New Zealand Naval Architect

The newsletter of the New Zealand Division of the Royal Institution of Naval Architects Issue 25 • August 2005

Automated Mooring

by
John Harrhy

In 1996 the New Zealand company, Mooring Systems Ltd. of Christchurch, developed a new type of mooring system. It now delivers its automated vacuum pad, ship-mooring technology to the world .

Fig 1 shows one of the units in action, the overall dimensions of the four 20 tonne units are 4m by 3m. Even though the units can move freely vertically on rails attached to the wharf the units can step up the ship's side and translate the vessel 400mm either forward or aft.

What's wrong with traditional rope/wire mooring lines and bollards? What extra value can this system offer? The Management and Masters of the Interisland Line Ferry Aratere know that the 6 minutes or so that are saved on each and every turnaround make the units essential.

Fig 1- One of the 80 tonne Mooring System Ltd automated vacuum system which are installed for the Phase I development of the new Port of Dover

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The first mooring unit developed by MSL was in response to the Interisland Line's requirement that such facility was to be included in the design and construction package for the Aratere. This initial concept was for a ship mounted system called Iron Sailor™. Two 20 tonne units were installed at vehicle deck level in the double skinned side structure. This hull structure was required to meet the new stability standards (the Stockholm Accord) introduced following the RORO shipping disasters in Europe.

The units clamp onto vertical plates that are free to move in vertical rails attached to the wharf deck. Once the transom pin on the

A Word from the President

My first article is written at, what I consider, is a time of crisis for the marine industry. The industry has seen the collapse of three of our major boat building exporters this year, and there is serious concern being expressed publicly about the RNZN's Project Protector. However at times of crisis there is always the opportunity for a re-evaluation and change.

Although there may be one or two exceptions, I am convinced that the NZ boat building industry is failing to recognize the need to transform itself into a ship building industry. While superyachts may be euphemistically called 'white boats', their complexity and cost are equivalent to sophisticated ships requiring all the

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professional expertise of modern naval architecture and business practices.

The naval architect and boat designer have pivotal roles to play if our marine industry is to be successful.

Yet our universities have not embraced the need to develop suitable NZ orientated courses to meet the needs of our special industry. It ***is*** special because NZ is unlikely to become the centre of mass produced boats, and far more likely to become excellent at producing tailor made one-off solutions that demand professional engineering disciplines from to design to project management.

I have been involved in overtures to some of our universities and can see that the RINA has a role to play in perhaps developing a NZ orientated course whose naval architectural content is monitored from overseas facility and run independently and in parallel with an available B Eng degree course.

Two years ago our industry was being touted as one of the most rapidly expanding business area for NZ. However a year ago the export receipts were a half of the year before. Clearly the high value of the NZ dollar played a significant role in our current demise.

Our superyacht builders hardly have the best water-side facilities and I have been involved in trying to convince Government and Local Authorities to allocate land at Hobsonville to permit the creation of ship building and maintenance facilities coupled to educational and research facilities alongside the last deep water location available close to Auckland's population centre.

NZ cannot rely on a low dollar for the maintenance of an effective industry, and in my opinion, we need to develop distinguishing features or points of difference to enable our industry to be an attractive centre for boat/superyacht production. These points of difference have to be innovative and attractive to the client. We must be able to offer services or technology that cannot be found elsewhere.

To enable this we need to be able fund education and research and the industry needs access to realistically priced venture capital.

I cannot see this being achieved without a real commitment from the NZ Government and I see that the RINA has an important role to play by facilitating and lobbying. Our council has been very effective in building up our naval architectural resources and in assisting the MIA disseminate knowledge to industries practitioners. However I intend to shift my personal emphasis and use my personal energies as RINA divisional President to convince politicians of the vital need for support and understanding for our marine industry's requirement for naval architects, marine research and venture capital.

vessel is engaged with the shore ramp the Master pushes a button and the pads engage the plates and pull the ship to a preset distance from the wharf's fender system.

A vacuum attaches the Iron Sailor™ to the plates and a hydraulic system then governs the unit to respond to departures from the preset distance which can arise from lateral wind and wave action for example. The units have to be able to compensate for the change in tide, and in changes in ship's draught, trim and heel angle cause by loading and unloading. Changes in tide level and draught are compensated by the plate which is connected to a float system that keeps the plate at a preset height above the tide level. However heel and trim changes require that the units are articulated to freely absorb these changes of angle.

The design elements of the system were submitted to Det Norske Veritas for review even though it appeared to fall outside the normal Ship Classification obligations. One of the areas of concern was the ability of the system to absorb the loads that would arise in the high beam winds experienced in Wellington. It was decided to set the nominal design level at 50knots wind speed. The side load calculation ignored the

Fig 2 The Iron Sailor™ mounted forward on the port side of the Aratere in Wellington, NZ

shadowing effect of wharves and wharf structures and was considered conservative and reasonable.

The system monitors itself, and provides the Ship's staff with warnings as the hydraulic pressure increases in reaction to increasing wind load. The Ship's Operational Procedures govern that, at a preset value, traditional lines have to be set or the bow thruster activated.

The system has been in operation since March 1999 and has performed continuously since that time having achieved (at Picton, and Wellington) over 14,000 operations without incident. On one occasion when the Aratere lost electrical power while alongside for five hours. The system, which relies on ship power, held on without losing vacuum.

One of the unexpected outcomes of the Iron Sailor™ was that the hydraulic system adds significant damping to the lateral ship motions. This occurs to such a degree, that in the early days of operation on the Aratere, the ship's staff disconnected the system to check that the reduced roll angles and acceleration were simply due to its operation. This was a most important discovery, since it is evidence that the system has real potential for mooring ships together while at sea because, like roll motions in general, damping prevents the build up of rolling energy and provides disproportionate roll reduction. A recent proposal regarding this application in Australia, involved the loading of ore on Cape Size Cargo ships. Damping between the Cape Size vessel and a large floating transfer barge the mooring system would have given significant benefits however, the test facility was unable to replicate the mooring system accurately and the test results were not representative.

Iron Sailor™ had the limitation that it could only moor the ship on which it was fitted. MoorMaster™ was developed as a wharf mounted system that could attach and moor any vessel alongside. Patrick Shipping Pty Ltd of Australia have subsequently installed systems for their RORO freight ferries at two Australian ports. It has been operating since December 2003.

The challenge that MoorMaster™ introduced was the fact that the ship's side needs to be sufficiently strong to resist the intense vacuum pressure of up to 85kPa over significant areas of plating and panels as well as absorb the mooring loads which, in this case were up to 40 tonnes per unit. As a precaution the ships' structures were strengthened internally in the target areas.

The wharf mounted system replaces the floating plate of the Iron Sailor with an articulated mechanism that permits free vertical movement, and adds very useful vertical damping, and although not substantiated by measurement, is likely to dampen the motions of these ships even more effectively than Iron Sailor™ on the Aratere. In 2005 Toll Shipping introduced a 2 x 40 tonne MoorMaster™ system for its Cook Strait crossings.

Developments in design have continued and it is increasingly likely that the stiffening required for the Searoad Mersey and Searoad Tamar can be substituted by a new structural concept in the pads themselves leading to a mooring solution that will not require ships to be strengthened, and which will, in all probability,

Fig 3 MoorMaster™ mooring the Patrick's RORO ferry, Searoad Tamar, in Australia

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receive type approval from Class Societies for application on all types of vessels.

In May 2005 Mooring Systems Ltd. European licencee Cavotec Group Holdings (CGH).announced that AP Moller Terminals (APMT) and Salalah Port Services (SPS), are to trial MSL's mooring technology within the Port of Salalah, Oman. The trial will involve the installation of two MoorMaster™ 400 (40 tonne) automated mooring units on a quay in Salalah. These units are currently being constructed by Cavotec in Italy and will be delivered to Salalah for commissioning.

John Harrhy is a Naval Architect and a founding Director of MSL.

Massey University Transport Design Degree

by
Bruce Woods

Many years ago Gifford Jackson set up the Naval Architecture Group (NAG) as a means of bringing together many people who had a passion for yacht and powerboat design. Gifford was a Naval Architect by training who in the 1940's, became deeply involved as a professional designer in the rapidly emerging field of industrial design. There was a concern that there was no career pathway available for those wishing to become small craft designers, so an educational sub-committee was set up a group unit standards for a degree were drawn up and approved. Unfortunately when no tertiary institution was prepared to set up a degree in Naval Architecture, the numbers of potential students were considered to be to low to be economic and the set up costs for equipment and facilities were too high,

Brian Woods then took on the mantle. Now retired, a graduate in Industrial Design his focus was given to developing a course that could be attached to an existing design degree. It was to have substantial theoretical content and was given a marine industry emphasis. In 2002 the four-year Massey University Marine Transport Design course was established and in 2004 RINA Accreditation was awarded to the degree. 2006 will see the first batch of Marine Designers graduating.

Trevor Blakeley CEO RINA during his visit in 2004 when the RINA Accreditation of the Degree was awarded to the College

The majority of Transport Design Degrees overseas have road vehicle design as their primary focus. Aesthetics and form creation, styling, both interior and exterior is given priority. However the Massey University Degree differs substantially in that it was conceived as having a substantial naval architecture and engineering core, 40% of the basic content for the course. It was felt that Transport Design must be based on a sound understanding of fundamental physical principles. In order to function effectively as a member of a design team working with naval architects and engineers understanding these principles is essential.

Where the degree differs substantially from an engineering or naval architecture degree is in the context that theory is taught. The emphasis is focussed on an integrative design approach where theory is taught almost exclusively in studio design classes. All classes and subjects are taught in a design context even model making and materials.

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Papers that deal with materials and processes have a brief introduction to timber and metal construction but the emphasis is on GRP and composites. Systems papers aim at giving a broad overview of systems, how they operate and impact on construction and fit out, rather than on how these systems are designed.

What do they do on the course?

Year 1 is a generic course which provides a very wide range of creative design process experience. This includes fine art and design, 2D and 3D form development, spatial design, performance design, manual drawing skills, model making, very basic introduction to research methods, verbal, written and visual communication, and presentation methods. Students are exposed to class criticism, joint and individual approaches to design.

In Year 2 students spend both semesters with a focus entirely on marine design, Semester 1 on Sailing Craft, and Semester 2 on Power-craft. At the same time different hull forms (displacement, transitional, planning), Weight, Displacement, Froude number, S/L ratio, and other simple Hydrostatic principles are studied. In this year the students design their first yacht, the focus is on the overall concept emphasising hull, deck, appendages and rig, with some initial consideration of layout. Students are required to complete basic estimates and calculations, sail-plan, balance etc and produce a basic technical report. They have to produce a lines plan together with a small scale fibre board model. Also covered in this year is the physics of sailing, basic design theory, model making, drawing, materials and complete several exercises in model making including building a ½ model from a set of plans provided. Computer studies include an introduction to 3D modelling using Ashlar Vellum Cobolt, and hull modelling using MaxSurf.

In Year 3 the students elect to design a sailing boat, powerboat or road vehicle. During this year they study composites, an introduction to systems, continue developing their drawing and rendering skills, and computer modelling skills, plus an advanced Ergonomics paper and Research Techniques paper. They are given an introduction to CAM, NC and Rapid Prototyping.

In year 4 the students work on their final major project. At the end of the year they are obliged to have completed a highly finished 3D physical model, virtual model, technical report and make a detailed audiovisual presentation to an examining group.

Students have reached the final of the RINA Concept Boat Design competition in 2003 & 2004 and a 3rd year student was a finalist in the 2003 Michelin Car Design competition.

Head to head Competition

In June third year students took their designs to the water of Takapuna beach. The students were asked to design and build the fastest-possible craft powered by an 8hp outboard motor. The boat had to be "fun" and be able to carry one or two people. Performance was evaluated by a 250m standing-start time trial and a fleet race around two laps of a triangular course. Students were organised into four teams for the competition each having a vessel of quite different designs.

Thresher, a three-point planing hull construction was conceived to be a fun boat simpler and more economical than a jet-ski. Spypeedo, a wave-piercing displacement catamaran was designed as an economical, simple to operate vessel, that could be used for a variety of waterborne activities. Aqua Skimmer, was developed with large water-plane area skis which tilted for steering. Unfortunately

Clockwise from top left—Spypeedo, Aqua, Xplora and Thresher

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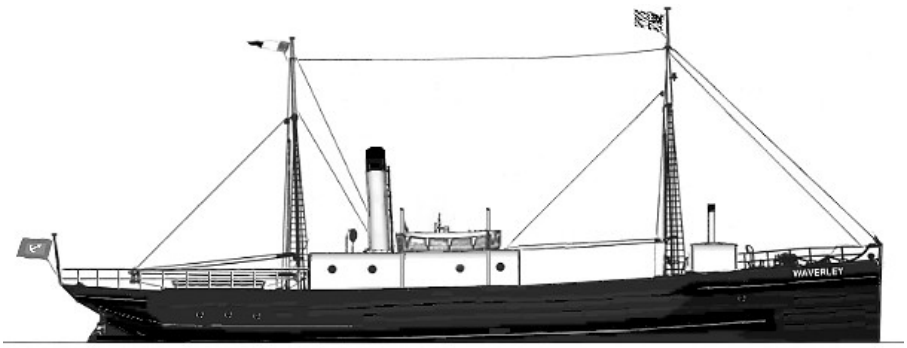
this steering method malfunctioned on race day and the vessel retired. Xplora, a trimaran that utilised downwash to create lift was designed as a stable boat for exploring and fishing. On the day Xplora won the circuit race and Thresher and Spypedo took the 250m standing start line races.

Summary

The ability to think and act creatively, learning to communicate ideas, and developing skill with computer-aided design are essential and substantial elements of the Marine Transport Design degree. This creative process begins when an idea, a concept is developed. The transport designer is focussed on making concepts work, changing ideas into reality. They look closely at how people and society will relate to the device or system, physically and emotionally, how they will operate it, and travel on or in the machine. They need artistic creative skills, technical skills, and communication skills. They need to be adaptable and be determined, they must be passionate about their work, be willing to have fun. In 2006 we shall know whether this has been achieved.

For further information about the Marine Transport Design option within the Bachol of Design course contact Bruce Woods at Massey University College of Design, Fine Arts and Music,
email: B.Woods@Massey.ac.nz.

"A Slice of History"
T S S Waverley



The last West Coast Gold Fields Steamer

Specifications

Official Number 69012

Displacement 92 tons net, 125 tons gross (later refitted to 157 tons gross).

Rig Schooner rigged twin screw steam ship

Length originally registered at 93 feet, 7 inches, she was lengthened to 112 feet in 1897

Beam 18 feet, 2 inches

Draught 8 feet, 4 inches

Hold depth 8 feet

Propulsion Twin 25 h.p. steam engines

In 1883 Waverley was built by Bailey and Seager at Freeman's Bay, Auckland for the Patea Steam Shipping Company at a cost of £5,700. Captain Gibbons, who would be her master in 1893, supervised the design. Although primarily built for cargo, she was also licensed to carry 42 passengers, with cabin berths for 12 males and 10 females. The Saloon and Smoking Room were panelled in Oak and Maple, with upholstery of Crimson velvet. Early in her career, she was known to be carrying live stock from the small ports of Taranaki to the freezing works (abattoir) at Petone in Port Nicholson,Wellington.

She arrived at Patea at the end of her delivery voyage in May 1883. The vessel made a loss of £313 in her first year of trading but the next trading year she made a handsome profit.

In 1886 she was purchased by the Anchor Steam Shipping Company of Nelson for £3,300 to replace the ss Wallace, which broke her back at Greymouth in the previous year. She remained with the company from 1886 to 1897.

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She usually left Wellington on a Friday afternoon and arrived at Nelson on Saturday morning, when she discharged her cargo for that port. Then she loaded cargo consisting mainly of general produce and groceries for Westport and Greymouth. Much of this came from the country by the Saturday afternoon train, which usually ran late. It was said that this train was not popular with the Line's staff because they usually lost their half holiday and even the biscuits would not make up for this. After discharging on the West Coast, the Waverley would then loaded coal for Nelson, Picton, Foxton, Wanganui, or Patea.

In 1897 she was lengthened by 18 feet, 5 inches, she was refitted to 157 tons displacement.

In 1898 The SS Ruapehu, bound from London to Wellington, stranded in broad day light on the Farewell Sandspit and the Waverley was sent to her assistance. She arrived early in the morning and during the day was joined by seven or eight other steamers willing to give assistance and to earn salvage. However, it was the case of the "mouse and the lion". All the steamers with the exception of the Waverley were of too deep a draught to get alongside the stranded vessel and consequently she was the only means of communication between the Ruapehu and the other vessels, two of which were intended to tow her off at the next high tide. Unfortunately, when transferring a heavy wire hawser from the Talune to the Ruapehu a Manila rope to which the hawser was attached became entangled in one of the propellers of the Waverley, and for a time it was feared that not only would the Waverley be out of action, but the special towing hawser would be lost. Captain Bendall, acting on behalf of Lloyds, endeavoured with the assistance of a boat's crew to clear the line but after considerable buffeting in a heavy sea gave it up as hopeless. William Rogers [1860-1940], having gained experience in similar propeller troubles volunteered to undertake the job and after a rough time in and out of the water, he managed to free the rope.

In 1901 she was taken over by the Anchor Shipping and Foundry Company Ltd. She was valued at £5,000 on the 4th of November. From 1905 until 1909 she was used by the company in the provision of its over night passenger and cargo service between Nelson and Wellington.

In April 1916 she was sold to the Patea Farmers' Co-operative Freezing Company. With her insulated holds, she was suitable for the freighting of frozen meat from Patea to Wellington. Between 1917 and 1925 she stranded 5 times at Patea. In 1928 she was dismantled at Wellington and then towed from Wellington by the SS Wairau to the mouth of the Wairua River, where she was to be sunk to form a breakwater. Before being scuttled, she was swept up the channel in a flood to where she now lies in the Wairau Lagoons (7.5km South-east of Blenheim) and where the NZ Army subsequently used her for target practice.

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Your Council

Over the past few months there have been a few changes to the council line up. Graeme Finch stood down as President after two years of service. John Harrhy who was Vice President has stepped into his shoes and Helen Quekett has taken on the position of Vice President.

Chris Mitchell who has held the position of Treasurer for five years has stepped down from the council and has handed over his responsibilities to Susan Edinger. Michael Eaglen has taken on the position of division secretary.

Martin Hannon and Heikki Hansen resigned from the council. Martin to pursue his sailing and Heikki to return home.

This month we welcome Roger Hill and Nick De Waal to the council. Brendan Fagan, Graeme Finch remain on the council.

We wish those leaving the council best wishes and many thanks for all the hard work they have put into the division.

In 2006 several members of the council will have to step down from the council in accordance with the RINA by-laws. If you are interested in joining the council and helping to shape the New Zealand division please email John Harrhy or talk to any of the other committee members. Committee meetings take place every 2 months and usually last between 1 and 1 $\frac{1}{2}$ hours.

Technical Meetings

More information on the following events will be provided in Up-date.

SEPTEMBER 20th: **High Modulus Research and Design Update**

6pm at High Modulus NZ ltd, 32 Canaveral Drive, North Harbour

NZ Division Library

To access the library collection contact:

Gillian Ralph: g.ralph@irl.cri.nz
(09) 920 3466

To see a list of the collection via the internet access the site

www.irl.cri.nz/infoservice

and search the library catalogues.

Don't forget to look up our RINA web site (www.rina.org.nz) It is where you'll find

- NASNZ Standard Terms of Trade and Standard Design Contract, available for free download.
- Past issues of the NZ Naval Architect

The New Zealand Naval Architect is published quarterly.

All correspondence and advertising should be sent to:

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The Royal Institution of Naval Architects (New Zealand Division) would like to acknowledge the continuing support of Clendon Feeney as our Honorary Solicitors.
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