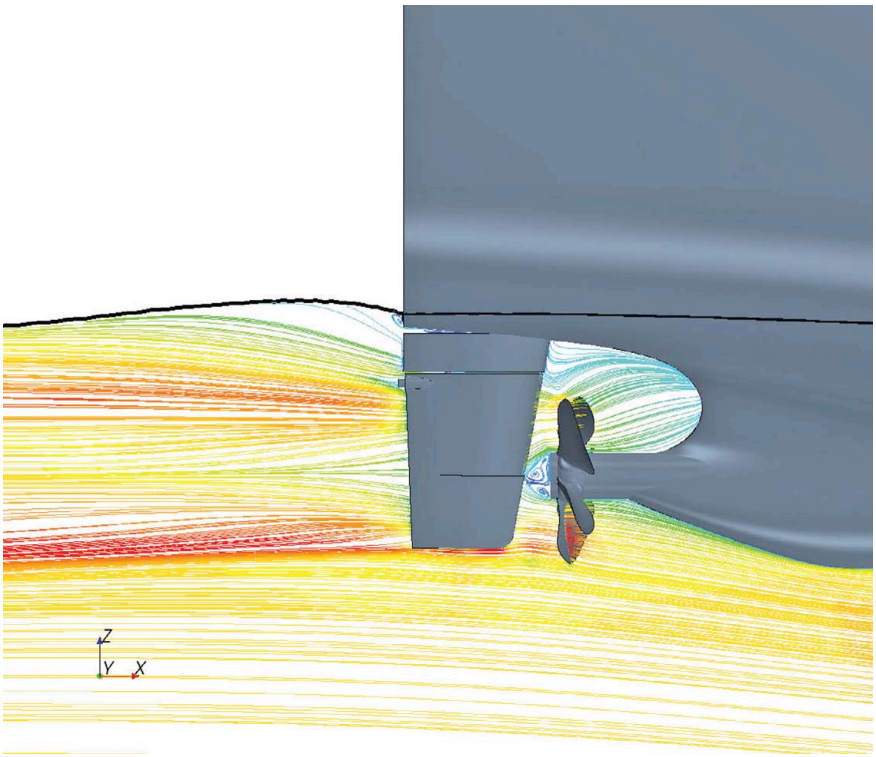
In 2004 Wärtsilä started with viscous flow simulations of propellers. The process to set-up the calculation, including the mesh generation, has been automated and continuously developed over the years. For proper performance predictions an analysis of viscous flow is required, even though it requires a lot of computer time. Wärtsilä is now at the stage where it can do the full open water viscous CFD analysis in a day. When Wärtsilä started using CFD the lead times for such analysis were quite long, but the evolution of the hardware and software along with efficient processes and methodologies have created a design system which offers the same outcome, regardless which CFD expert carries out the flow simulation.

Data derived from the CFD programme, in this case CD-Adapco's STAR-CCM+, is used to bypass the model basin testing and offers a far more accurate data set than the stock propeller used by the model basins in the past, but this is a new way of working and it takes time for owners to build the trust in the process necessary.

As a result the further development of OPTI Design is dependent on proof that the system works; that it produces a propeller that will offer, less resistance and translate more energy into ship power. The proof of this particular pudding will be in the eating and as such Wärtsilä has an advantage here with its Ship Design company, offering design packages that can include an OPTI Design propeller.

The main message for FPP OPTI Design is the important step of designing for full scale instead of model scale and that vessel and propulsor are designed together and not as separate components as is traditionally the case. Interaction effects between the propeller and hull are included and utilised to optimise the total propulsion efficiency for the actual situation the vessel will operate in, and not for a scaled model. *NA*

CFD analysis for OPTI Design; the water surface is included in the computations.



Lemissoler selects Kappel propellers

Cyprus-based Lemissoler has ordered eight 58,500dwt bulk carriers from the New Century Shipbuilding Group, Jiangsu Province, China for delivery next year and the following year. The four-bladed Kappel propeller design is one of the fuel efficiency measures included on the vessels

Designed by the Shanghai-based naval architects SDARI the latest ships will be built at New Century's New Times Shipbuilding yard with a fully optimised propulsion system, including the main engine and shaft.

The propellers are the fuel efficient MAN Alpha Kappel screws: "The 6.8m, slow-running, four-bladed Kappel fixed-pitch propellers will be tailored to the SDARI-designed bulk carriers and a drivetrain powered by an MAN B&W 5S60ME-C engine, economy-rated at 8,050kW and 89r/min," says an MAN statement.

The manufacture of the propellers will be completed by the Dalian Marine Propeller Co., Ltd (DMPC) in China, which is the propeller production partner for MAN Diesel & Turbo in China. The fixed pitch propellers will have a finished weight of around 17.8tonnes, says the company.

Thomas Leander, senior manager of the Propeller & Aft Ship division for MAN Diesel & Turbo says the company was satisfied with the cooperation between the firms: "The cooperation and optimisation process with the owners and SDARI has been excellent, especially in terms of developing the fully optimised main-engine, propeller, shafting and aft-ship layout. Furthermore, this Kappel order gives MAN Alpha propellers a strong foothold within the medium- to large-sized bulker segment". *NA*

TECHNICAL PARTICULARS

58,500dwt bulk carrier

Type of vessel	58,500 DWT Bulk Carrier
Length between pp (m)	186.5
Breadth moulded (m)	32.26
Draught fp/ap (m)	11.30
Design speed (knots)	14.2
Main engine	MAN B&W 5S60ME-C 8.2
Output (SMCR kW)	8,050 at 89 r/min
Propeller	MAN Alpha Kappel
Blades/diameter (mm)	4 / 6,800

Greening the credentials

Italian-based RINa has been focusing on helping yacht owners and yards develop designs that will meet with future environmental regulation

The current regulatory standards are putting pressure on yacht owners and designers to think "green" about their vessels. In particular RINa has highlighted the NOx Tier III regulation is particularly challenging for the industry. In light of this RINa presented the problems that the yachting industry would face with the current time schedule to the IMO MEPC 66 in April, which then saw the postponement of the deadline of Tier III to 2021.

"NOx has always been an issue. Above the 70m length the matter of space onboard to fit the equipment isn't so much of an issue, however it will become impossible to build 30m yachts because of the space required for the equipment. They [shipyards] need to build the abatement equipment with the manufacturers. Yards and owners need time to look for and adapt solutions for the vessels," says Paolo Moretti, general manager business line marine, RINa.

RINa has also been working with shipyards to develop better standards and designs for yachts. One of the developments has been in the area of noise and vibration, looking at how the noise is created and calculated.

"We recognise that shipyards are building good quality yachts. In the past there has been more weight onboard yachts, due to materials used that has dampened the noise. As designs have improved and materials used have become lighter, modern designs now make more noise," says Fiorenzo Spadoni, sector manager pleasure vessel, RINa Services.

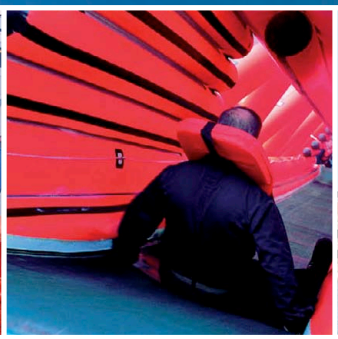
Due to this increased noise factor, RINa has been working with shipyards to reduce this and has developed this into its RINa yachts advisory services. It highlights a project that it has been working on with Benetti shipyard. The project involves a study of a 90m yacht, which RINa is carrying out a full vibration study on.

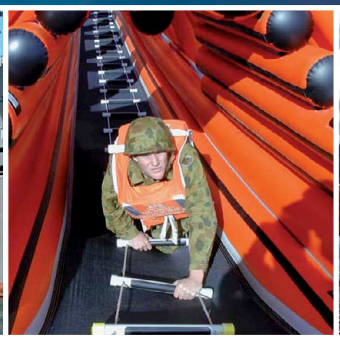
Factors of this study have looked at the frequency and vibrations coming from the propeller and also the other propulsion systems onboard. RINa says that it has done three models of the yacht applying different forces to the studies.

RINa has been working with Technomar also carrying out studies in noise and vibration. Spadoni says that each new project uses the RINa AVRI software to conduct the analysis.

From this and other studies that RINa conducts its aim is to guide yacht owners and yards to create designs that will not only meet with owners requirements, but will also meet with future environmental regulation. "We

THE MES YOU CAN DEPEND ON

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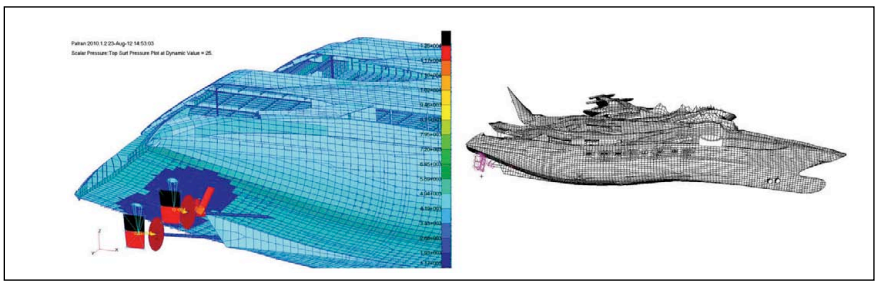
want to be able to give a know-how answer. We show them [yards] what installation materials to use based on the studies carried out. If you do these calculations then you can look where the areas that need attention are. The studies also look at structure and vibration, which can be used for future designs," says Spadoni.

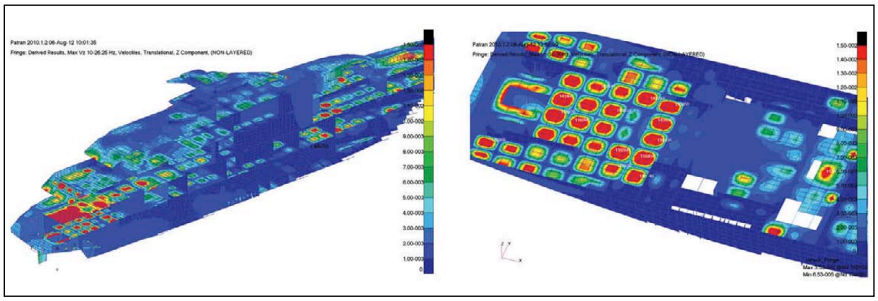
He adds that most of the studies focus on the engine room. "Even if the main sources of the noise and vibration do not start there and it is coming from an external source such as the propeller, the effect comes back to the engine room," he explains.

Further to this, Spadoni notes that it is important to take into account all areas, such as hull shape and size, full modelling of the vessel and HVAC systems onboard which can carry noise through to other parts of the vessel.

RINa also introduced its Rig Rules in 2013 using software that looks at hydrodynamic and aerodynamics in yachts that use rigs. The rules look at the best way to sail, which also incorporates the adoption of environmental equipment and design optimisation. For this RINa has been looking at hybrid propulsion as an alternative propulsion system as it says this form of propulsion can significantly lower fuel consumption. *NA*



Modelling of excitation forces of submerged parts on a 90m yacht



Vibration hotspots

Polar Code in training

The Polar Code highlights certain issues in the maritime industry that need to be addressed if vessels are to operate in extreme environments more often, with particular focus on safe operations

The Polar Code has been created to ensure the safety of the crew and vessel that operate in harsh/Arctic conditions. However, with recent amendments to the code, more focus has been put on the safety of operations in the Arctic through crew training and company management plans.

In May the IMO's MSC 93 approved in principle a draft of the Polar Code and a draft of a new Chapter XIV of the international convention for the safety of life at sea (SOLAS), which prescribes mandatory compliance with the provisions of Part I of the Polar Code by all ships' certified under Chapter I of the SOLAS convention. The Polar Code entry into force is expected on 1 January 2017, following the adoption of the Code and the new Chapter XIV of SOLAS at MSC 94 later this year. Existing ships will have to comply with the Code by the first intermediate or renewal survey following 1 January 2018.

The Russian Register of Shipping (RS) says that one of the significant points about the Polar Code is its regard to crew training for operating in arctic conditions. The RS highlights the need for owners to prepare crew for operating in the arctic. "It is of utmost importance that the crew is additionally trained to work in icy conditions and ship's officers have sufficient experience of navigation in ice conditions," Vladimir Shurpyak, senior principal surveyor, Machinery department, RS, states.

Chapter 13 of the Polar Code approved at MSC 93 is intended to ensure that ships are appropriately manned by adequately qualified, trained and experienced personnel. "According to this Chapter, the companies are responsible for ensuring that masters, chief mates and officers in charge of a navigation watch onboard ships operating in polar waters have completed training to attain the abilities that are appropriate to the capacity to be filled and duties and responsibilities to be taken up, taking into account the provisions given in the STCW convention and Code, as amended," explains a spokesperson for RS about how training should be carried out.

Further developments of the Polar Code highlight the need for crew training for this environment

The Chapter also foresees two levels of training: basic and standard. The masters, chief mates and officers in charge of a navigation watch shall be qualified in accordance with Chapter V of the STCW convention (International Convention on Standards of training, certification and Watchkeeping for seafarers, 1976) and the STCW Code, as amended. It also states that every crew member shall be made familiar with the procedures and equipment contained or referenced in the Polar Water Operational Manual relevant to their assigned duties.

"RS as a classification society and a certification body can provide independent services for quality management systems (QMS) of organisations engaged in simulator training as well as seafarers training, and certification in compliance with requirements of the STCW convention," says the spokesperson.

Shurpyak also highlights the shipowners' responsibilities for meeting the Polar Code: "The shipping company's Safety Management System should be prepared for the possibility of operating the ships in polar waters. The company should carry out planning of the polar voyage and inform the maritime administration of polar coastal states,"

Further to this, RS highlights that where it has worked with seafarers, maritime academies and training centres in the countries where shipping in the arctic is familiar territory, on that basis RS says that these centres will be capable of developing further training programmes that they offer focused on the navigation in the harsh climate conditions in full compliance with the future Polar Code *NA*

RS classes revamped RST 22M design

Turkish-based Palmali has ordered two RST 22M river-sea oil tankers, which will also be built to the Russian Maritime Register of Shipping (RS) class

The Project RST 22M was initially developed by the Marine Engineering Bureau (MEB), as an eco-vessel that would meet the needs of future regulations.

The development of the RST 22M came from the RST 22 design. The modified RST 22M design takes into account the latest MARPOL requirements, access to hull structures in cargo tanks, a double bottom and double side spaces. The RST 22M will have higher capacity pumps installed onboard, six pumps with 200m^3/h capacity will be fitted on the vessels instead of the traditional six 150m^3/h, which will reduce the time of cargo operation to 2.5hours. Submersible pumps will also be fitted and the aft cargo manifold has been removed. The design and arrangement of the engine room has also been improved.

Palmali Group stipulated that the new tankers would need to comply with the Volga-Don Ship Canal and the Volga-Baltic Waterway size and to operate both in river-sea traffic and the traffic in the Caspian, Black, Mediterranean, Baltic and North Seas including pan-European voyages and voyages to the Irish Sea in winter.

MEB highlights that the main feature of the design is its adaption for operation at sea conditions. "In comparison with the wide spread existing old Volgoneft type tankers with the same carrying capacity in river conditions (about 4,700dwt) tankers of the Armada type at sea conditions have a much better seaworthiness and ice capability," says Igor Ilnytskyi, deputy director general, chief designer, MEB.

Further to its development, the RST 22M design has been optimised taking into account the operational experience of the RST 22. Optimisation of the design has been carried out on the configuration and arrangement of mooring equipment, especially for operation in river locks. The navigation equipment has been optimised with particular attention to the movable antenna to be able to operate at sea as well as on rivers with a limited air draught.

The RST 22M tankers are part of Palmali's fleet development of eco-friendly vessels

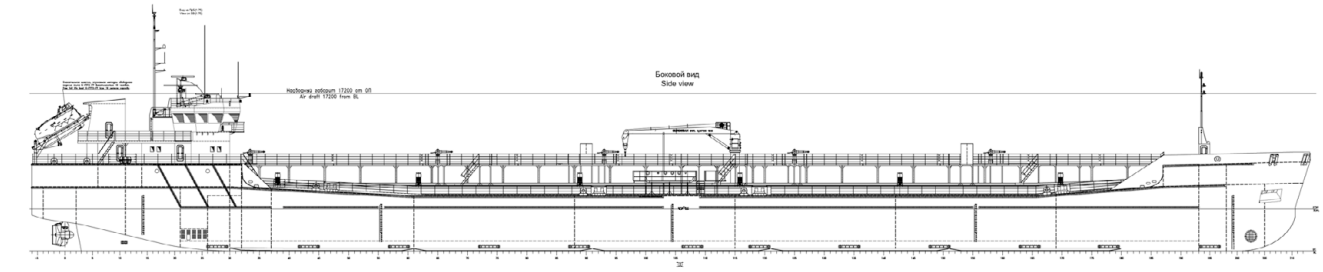
RST 22M under construction at Armada shipyard

An agreement has been signed by RS with Armada Shipyard that will construct the ships for the Palmali Group. RS is currently engaged in the plan approval of the ships. According to the agreement, RS will render classification of the newbuildings and survey under construction for compliance with applicable statutory requirements. RS says that its experts will perform survey of hull construction and the installation of machinery, electrical and automation equipment, and will check the ship compliance with approved technical documentation, all the applicable international and national requirements, as well as participate in the mooring tests and trials.

The vessels' RS class notation is KM(*) Ice1 R2 AUT1-ICS VCS ECO-S BWM OMBO Oil tanker (ESP). The ships are designed to carry crude oil, oil fuel, diesel oil, other oil products and vegetable oils, and are capable to carry three types of cargo simultaneously. The ship design also considers the RS additional environmental requirements (ECO-S).

The two vessels will be constructed at Armada Shipyard, Turkey with the first in the series expected to be delivered in mid-2015. MEB has highlighted that Palmali Group has had experience of the Armada type tankers in the past, hence their decision for these vessels. In addition, Palamali intends to build a new series of tankers designed specifically to operate in river conditions of the RST 12 (5,700dwt) design, which are a development of the ultra 'full' hull form RST 27 design. *NA*

GA for RST 22M

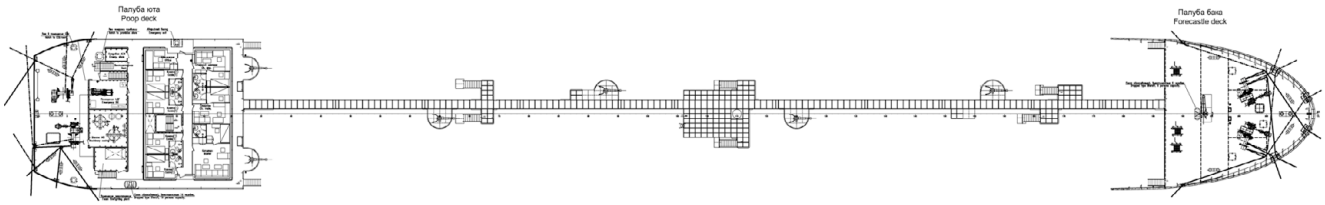


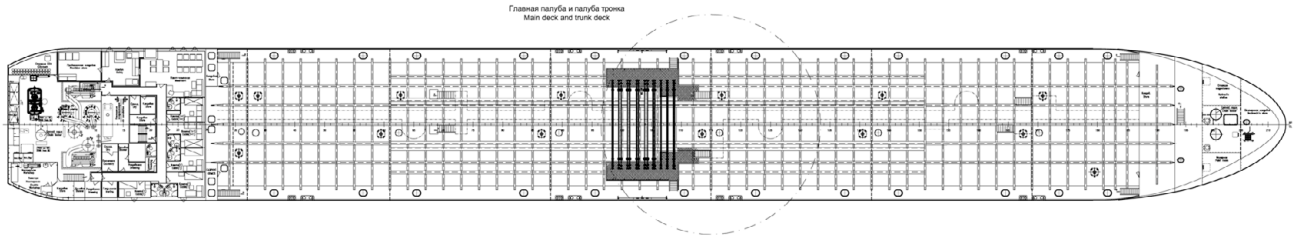
ОСНОВНЫЕ ХАРАКТЕРИСТИКИ

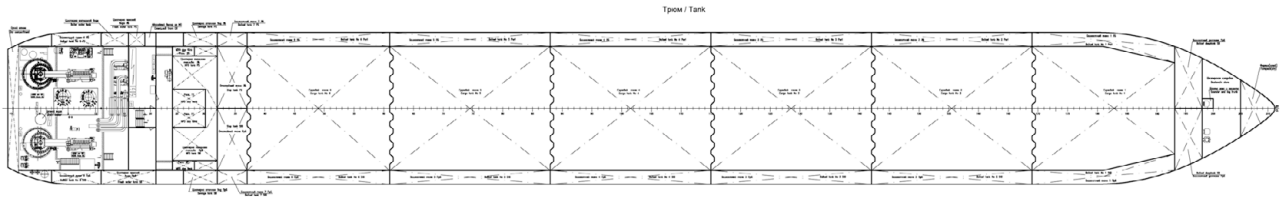
Длина наибольшая	139,95 м
Длина между перпендикулярами	134,50 м
Ширина	16,60 м
Высота борта	6,00 м
Осадка в море (ЛГВЛ)	4,60 м
Дедвейт при осадке 4,60 м (в море)	7008 т
Вместимость грузовых танков	7833 куб. м
Мощность ГД	2x1200 кВт
Скорость	10,5±0,2 уз
Класс РС	КМ ★ Ice1 R2 AUT1-ICS, VCS, ECO-S, BWM, Oil tanker (ESP)

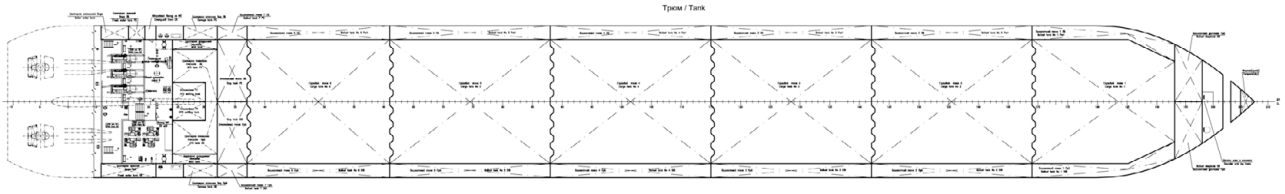
GENERAL DATA

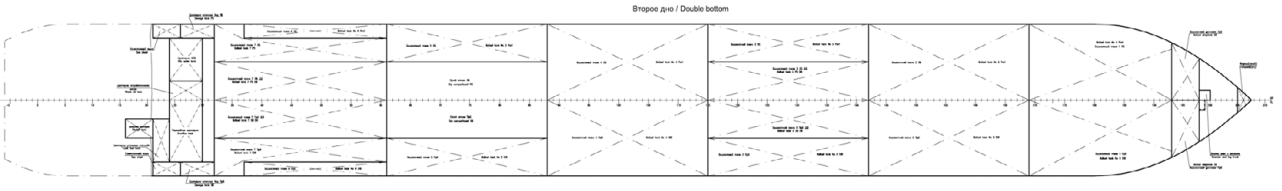
Length overall	139,95 m
Length between PP	134,50 m
Breadth	16,60 m
Depth	6,00 m
Draught at sea (SLWL)	4,60 m
DWT at the draught 4.60 m (at sea)	7000 t
Cargo tanks capacity	7833 cub. m
Main engine power	2x1200 kW
Speed	10,5±0,3 kn
RS class	КМ ★ Ice1 R2 AUT1-ICS, VCS, ECO-S, BWM, Oil tanker (ESP)











The Royal Institution of Naval Architects

Marine Design

3-4 September 2014, Coventry, UK

Lifelong Learning Programme

EBDIG European Boat Design Innovation Group

Coventry University

Lloyd's Register

Second Announcement

RINA Marine Design 2014 will provide a forum for reporting and discussing the design practice and technical issues associated with aesthetic design. The full spectrum of marine design from small craft to super yachts, including commercial and specialist vessels, will be examined.

An exhibition celebrating the 30th year of boat design at Coventry University will be opened at the end of the conference, which will include a virtual 3D exhibition of Coventry University students' design work. This will show the breadth of capability within the department of Industrial Design including automotive, transport and boat design.

The conference will present technical papers on a number of aspects of aesthetic marine design, including:

- ***Design Visualisation*** (including design methodologies, design practice, innovative concepts, design analysis tools, Computer Aided Design, TOI (Transfer of Innovation) from other industry sectors).
- ***Human System Integration*** (including HFE (Human Factors Engineering), Maritime Security, UCD (User Centred Design) methodologies, Emotional Design methodologies, Empathic Design methodologies, 'Ageing in Place', TOI from other industry sectors).
- ***Sustainability in construction*** (including one-off construction and series production issues, facility design, materials, joining technologies, reconstructions and rebuilds of historic craft, results of simulation).
- ***Sustainability in operation*** (including, equipment, results of sea trials, results of instrumentation, results of simulation, TOI from other industry sectors).
- ***Implementation of regulations*** in the design process (including international, national, and regional regulatory frameworks, classification, codes of practice, rating rules).
- ***Virtual work/learning environments*** (including, CPD for marine designers, networking opportunities for innovation and exchange, virtual work environments to facilitate multi-disciplinary, multinational teams).

www.rina.org.uk/marine_design2014

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Sovcomflot's eco tankers

Sovcomflot has ordered four eco-friendly LNG carriers. The first of which, *Velikiy Novgorod*, was delivered at the beginning of the year

Seven years ago Sovcomflot (SCF) began to use its own gas carriers for the transportation of LNG, which SCF explains as a market segment that was previously inaccessible to Russian companies. However, SCF's fleet now includes eight LNG and LPG carriers that are engaged in projects globally with a further six gas carriers under construction.

With the development of arctic projects and also environmental regulations the need for more technically advanced vessels has evolved. The state-of-the-art *Velikiy Novgorod* and its sisters were ordered by Sovcomflot from STX Offshore & Shipbuilding, Korea, in 2011. The second vessel in the series *Pskov*, is also expected to be delivered later this year.

Velikiy Novgorod is an Atlanticmax gas carrier with membrane cargo tanks of 170,000m^3 total capacity. One of the main features of the vessel is that it will be able to operate on a year-round basis, which will also include operating at the Sakhalin-2 and forthcoming Vladivostok LNG terminals.

Sovcomflot's latest addition to its fleet *Velikiy Novgorod* will meet environmental emissions standards

TECHNICAL PARTICULARS

Velikiy Novgorod

Length oa:	229.90m
Length bp:	288.00m
Breadth moulded:	45.80m
Depth moulded:	26.00m
Gross:	113,876gt
Deadweight (scantling):	93,485dwt
Speed:	19.5knots
Main engines:	2 x ABB AMZ 1120MR08 LSF
Output:	2 x 11,700kW
Electric generators:	
	2 x ABBAMG 1120MR14LSE/9,667kVA
	2 x ABB AMG 1120MR14LSE/1,556kVA
	1 x Hyundai HHN2 503-4P/ 2,250kVA
Output	2 x 9,000kW
	2 x 8,000kW
	1 x 1,800kW
Classification Society and notations:	LR/RS KM⚽Ice2, AUT1, OMBO, EPP, ANTI-ICE, LI, ECO-S, Winterization (-30) gas carrier type 2G (methane)

The design of the LNG carriers was developed in collaboration with experts from Gazprom, Sovcomflot, Russian Maritime Register of Shipping (RS) and the United Shipbuilding Company (OAO OSK). The vessel design complies with the latest requirements regarding environmental norms, energy efficiencies, working conditions and leisure provisions for crews, as well as onboard safety.

The cargo tanks are of a double membrane, Gaz Transport and Technigaz (GTT) No. 96E2 evolution system design. Sovcomflot states that this type of cargo system (reinforced membrane structure) is suited to operations in challenging climatic conditions. This has been proven through trials carried out in collaboration with RS and Krylov State Research Centre.

Velikiy Novgorod has a tri-fuel (LNG, fuel oil or gas oil) diesel-electric propulsion system that has been specifically adapted for operation in the North. "The specific feature of the newbuildings is a three-fuel diesel-electric propulsion plant allowing the use of LNG to be carried as a fuel. The use of gas as a fuel will enable the reduction of nitrogen and sulphur emissions to the atmosphere, which is an important step towards reduction of the maritime transport share in the environmental pollution," says Sergey N. Sedor, CEO at RS.

According to RS, *Velikiy Novgorod* is an Ice2 class vessel which covers ice-going vessels capable of non-escorted transit in ice types such as ice cake and brash ice found in the Arctic region or in solid ice escorted by an icebreaker, with ice thickness reaching up to half a meter.

"This ship was ordered by Sovcomflot to dual LR/RS class, with RS acting as the leading class society. The distinguishing marks ECO and ECO-S are assigned to ships which are safer in respect of emissions reductions as they take technical measures to prevent environmental pollution," adds Sedov. ***NA***

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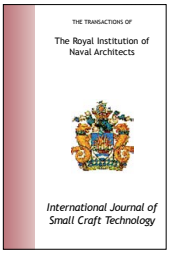

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