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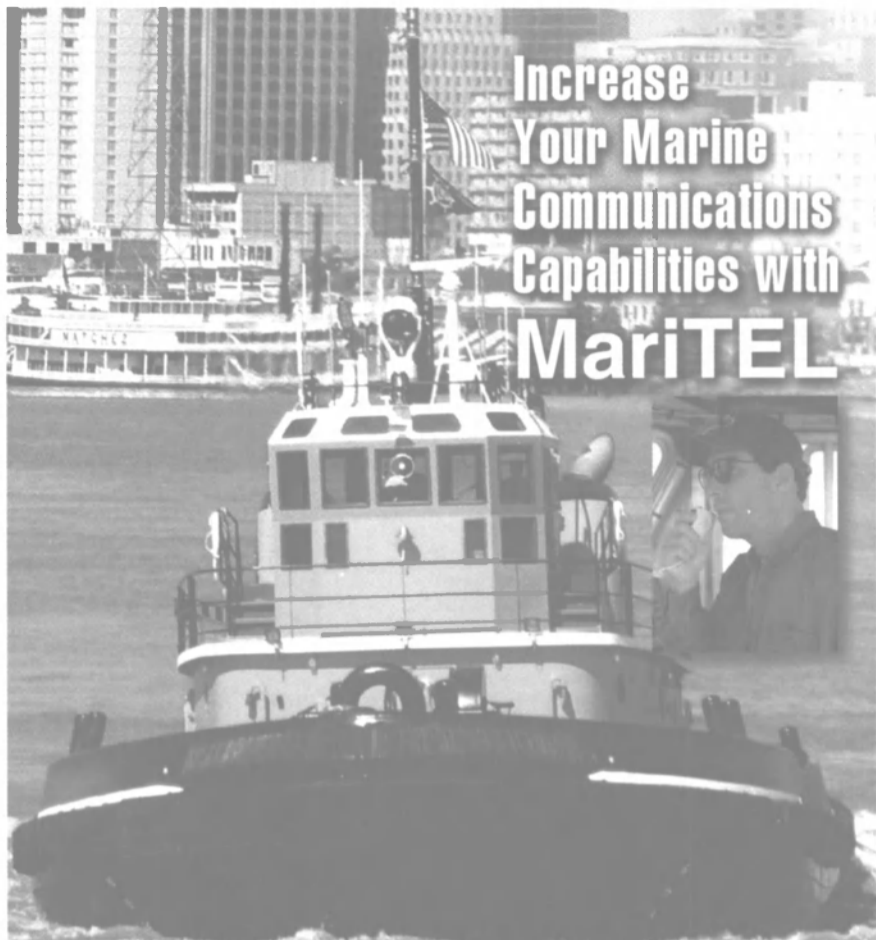


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On the Cover: Pictured is an innovative concept for a dual deep-draft/shallow-draft vessel proposed by Leary Engineering in New Orleans. The concepts embodied in the Hinge Ship are indicative of the continual efforts of naval architects and marine engineers to enhance efficiency, safety and profitability. Read about the Hinge Ship, and other emerging marine technologies, starting on page 40.

8 Like Father Like Son

The Tillberg family name is synonymous with excellence in cruise ship design, a passion and talent, which has transcended a generation. — by **Regina P. Ciardiello**

17 The Technology Way

Germanischer Lloyd's Dr. **Hans Payer** discusses the emerging technologies that will define shipping's future.

25 Shipbuilding by Numbers

Powerful CAD/CAM systems have radically enhanced the ability of designers and builders to cost effectively design vessels. PTC, a \$1-billion behemoth with advanced design products across many industries, has launched its new shipbuilding specific product.

31 Propulsion Report

Tailored propulsion solutions continue to offer vessel owners, and builders a greater array of options.

40 The Future Is Now

Whether it's a viable transportation solution or one designer's dream, innovations such as the Hinge Ship continually challenge marine industry designers, builders and owners to push the limits.

44B German Marine Report/ SMM 2000 Preview

The world's largest and arguably most important marine industry exhibition is set to sail again in Hamburg. Read up on some of the innovations due to be unveiled at the show.

67 Invasive Species Are On Alert

The ballast water conundrum is gaining legislative attention and dollars on the international and national levels, as the industry will increasingly be forced to deal with solutions to the invasive species problem.

13 E-Commerce

23 New & Notable

28 SNAME Preview

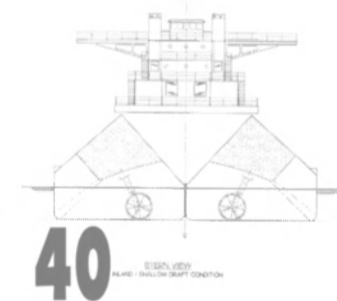
54 FPSO Report

60 Marine Literature Review

71 Buyer's Guide

74 Advertiser's Index

75 Classifieds



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Editor's Note

“Find the great thing in this world is not so much where we stand, as in what direction we are moving. To reach the port of heaven, we must sail sometimes with the wind and sometimes against it, but we must sail and not drift, nor lie at anchor.”

Never remiss to incorporate wisdom of the ages for the editorial good, I found this quote — from Oliver Wendell Holmes, *The Autocrat of the Breakfast Table*, 1858 — hanging handily on the wall of my colleague, Charles Keil, on a recent visit to our office in Florida. It concisely summarizes not only the editorial content of this edition, but the various forces that have helped to shape the direction of the maritime industry today.

Often erroneously regarded as “set in its ways,” the marine market is in the midst of dynamic changes that touch its very core. Driven by corporate consolidation and international expansion, fewer, larger companies are battling for precious market share by constantly researching, developing and delivering to market engineered solutions that are designed to increase efficiency while minimizing cost. The propulsion segment is a prime example, with major diesel engine manufacturers battling each other — and more recently gas turbine manufacturers on high value, high prestige cruise ship references — by producing powerplants that are less complex and maintenance intensive, more efficient and increasingly environmentally friendly. The result: designers and owners have more flexibility and more choice.

Innovation in terms of vessel design has similarly impacted the maritime niche, as naval architects and marine engineers are increasingly empowered with new technological tools designed to make the process of designing and building better boats and ships for a lower cost. PTC, a \$1-billion company with proven CAD/CAM solutions in many industries, has launched a new shipbuilding specific package, which is detailed on page 25.

The continued push for optimized vessel design is embodied in this month's cover story on the Hinge Ship from Leary Engineering in New Orleans. Many patented concepts pass our editorial desks each year, some incorporated into the publication, some stashed in “future edition” limbo, and some landing in the “permanent file” (i.e. trash can). The concept was striking in that it envisages a unit capable of transiting both deep and shallow draft routes with the same vessel. While it is unlikely that the waterways of the world will anytime soon be filled with hinge ships, it is fair to say that it is this type of “out of the box” thinking that lays the foundation for progress.

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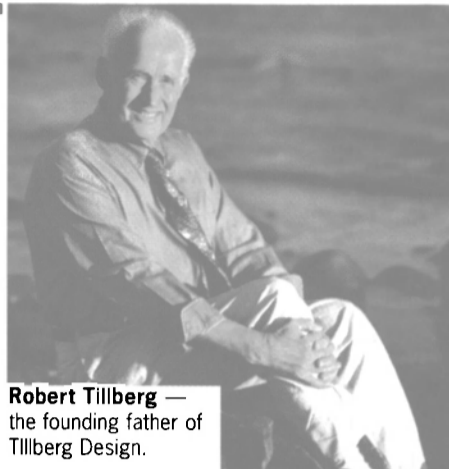
First Family of Design

The Tillberg name is synonymous with luxurious cruise ship design, often serving as the masterminds in the creation of images and themes that will capture the essence of the each vessel's itinerary and passenger base. MR/EN spoke with two generations of the Tillbergs — founder Robert — and son Tomas — to discuss their philosophies, ideas and creations for a business that is expediently working to meet the cruise industry's newbuild boom.— By Regina P. Ciardiello, associate editor

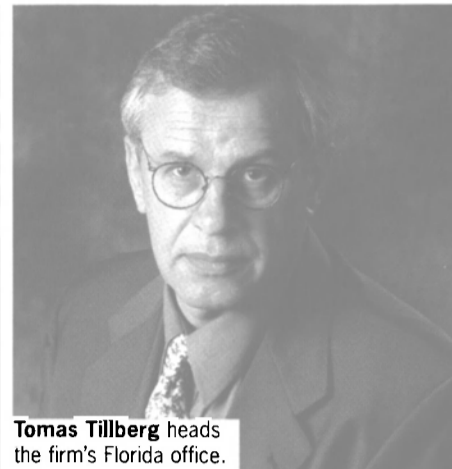
From the time he was a young man attending college in Sweden, **Tomas Tillberg** longed for the day that he could join his father, **Robert Tillberg**, at work designing and dreaming up new ideas for the cruise ship industry. Tomas remembers wanting to accompany his father on his daily routine — whether it was a meeting at a European shipyard with engineers or at his father's home base at his design firm in Viken, Sweden — Tomas wanted to be a part of the industry that has helped to establish Tillberg Design into the "family" of cruise ship designers/engineers. As much as the younger Tillberg wanted to free his creative mind within the world of cruise ship designing, at that time, little did he know that one day he would go on to head the U.S. branch of his father's com-

pany during one of the most groundbreaking moments in the cruise industry — the construction of the first cruise ships in the U.S. in 40 years.

Tillberg Design has earned the title as one of the two firms working to design the two newbuilds that have been ordered for American Classic Voyages' (AMCV) new United States Lines. The two vessels, which are currently being built by Litton Ingalls Shipbuilding in Pascagoula, Miss. will be homeported in Honolulu, Hawaii for weekly cruises throughout the Hawaiian Islands. Originally supposed to have been constructed by NASSCO, AMCV chose Litton Ingalls to build the two ships, whose first steel was just recently cut. Since the Norwegian firm of Yran and Storbraaten had already been tapped by Ingalls to



Robert Tillberg — the founding father of Tillberg Design.



Tomas Tillberg heads the firm's Florida office.

perform the architectural design of the vessel pair, the firm was signed on with Tillberg as a joint effort since AMCV had a strong belief that the Tillbergs could effectively capture the sense of a surreal Hawaiian atmosphere — and why not, when after all, the Tillberg team swears by two basic criteria before designing a ship — itinerary and passenger.

In fact, Tomas added that AMCV invited the Tillberg architects that were assigned to the project to step onboard AMCV-owned (American Hawaii's) S.S. Independence to grab hold of the Hawaiian essence (the vessel currently operates cruises to the Hawaiian Islands for the line).

"Project America (U.S. Lines) is specifically geared toward

Hawaii/American patriotism," Tomas said. "We try not to do a pastiche or rather, looking glass feel, we want to capture the real thing — rather than just providing a take on it."

Just what is Hawaiian design and how is the Tillberg team going to provide the "real thing?" According to both Tomas and Robert, there's a certain heritage that Hawaii possesses — it's different from the Caribbean, not just by its landscape, but the fact that it boasts natural wonders as rain forests and volcanoes. In addition, unlike the Caribbean, the weather patterns are different allowing the option for the design of an outdoor eating area on the ship.

As lead designer on the project, Tomas is modest to credit one specific person who assisted the firm in "capturing the

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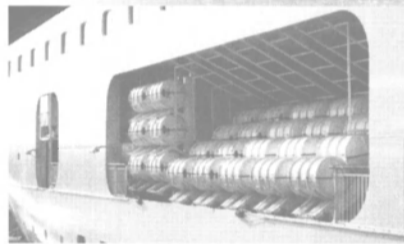
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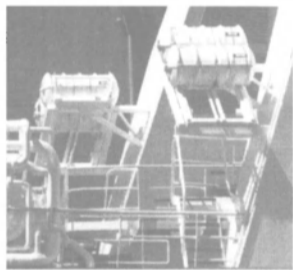
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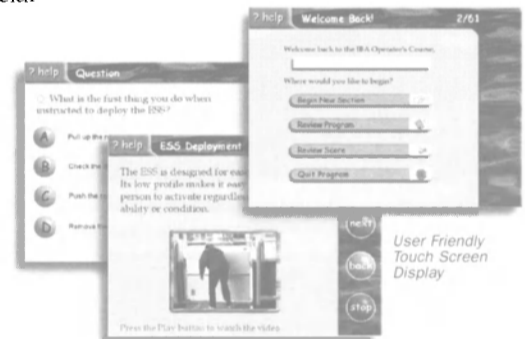
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Hawaiian essence" on the vessels — **Mary Philpotts** of Honolulu-based Philpotts and Associates. A Hawaiian native, Philpotts was hired by AMCV to provide Tillberg with her knowledge and ideas of what represents Hawaiian design, and to assist **Marcello Mojno** of the firm's Fort Lauderdale office with

the design of the vessels' atriums. Mojno, who is the lead designer on this specific area, worked with Philpotts on this public area to grasp the crux of Hawaiian culture through design.

The Commencement Of A Legacy
Growing up along the coastal town of

Vasterik, Sweden. Robert first aspired to devote his talents as a landscape artist, but these thoughts were squandered when after comparing his work to that of others, Robert felt he could not measure up — thus leading him to set his sights on something more fruitful — specifically in the league of furniture design.

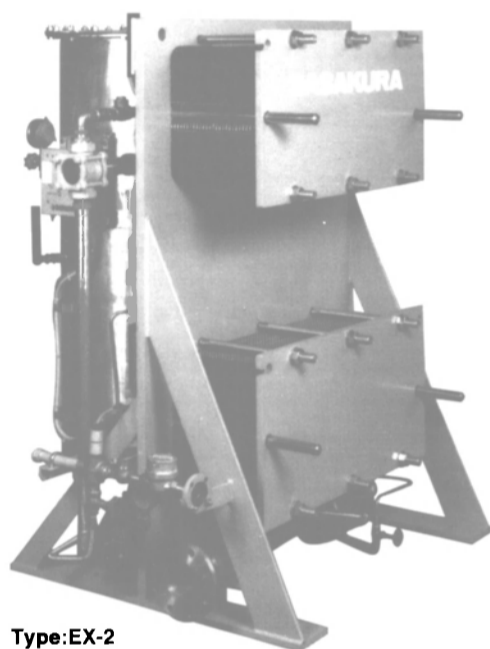


A Tillberg rendering of the lobby area onboard Sea America.

Deciding to leave the small haven of Vasterik to study architecture and furniture design in Stockholm was most likely Robert's gift to the cruise industry, as it was there where he began to shape his craft. While in Stockholm, he developed his talents within the areas of cabinet making, upholstery, fabrics and textiles, which most likely lended a hand in the evolution of his now-illustrious career. Robert concluded his formal education — which also allowed him to study with Swedish furniture designer **Carl Malmsten** — earning the titles of qualified architect and furniture designer. Shortly after, Robert landed a job with G.A. Berg — a Gothenburg company that concentrated on ships' furnishings. G.A. Berg prepared Robert for what would plant the seeds for his eventual status — as it was there that he began designing and creating furniture for ships — a career that would carry him throughout the 1940s and 1950s — and would include the outfitting of vessels such as the North Sea passenger ferry SAGA.

In 1964, Tillberg entered the cruise design arena on his own by garnering the contract as lead designer on Swedish American Line's Kungsholm. The vessel, which ironically was built in the same yard as Cunard's QEII, preceded two vessels, which undoubtedly hold special places in Robert's heart, as they were the newbuilds that most likely allowed Robert to find his niche within the cruise ship design industry. The vessels, Sea Venture and Island Venture included a series of special chairs used in the vessels' lounges and dining areas. These "comfortable, easy chairs," were designed by one of the only two original Tillberg designers who are still with the firm — **Walter Moller**. Described by Robert as a "very good designer of furniture," Moller, who has been loyal to the firm for more than 30 years, still contributes his creativity to different Tillberg projects. Robert credits part two of his lifers as **Anders Johansson** who, like Moller has been with the firm for 30+ years. Although he is on the edge of retirement, Johansson operates out of the Swedish office, maintaining and establishing the relationships that he has

(Continued on page 56)



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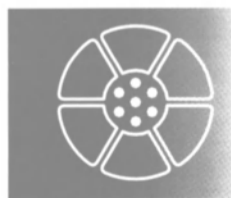
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Unitor Launches New IT Program

Unitor has taken the next step in giving customers the power to manage their fleets. Customer empowerment in the area of information technology is the next generation of service supported product offerings. Unitor's new information technology system named PartnerSHIP offers subscribers access to all critical information regarding their fleet as well as data about Unitor's worldwide network. This Web-based program offers secure and direct customer access into Unitor's mainframe computer. This computer network acts as a data repository for all of the customer's information. In conjunction with that information it also accesses Unitor's own central database regarding its products, services and port information through a secure



web server. By offering customers all of this information through a single vehicle it allows owners to better understand how and where they are utilizing the Unitor network. Unitor is the first marine chemical company to offer such a free service to its clients. This variety of informational tools focus on ship owner specific pricing, reporting, port offerings, and product support.

PartnerSHIP gives instant access to pricing of Unitor products worldwide. Once a client's contract pricing is established, the client can then access PartnerSHIP to review net pricing in potential ports. Clients can also make comparative reports in order to evaluate the cost benefits of all proposed ports. Since shipowners will know in advance their ports of call, Unitor makes it possible to forecast future costs based on pricing structures and anticipated consumption. With regards to actual deliveries, users can also drill down to review signed delivery documents and related information. This alleviates the time necessary in researching delivery notes and allows for auditing of actual pricing from contract to delivery.

PartnerSHIP allows ship owners access to their own data in order to generate custom reports. These reports can be used to review fleetwide costs and consumption. The program also allows



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the generation of reports that can compare similar vessels in order to determine proper usage of products onboard. This allows for real-time access to data that might not be readily available to ship owners until the end of the month or worse still — the end of the year. This permits corrective measures to be taken well in advance to avoid end-of-year budget overruns. Another feature of this reporting function is that PartnerSHIP can download customer data to any spreadsheet type program. This enables the owner to perform efficient comparisons, internal reports, and other documents that ship owners require through the course of the year. As with all capabilities of PartnerSHIP, this downloading ability is user specific and only information related to the client's company can be accessed.

Robert Lee Gordon is the director of purchasing for Ocean Development Company. Gordon is responsible for all project related purchasing of hotel, nautical, and engineering products for Project America, M/S Patriot, Columbia Queen, and the Coastal Vessels.

Marinetalk.com Relaunches

MarineTalk.com has just launched a new, user-friendly version of its popular web portal, offering improved content and navigation. Focusing on the technical sector of the marine industry, Marinetalk.com provides free listings of products, services, and business contacts on its portal, and to date the organization claims that there are more than 10,000 companies listed.

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BV In E-Commerce Push

Bureau Veritas reports that a group-wide move into e-commerce is expected to underpin a projected nine percent growth in revenues and 15 percent growth in profits for 2000. Chairman **Bernard Renard** said "Growing by acquisitions is one part of our program. The other is to grow organically by developing our e-commerce strategy. Our industry sectors, global, flexible and diverse, are ideally suited to harnessing the power of the Internet, and BV has invested heavily in IT over the last few years to position itself for this move.

"There are four main things we can do with the Internet. We can use it to make our business more efficient and to make us even more user friendly to clients. We can be a major information provider. We can use our IT knowledge to help companies build e-commerce solutions.

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Marex Grabs Hold Of Maritime Market

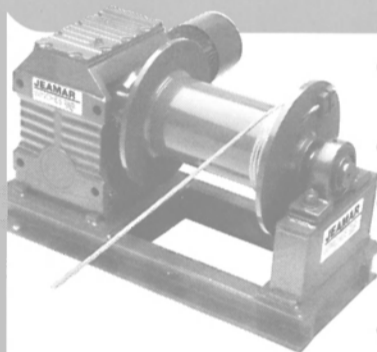
Marex.com has expanded into the \$500 billion global maritime industry through a newly formed entity, Marex Maritime, which will pursue joint ventures and partnership opportunities with

in the global maritime market. The Miami, Fla.-based company has retained Merrill Lynch to serve as its financial advisor for the review and analysis of strategic initiatives, and is formally examining various strategic initiatives including alliances, partnerships and other relationships, both with maritime

related e-commerce companies and major maritime industry participants.

Additionally, the company elected **Sara L. Wilkins** as vice president of Investor Relations and Corporate Communications. Wilkins has vast experience in both the public and private sectors within investor relations.

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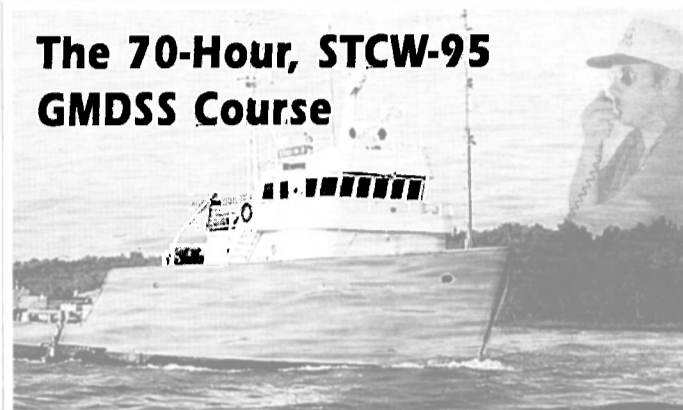
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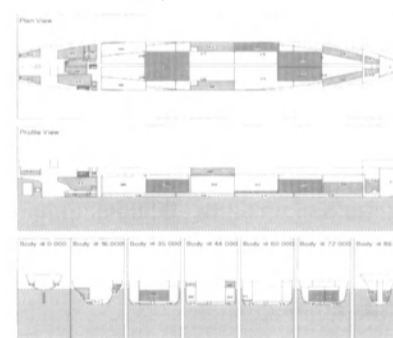
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Kvaerner Gets Two Cruise Deals

Kvaerner signed a deal with Costa Crociere to construct a 86,000-grt cruise ship. The vessel will accommodate 2,100 passengers and will cost more than \$500 million to build.

The ship will be built in Helsinki to be delivered in 2003. Kvaerner said it will

arrange third party financing to cover the major proportion of costs associated with construction.

Kvaerner To Build Cruise Ship For Carnival

Kvaerner ASA also reported that it had won a contract worth almost 3.3 billion Norwegian crowns (\$366.5 million) to build a cruise ship for Carnival Corp.

The vessel, to be built at Kvaerner's Masa-Yards shipyard in Finland, will be 86,000-grt, due for delivery at the end of 2003.

Following the contracts, Kvaerner said the current order book at its Masa-Yards shipyard in Finland now stands at \$3 billion.

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FirstWave/Newpark Awarded Contracts

FirstWave/Newpark Shipbuilding was granted two contracts from Marine Drilling Company. The Marine Rig 202 arrived from Singapore on June 26 for skirt repairs and replacement to the rig mat. The Marine Rig 201 — also from Singapore arrived at Newpark's East Pelican Island Facility June 28 for minor repairs and loadout.

The company was also awarded a contract from Parker Drilling Offshore Corporation for steel and piping repairs to the Parker 25 J, which arrived at FirstWave's East Pelican Island facility on June 23.

Bollinger To Construct Double Hull

Bollinger Marine Fabricators, Amelia, La. has signed a contract to construct a pair of 250-ft. (76.2 m), double hull, jumbo coastwise service, single rake hopper barges for Tide Leasing of Birmingham, Ala. With construction already having begun on the first barge, the building of the second vessel will begin in August. Both are scheduled for a November 2000 delivery.

With a depth of 14 ft. (4.2 m) each, 52.5 ft. (16 m) beam and 11.5 ft. (3.5 m) maximum draft, the vessels will be built with .75-in. steel at the hopper bottoms and .625-in. steel at the hopper sides plus .50-in. T-1 liner plates on the bottom and upper sides of the hopper. Operating out of Santa Marta, Columbia, each barge will be able to transport up to 3,000 metric tons of coal.

Metairie, La.-based Shearer and Associates designed the new barges for the transportation of coal in limited offshore service. Classed by Lloyd's Register of Shipping, the barges will have a Lloyd's load line.

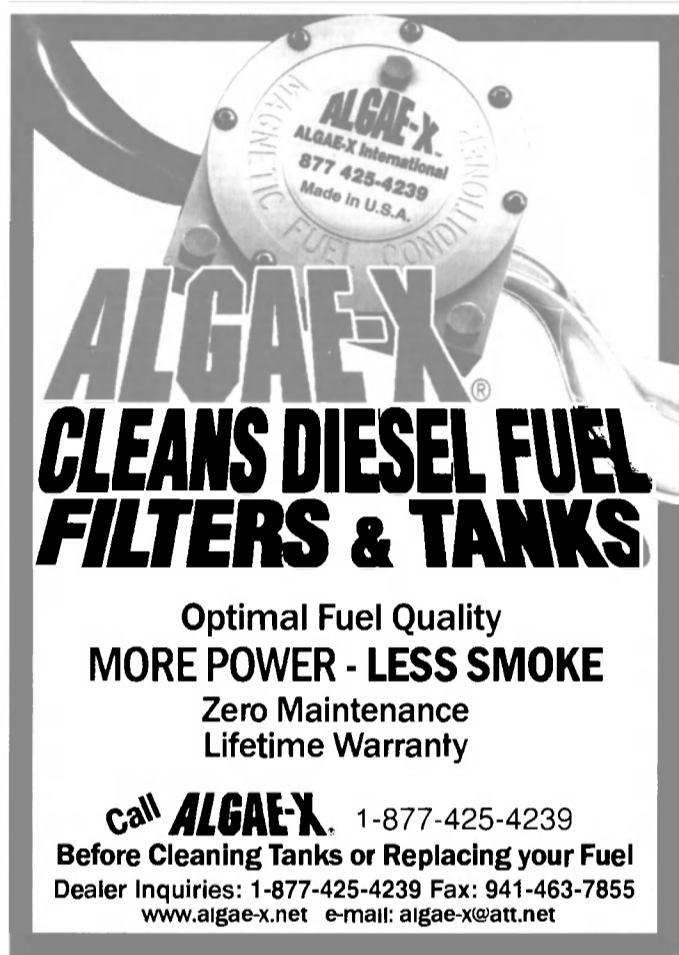
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BP Amoco Orders Two LNG Carriers From SHI

BP Amoco ordered two liquefied natural gas (LNG) ships, with options to purchase three more, from Samsung Heavy Industries Co for in excess of \$300 million.

The oil giant, which is the world's second largest non-state producer of natural gas, said construction will start in April 2001 with delivery of the first ship in the fourth quarter of 2002 and the second in the first quarter of 2003.

Company officials said that the orders formed part of the group's wider gas and power strategy including the recent deal to supply LNG to the Dominican Republic. The ships will have a capacity of 136,000 cubic metres at 98.5 percent full.

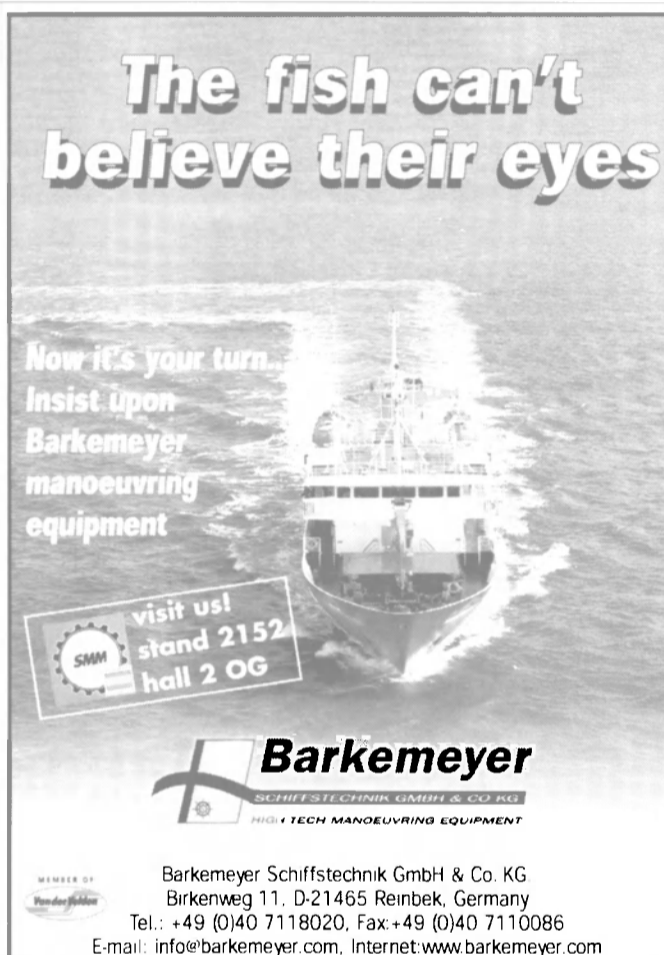


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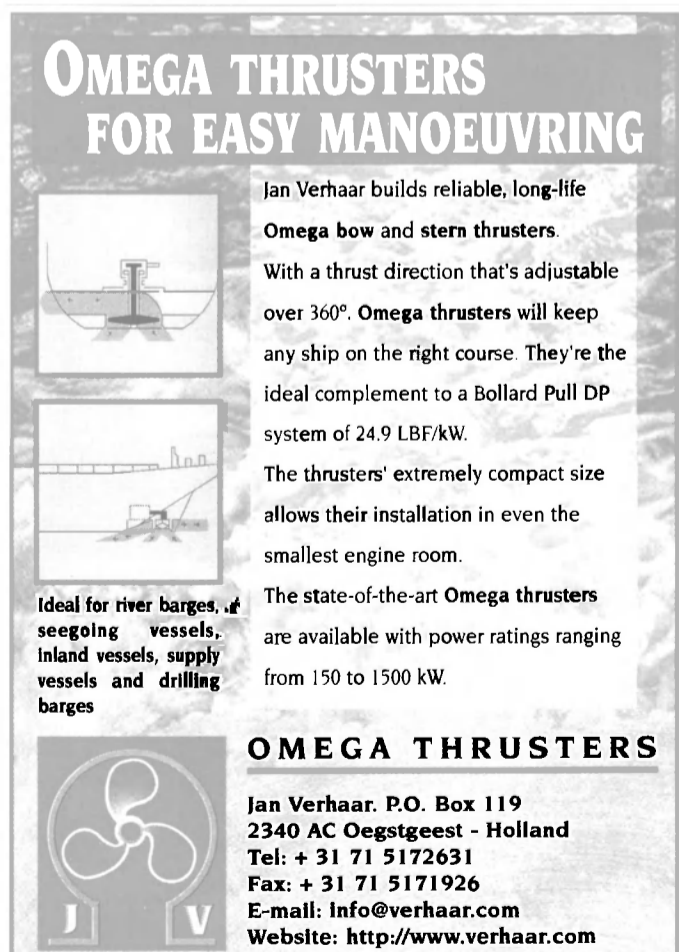
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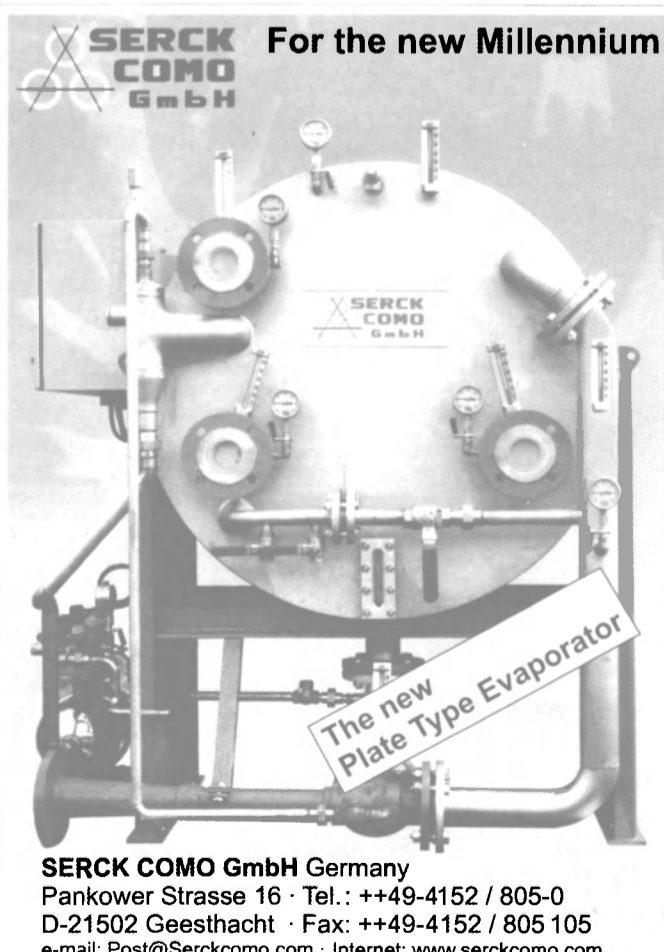
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Market Forces And Technology Will Shape The Future Of Shipping

We are living in a time of vigorous world growth and the liberalization and globalization of world trade, and no industry will be more central to this process than shipping. As in the past, our industry will be driven by the requirements of the market and by advancing technology, and over the next decade we can expect evolutions in the development of all types of ships.

This is also a time of transition from prescriptive rules and regulations to the creation of an industry wide safety culture based on self-regulation and self-responsibility, and the classification societies will be at the heart of this.

What sort of technical advances can we expect to see in the main types of ships throughout the next 10 years or so, and what will be the problems and risks involved?

Containershipping

The most dynamic development will continue to be in the field of container ships. Today the world fleet of 2,600 fully cellular ships of 53 million-gt accounts for nearly 10 percent of world merchant ship tonnage. Some five years ago this was only 5 percent. Now roughly 70 percent of general cargo is containerized, and it is expected that this will grow to more than 90 percent by 2010.

The economies of scale are highly relevant to this ship type, and that is why we will see increasingly larger ocean carriers and feeder ships. Panamax ships of more than 4,800-teu are already in service, and there will be innovations to increase the capacity of these ships to more than 5,000-teu, such as 12 abreast stowage, a reduction in double bottom height and the quantity of ballast water, and modifications to transverse bulkhead configurations.

Propulsion Power

Soon we will see the introduction of Post-Panamax megaships of 8,000-teu or even larger. Indeed, a stretched Maersk K-class vessel can already carry more than 7,000-teu. A comprehensive design project by a German consortium, showed that it is possible to cope with the structural problems of the 8,000-teu ship and beyond. Limitations on the development of mega containerships are more likely to arise from the capability of port cargo handling facilities and inadequate depth of water, along with the maximum available size of propulsion plants. The largest slow speed diesel engines currently available with a maximum output of 68,000 kW (95,000-bhp) provide adequate propulsive power

for a Post-Panamax ship of 8,000-teu for a speed of up to approximately 25 knots. Some earlier considerations for even larger engines of 14 or 16 cylinders, possibly using a V-arrangement for the

cylinders in order to reduce length, have been reactivated by engine manufacturers. Two engine plants would have to be installed for even larger and faster ships. However, once we decide on a twin



by Dr. Hans G. Payer, member of the executive board of Germanischer Lloyd and immediate past chair of IACS.

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propulsion design, maximum efficiency will again be achieved with two of the largest engines available. For a design speed of 25 knots, this leads to a vessel of approximately 15,000-teu with a total power output of 190,000-bhp.

On the topic of engines generally, the concept of "green" ships is well recog-

nized and the manufacturers, class and the industry generally will be challenged to meet the growing international drive to reduce marine diesel emissions. There will also be an increasing propensity to use other advanced propulsion systems such as diesel electric, gas turbines and waterjets for fast and special-

ized services.

There are already several projects for fast trans-ocean shipment of containers with speeds up to 40 knots and more. Speed is also the driving force in the development of container feeder ships, with orders for fast cargo cats probably imminent.

With the continuing containerization regarding various cargo of all types, we will see the further introduction of specialized containers and containerships such as fully containerized reefer vessels. Another area where further development is expected is the open top containership, which is being very successful from an operational and safety point of view. Unfortunately, the numbers of this type of vessel are being constrained artificially by high port dues based on the GT of these ships with their extra freeboard.

The boom in cruise vessels and RoRo passenger ferries seems set to continue, along with the trend towards even larger ships. Strength of hull and size of machinery are not problems even in vessels, which can carry more than 3,000 passengers and 2,000 crewmembers. However some risk may exist due to their sheer size and scale of operation, and in the execution of emergency evacuation. The problem is recognized by both the IMO and IACS and risks are being analyzed objectively, and impartial solutions will be found. We will see more fast monohull passenger ships such as the 24,500-gt Olympic Voyager with a service speed of 27 knots, which recently entered service. Also the rapid growth will continue of HSCs of more than 328 ft. (100 m) and with speeds of some 40 knots, for both passengers and cars, including both monohulls and catamarans.

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Corrosion

Corrosion is a central problem with all ships, although less so with types such as container vessels and gas carriers. Corrosion is the result of the aggressive nature of the sea environment together with poor maintenance. Often the class societies are criticized for allowing older ships to operate, but it is important to remember that it is the condition of the vessel, which may make it a sub-standard vessel. Corrosion prevention will be a priority over the next 10 years or so. Of course, this is expensive, and the necessary investments will only be made if everything is done to prevent substandard owners from continuing to operate without extra cost.

Tankers and bulk carriers are the two types of ships most affected by corrosion. These ships will continue to comprise a large portion of world tonnage. It is a fact that ship accidents decreased during the '90s, but that accomplishment is eclipsed in the eyes of politicians and the general public by dramatic accidents such as the Erika — an accident caused by corrosion and probably a lack of maintenance.

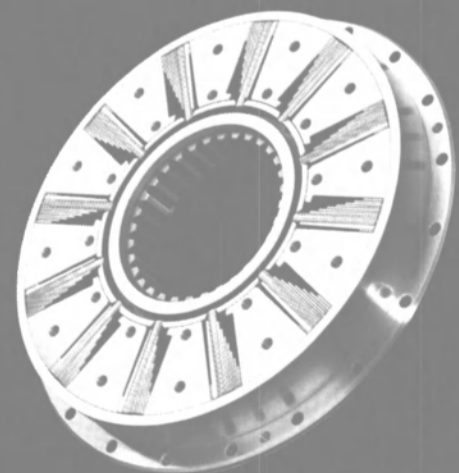
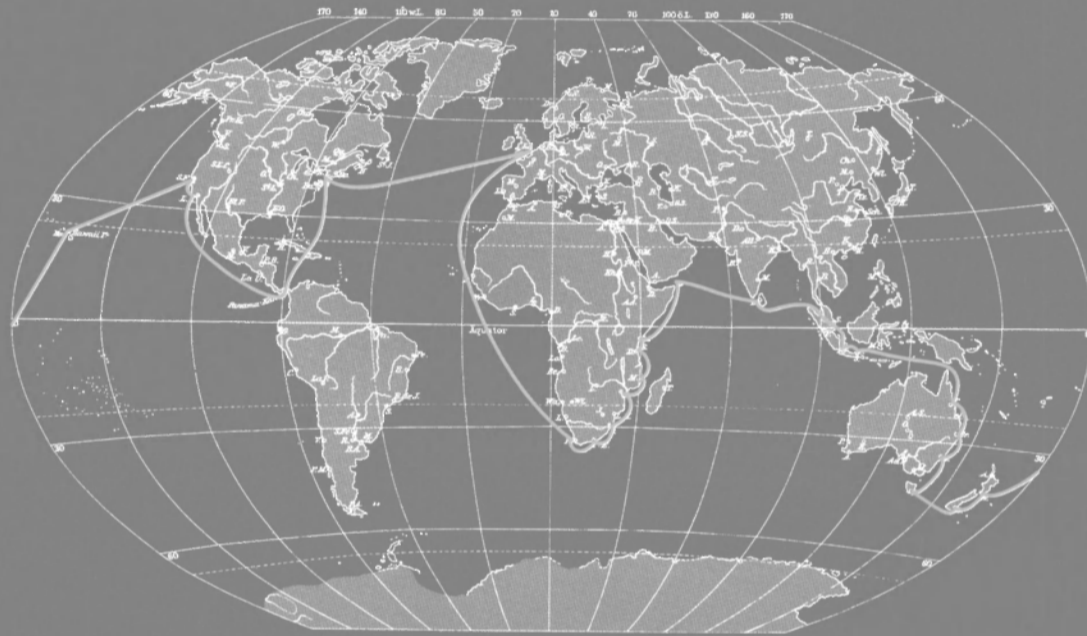
Under present legislation, single hull tankers above 30,000-dwt will be

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phased out by 2018. The main advantage of the double hull is that the cargo is not in direct contact with the outer shell and bottom. But the ships still only have a single deck, which can corrode exactly like a single skin. So we will have to do more. Class will be more involved with corrosion protection, possibly in a leading role.

The predictions are that after moderate newbuilding activity in the first part of the decade, the need for new and additional bulk carriers will increase again. Corrosion and damage from poor loading and discharging practices have led to serious structural problems, and there are substantial pressures for the safety of these vessels to be improved. IACS

derived decisive measures based on detailed studies, which were adopted by the IMO. These include higher safety margins particularly for double bottom and bulkhead structures to allow for accidental flooding. For the future we may expect that double hull designs, which are safer against water ingress, will become dominant also for bulk car-

riers. But ways will have to be found to reduce the rough treatment during loading and unloading, and this will include more extensive use of self-loading systems.

Gas carriers have an excellent safety record thanks to close co-operation between designers, shipyards and class societies, but also here new design ideas will be developed resulting in further progress in efficiency and safety.

The large fleet of aging general cargo ships is being replaced by modern multipurpose carriers or by pure container ships. The multipurpose ships have become optimized multifunctional vessels, many of them with sophisticated design and operation aspects. Because they are equipped to carry containers in the holds and on deck, they are being employed on many routes as feeder vessels in the container transport chain.

The central role of classification societies in ship safety will continue — not least because they have the most resources of technical expertise and feedback from their worldwide networks. Because of the reduced engineering resources of shipowners and yards, the engineers from class will play an increasing role in the future.

Class too will adapt to the economies of scale, which have caused many owners and yards to amalgamate. We may well see in the near future consolidation among class societies with at very least co-operative agreements between them.

The policies of the individual societies are going to be increasingly shaped by those agreed collectively through IACS — for to cope with future tasks our industry must act in unison. Additionally class and IACS must respond to the increasing interest and involvement of politicians and the public united in safety at sea.

Great strides have been made in recent years to better co-ordinate the activities of the class societies and to standardize our activities. Important new policies emerged from the Erika disaster, which will bear fruit no doubt in the future.

Further improvements in safety at sea and the elimination of substandard ships can only be achieved if the entire industry — owners, operators, charterers, yards, insurers, industry bodies, the IMO, flag states and port states — work together for collective solutions. IACS today considers all these groups to be partners in this endeavor. Class societies individually and within IACS will consult and work closely with them as rules and regulations are adjusted and new policies developed.

For additional SMM coverage, turn to page 45.



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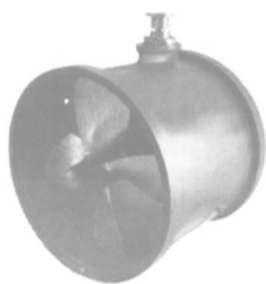
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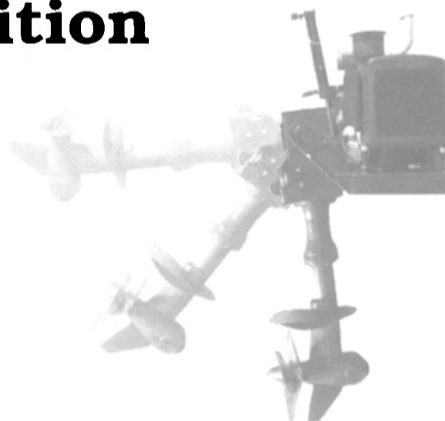


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New & Notable

Bahamas Receives New RoPax Service

Ten years ago, a RoRo passenger service called Sealink, commenced in the Bahamas — operating from Nassau to port of Governor's Harbor on the adjacent island of Eleuthera. The vessel that performed this service was an aging 14-



knot Greek ferry, which established a solid market within the RoRo sector. Despite its healthy growth spurt, the venture ceased in 1993 resulting from rising repair costs and maintenance, specifically in the machinery department, as some engine parts had since been discontinued.

Then a group of local businessmen purchased an Australian RoPax catamaran to re-enter the Eleuthera trade. This vessel, which incidentally is also named Sealink, is from the Sea Transport Solutions (STS) design studio in Queensland, Australia.

According to **Craig Symonette**, chairman of Bahamas Searoad, the shallow draft and quadruple engines provide good access to shallow ports, but more importantly a redundancy coverage that their previous vessels didn't have.

While the selected one-year-old Sealink was similar to the optimum vessel, the weather on the alternative route of Nassau to Abaco generated waves up to 10 ft. (3 m) at certain times. STS designed a modified high bow and generated the CNC discs to facilitate the modification. The process of removing the old bow was undertaken by a local shipyard in Brisbane.

Boasting four MAN 14-liter, 390-shp diesels with 2.5:1 twin disc gearboxes, providing a service speed of 16 knots, the vessel also holds aluminum deck hatches above each engine room to facilitate a rapid engine change, while two generators supply 35 kva each.

The vessel can transport four trucks, 24 cars and 200 passengers, while its 50 ft. (15.2 m) wide deck allows cars to load first and drive up the portside, turning around and facing aft on the starboard side. Sealink ran into its first experience with harsh weather conditions in April where it was caught in the middle of cyclone Neil east of Fiji — experiencing 25-30 ft. waves — both the vessel and crew were unharmed.

Circle 93 on Reader Service Card

Crowley Delivers Last Of Prevention Tug Series

Crowley Marine Services has delivered *Aware* — the third in a series of three 140-ft. (42.6 m), 10,000-hp Prevention and Response Tugs (PRTs), to Alyeska Pipeline Service Company in Valdez, Alaska.

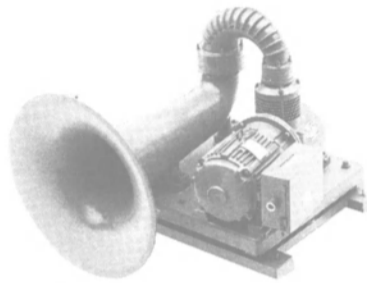
Aware and her two sisterships — *Attentive* and *Alert* — have been specifically designed and developed for Alyeska Pipeline Service Company by Crowley for use in the Trans Alaska Pipeline System trade. *Alert* was delivered to Alyeska in February and *Attentive* was delivered in June.

The three PRTs are deployed in

Alyeska's Ship Escort Response Vessel System (SERVS), serving as tanker escorts in Prince William Sound.

The mission of Alyeska/SERVS is to prevent oil spills by assisting tankers in safe navigation through Prince William Sound, and to protect the environment by providing rapid and effective response services to the Valdez Marine

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Chosen for use on aircraft carriers as well as commercial vessels over 200 meters in length, the S-120 utilizes an oscillating piston driven by 7-1/2 horsepower 3 phase 220/440 volt electric motor producing 143 dB and a fundamental frequency of 94 Hz in 1/3 octave band at one meter.



Kahlenberg Signals were developed to withstand the punishing use of commercial and military service. Their durability has been demonstrated over decades of service on ocean-going vessels ranging from naval warships to commercial vessels. Military specifications have required extensive testing for many of these whistles and the accessories supplied with them, which have proven the exceptional qualities of Kahlenberg design and manufacturing.

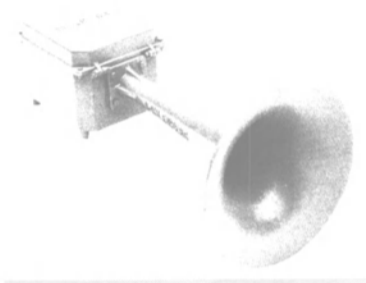
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Model S-203C S-203 CHT

For vessels over 75 meters in length, this design allows both whistles to exceed 143 dB (1/3 octave band). The S-2036 and S-203 CHT are virtually maintenance free. Durability is ensured by the use of bronze and marine aluminum construction materials through out. For the most extreme cold weather operation, Model S-203 CHT (shown) includes a thermostatically controlled, heated enclosure for both the combination manual/electric valve, and the horn sounding body.

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During sea trials, Aware generated a certified bollard pull of 305,000-lbs. and a free running speed in excess of 16 knots. The PRTs are powered by twin Caterpillar 3612B engines generating the combined 10,192-hp driving two Kamewa Aquamaster azimuthing thrusters. They are also equipped for

firefighting, emergency response and oil spill recovery equipment.

The PRT trio was designed by Seattle-based Guido Perla and Associates and built at Dakota Creek Shipyard in Anacortes, Wash., for Vessel Management Services, a Crowley Maritime subsidiary that owns and leases vessels. The vessels have oil spill recovery and stor-

age capability for up to 43,000 gallons of recovered oil. Design features include accommodations for up to 16 personnel, Schuyler fendering, a Markey TDS-40 towing winch, Step Warmfloor (tm) heated decking, 3,000 ft. of oil recovery boom, and on-deck stowage for two oil spill recovery skiffs.

Circle 8 on Reader Service Card

Image Marine Delivers Police Boat Trio

Image Marine has delivered three of nine innovative police boats for the New South Wales Police Service, Water Police Branch. Arriving in Sydney Harbor — the vessels, which are named Vigilant, Vanguard and Victor — were to have been joined by the remaining six the end of this July.

Upon completion, the new fleet will consist of two 72-ft. (22-m) vessels and seven 52-ft. (16-m) vessels. Nicknamed "Water Rats," the vessels will replace many of the existing vessels in the Police Fleet. The new boats will work to



conduct marine search and rescue operations; combating marine criminal activities and marine security in Sydney during the Olympic Games. With a maximum speed of 28.5 knots, designs of the monohull Class 1 and Class 2 vessels were specifically formatted to meet the needs of the N.S.W. police. Designed by the company's in-house team, the vessels have a planing aluminum hull form with a varying deadrise, with the waterline entry providing the least resistance at full operational speed. At the same time, the design also offers the most comfort in a variety of sea conditions.

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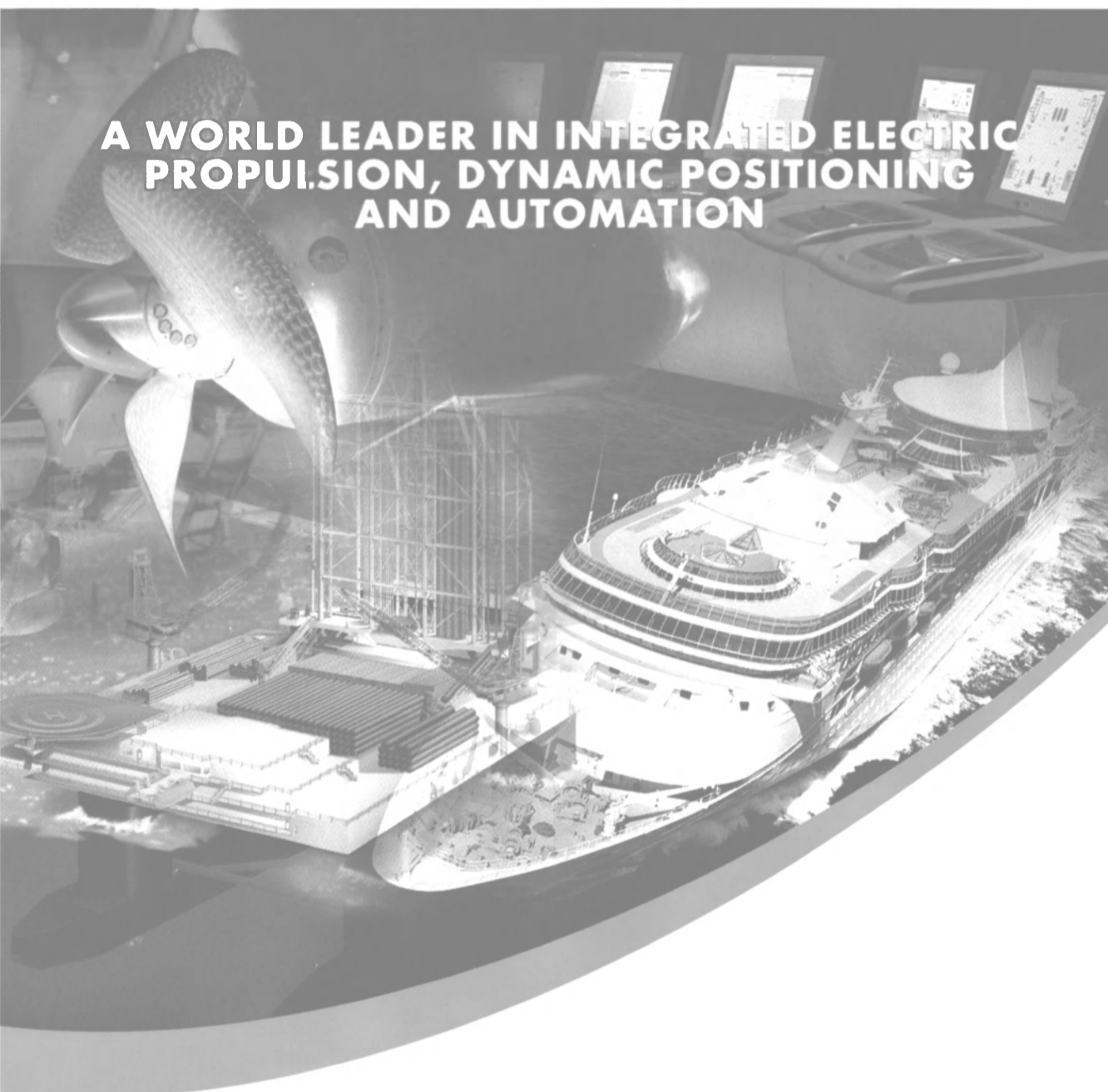
3.Maj Concludes Chem Carriers

Shipbuilding contracts for two (plus one under option) 23,400-ton oil products/chemical carriers were signed this past March between 3.Maj and Erste Buttner Schiffahrts Gesellschaft MBH & Co. and Carl Buttner Schiffahrts Gesellschaft MBH & Co. have been released for action, following the owners' payment of the first contract price installment.

If the owners decide to utilize their option with 3.Maj for a third vessel, the total value of the contracts would be raised to \$70 million.

The pair of oil products/chemical carriers are scheduled for delivery in February and June 2002.

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PTC Launches New CAD/CAM Shipbuilding Solution

PTC, a leader in the CAD/CAM marketplace with its software in use at more than 28,000 companies including companies such as Caterpillar, Lucent, Mitsubishi, Nike and Siemens, has launched a shipbuilding specific product.

Working with partners like Hyundai Heavy Industries, BAE SYSTEMS, DCN, BIW, and Ingalls, PTC has more than 20 years of experience in bringing innovative design solutions to the shipbuilding industry with products like CADDS 5I, Medusa, and Dimension III. Drawing on its experience with proven solutions and existing customers, PTC recognized that its industry solutions provided by Pro/ENGINEER could and should be leveraged to develop the next generation shipbuilding solution — a product the company will debut at SMM in Hamburg, Germany.

This solution combines the power of Pro/ENGINEER for design with the Web-based collaboration and product design information sharing capabilities of Windchill. Shipbuilders will now be able to control critical design features like decks, frames, bulkheads, and compartments with parameters (i.e. dimensions). Since the geometry has built in relationships, an engineer can readily propagate changes throughout the design. In addition, all downstream deliverables such as manufacturing drawings, machine tool paths, and structural analysis models can be automatically updated to reflect the change because of the inherent "associativity" of the system. Through the information sharing capabilities of Windchill, notification of changes can also be propagated throughout the design staff, eliminating rework and design errors. Associativity can be controlled globally. For instance, an engineer can move a deck and all pipes routed relative to that deck will update. Or locally, if a stiffener

changes size, the associated cutouts can be updated. In the extreme case, if once the detail design is begun and a new hull surface is required, the hull could sim-

ply be replaced and the structural steel will update to the new shape.

There are many users of the design information created by the engineer out-

side of the design staff, and when the information changes, these people need to be informed. With this system, a production engineer could use a Web

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Marine Engineering

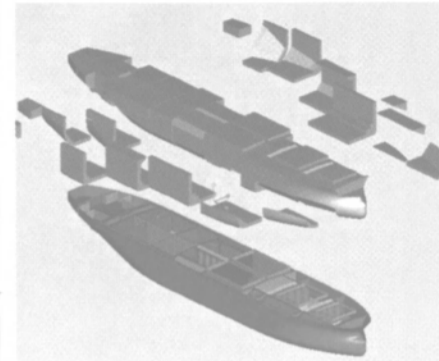
browser to see the up-to-date mass properties of a manufacturing block as the design evolves and make a crane selection for lifting it, accordingly. Change is unavoidable. Being able to effectively manage it is what enables productivity gains across the shipyard.

At the core of the Pro/ENGINEER Shipbuilding Solution is functionality

that addresses each of the following disciplines: Basic Hull Design; Structural Hull Design; Piping; HVAC; Electrical Systems; Machinery and Structural Outfitting; Routed Systems Support; and Accommodations.

These modules will allow the user to design in an assembly-centric design environment, creating fully paramet-

ric/modifiable 3-D structural components. Based on the engineer's design intent, change propagation can be managed throughout all of the design modules. The routed systems are specification driven and incorporate intuitive routing within the context of the overall 3-D assembly. These modules, combined with the existing Pro/ENGINEER



Exploded view of ship compartments using the Basic Hull application — created by PTC's partner Hyundai Heavy Industries.

simulation (CAE) and manufacturing (CAM) environment tools, provide the user a single, complete design solution

Improving Design Efficiency

Behavioral Modeling, a patent-pending technology at the heart of Pro/ENGINEER, is a solution that captures product-intent as a natural part of the engineering process, and then automatically builds virtual prototypes that satisfy these multiple objectives. What's more, because the problem and solution have been captured electronically in the design, the system can automatically solve future real engineering problems.

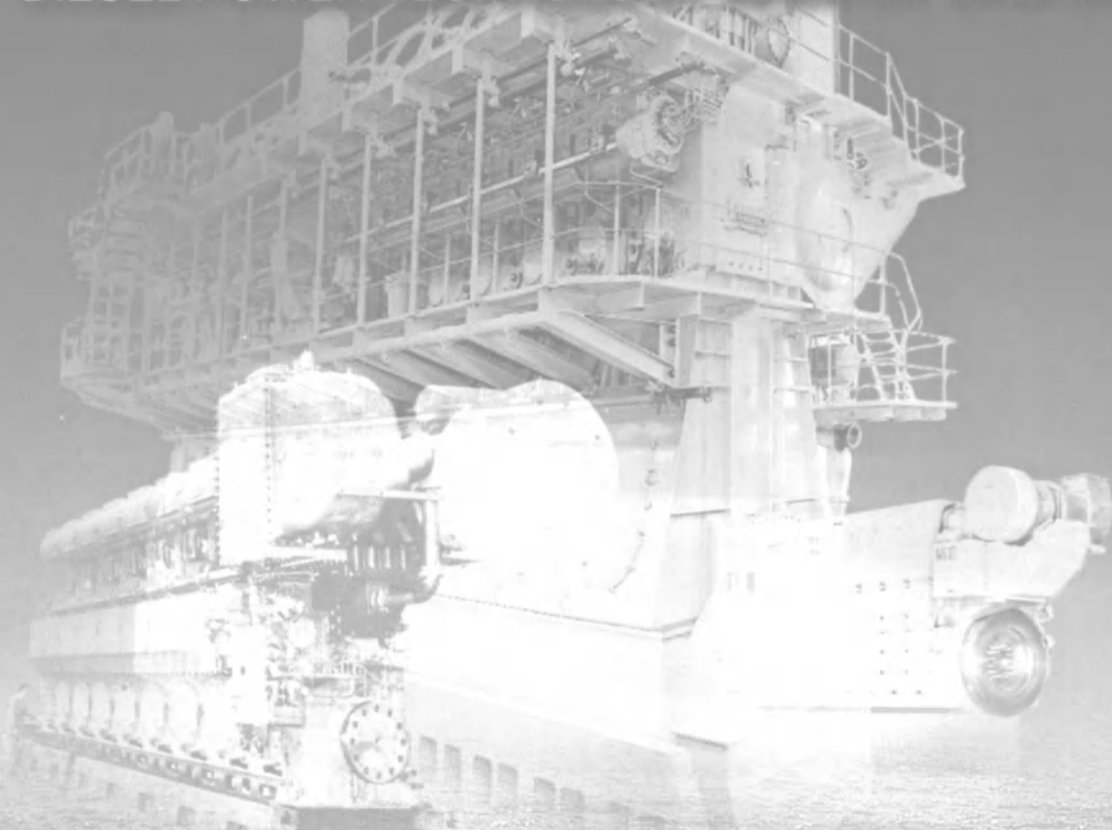
PTC seeks to deliver improved productivity to the shipbuilding industry in the same way it revolutionized traditional computer aided design in other industries. For example in aerospace, Pro/ENGINEER reduced airframe design by 50 percent; allowed for 97 percent first time fit, and 40 percent reduction in resources on the Global Hawk, Northrop Grumman's high altitude aerial vehicle. At Lockheed Martin, PTC's products helped deliver the Atlas rocket program product with a 25 percent reduction in engineering change orders (ECO's), saving \$10 million. These are the benefits of this new CAD architecture on complex engineering projects and PTC is bringing these types of cost advantages to the shipbuilding industry, which can employ tools like these to respond to new customer demands and market-driven forces with increased efficiency, even late in the product development cycle.



A virtual tank test of Prada's Luna Rossa using behavioral modeling.

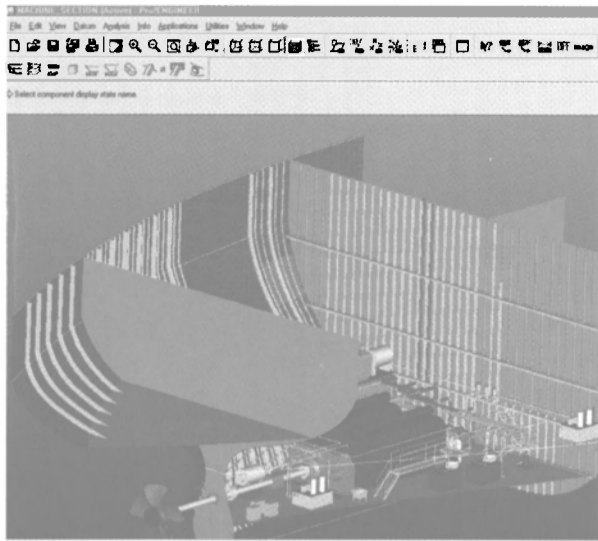


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Collaboration Is Key

Shipbuilding is becoming increasingly reliant upon collaboration as a means of achieving project goals. Shipyards have shifted toward the extensive use of sub-contractors, increasing the importance of data management and necessitating the sharing of information across an extended enterprise. It is crucial to have

a design tool integrated with an enterprise information management system, like PTC's Windchill, to facilitate this information sharing. This is the idea behind the Pro/ENGINEER Shipbuilding Solutions product.

With Windchill, the Web is used to link ship information across departments, divisions, strategic suppliers, ship owners, and anyone else who is desired to be included within the extended enterprise. All common product information is stored in shared databases. Data visualization and digital mock-up are accomplished using common web browser technologies.

Electronic data from suppliers, which originates from other CAD systems, can be easily retrieved and used for design purposes using PTC's Associative Topology Bus. Windchill also manages workflow, triggering actions to be taken.

In addition, Windchill links existing disparate databases together. For example, a drawing cataloging system could be tied to a bill of material system via simple Web pages. Information can now easily come together to allow engineers to effectively collaborate with other members of the design enterprise.

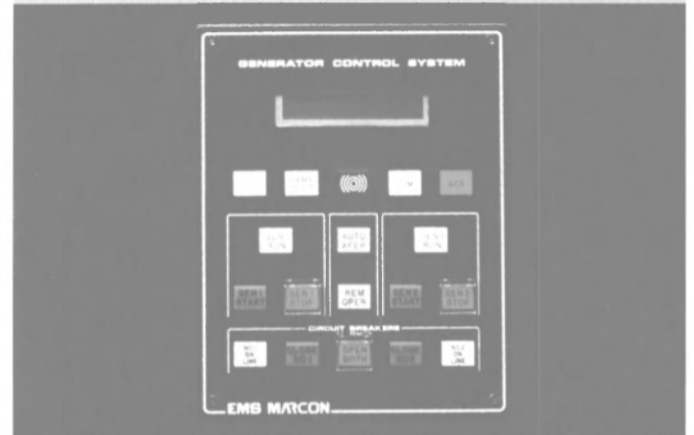
PTC is presenting to the shipbuilding industry what it dubs the next generation of shipbuilding design solutions with the introduction of the

Pro/ENGINEER Shipbuilding Solutions package.

PTC recognizes the tremendous pressures of competition in the shipbuilding industry and by providing the unique, state-of-the-art collaborative design solution found in Pro/ENGINEER Shipbuilding Solutions, PTC is providing to the shipbuilding community the tools needed to successfully compete in new global markets.

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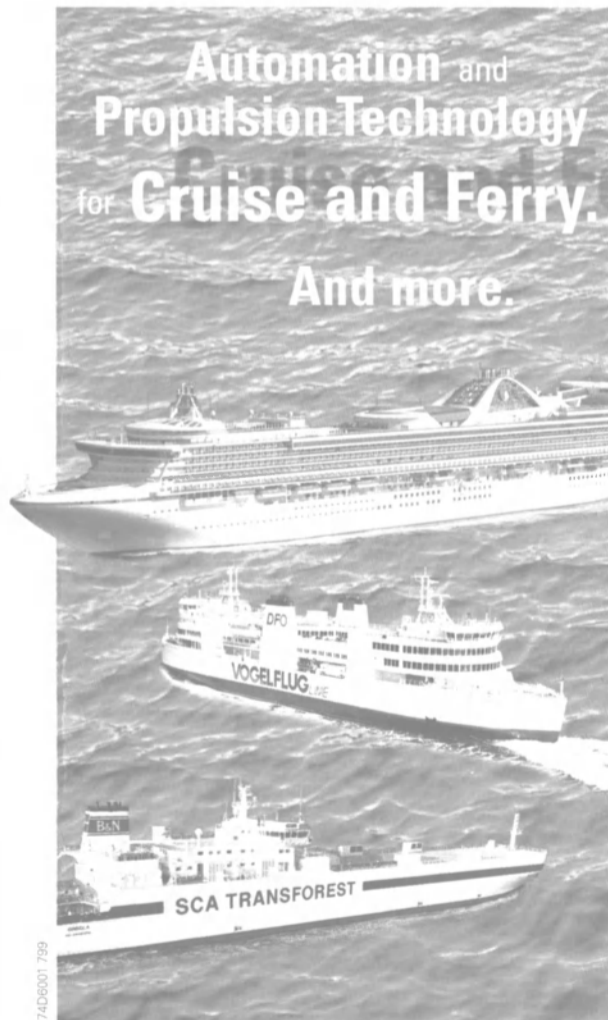
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SNAME 2000 Aims To Connect Leaders

The annual exhibition sponsored by the Society of Naval Architects and Engineers (SNAME) is scheduled to be held in Vancouver, B.C., Canada — giving both attendees and exhibitors a direct connection with industry leaders from the Pacific Rim, the Northwestern


U.S. and Canada. International networking, as well as the traditionally solid technical conference line-up could most definitely be touted as a main draw to SNAME, which held its earliest meetings in New York before eventually branching out to other locations


throughout the U.S. This year's exposition and conference will be conducted at the Vancouver Convention and Exhibition Center, which is fittingly located between the oceans and mountains of one of the most picturesque harbors. Touted as "Vancouver's most distinctive landmark," the convention center is strategically located minutes from the city's downtown area, offering both

attendees and exhibitors direct access to Vancouver's scenic waterfront parkway for travel purposes.

The exhibition, which has never before been held in the Pacific Northwest, will begin on Wednesday, October 4 with special courses in Human Factors and Safety Engineering, and Naval Architecture. The main portion of the convention begins the following day

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with commencement of both the technical programs and the International Maritime Exposition. The exposition, which will be open on October 5-6 from 9:15 a.m. - 6 p.m. and 9 a.m. - 4 p.m., respectively will include seasoned maritime suppliers/companies representing various aspects of the maritime industry, such as: Cummins Marine, ABS, Alabama Shipyard-Atlantic Marine-Atlantic Dry Dock, Alstom, Jastram and Newport News Shipbuilding. The technical program boasts presentation of papers that have been submitted by a variety of industry experts. Occurring the same days as the exposition end of the SNAME convention, this portion will individually discuss (in one hour increments) each paper that was chosen for presentation. Selected topics include, "Predicting the Per-

formance of a Tug and Tanker During Escort Operations Using Computer Simulations and Model Tests;" "The Impact of Bioconcretious Structures on the RMS Titanic: Implications to Maritime Steel Structures;" "Development of a Shallow Draft RoRo Transport Vessel, the M/V Delta Mariner;" and "Design Development of a Survey Yacht." In addition, there will also be a Technical and Research Session on Friday, October 6 from 1:30 p.m. - 5:30 p.m. dealing with completed and concurrent work of the Ad Hoc Panel on Ballast Water Management. This session will examine current information on regulations, ballast water exchange, onboard treatment methods and current experimental and full scale testing programs. The conference concludes on Saturday, Octo-

ber 7 with a golf tournament from 8 a.m. - 4:30 p.m. followed by a reception and dinner occurring from 6 p.m. - 11 p.m. For further information on exhibiting contact: **Susan Giver**, exposition manager, SNAME, 601 Pavonia Ave., Ste. 400, Jersey City, N.J. 08221, tel: (609) 927-7177 or (800) 798-2188, e-mail: sgiver@sname.org. Attendees can register by calling (800) 798-2188 or online at www.sname.org.

For a full listing of companies participating in SNAME and their exhibition plans, please visit:
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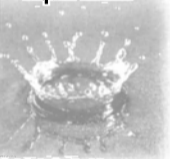
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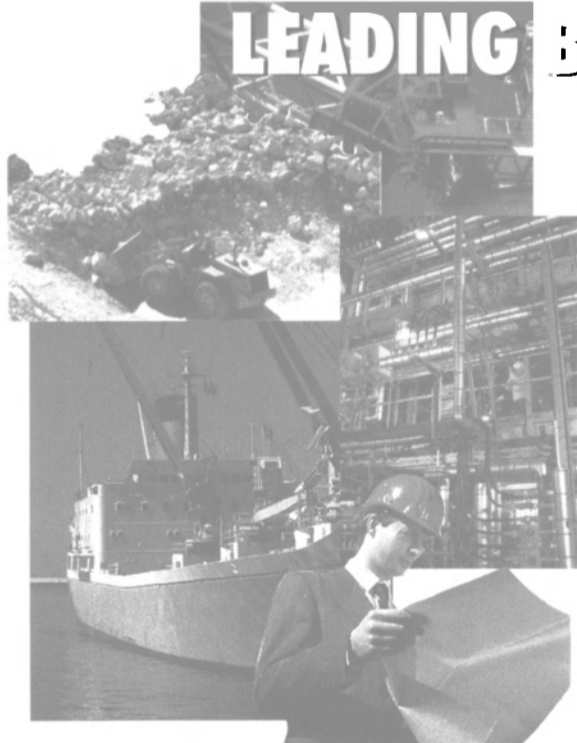
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Propulsion Report

Pods for a rising market

The design and operating benefits conferred by podded electric drives are finding increasing favor throughout the industry, as manifested in the growing application list involving cruise ships,

icebreakers, offshore vessels, specialized tankers, and, most recently, RoRo passenger ferry and ice-going crude oil carrier new-buildings. So as to better maintain the business momentum and broaden the market reach for the technology, Finnish electrical engineering innovator ABB

Industry is promoting a new Azipod-derived design bred specifically for smaller vessel types.

While the main Azipod series has been engineered for unit powers up to 25-MW, the recently unveiled Compact Azipod has been conceived for applications in the range from 400 kW to five



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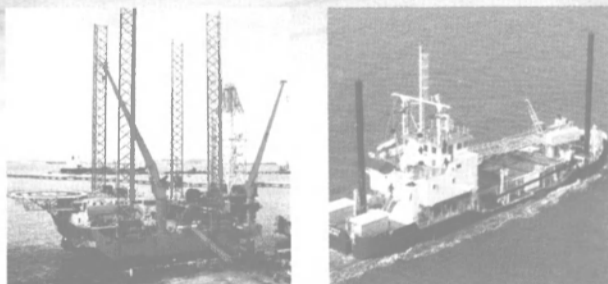
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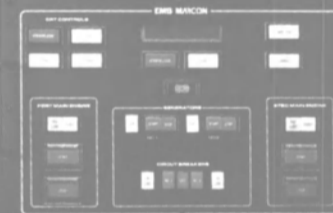
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Circle 230 on Reader Service Card

Propulsion Report

MW. It addresses not only the fundamental requirement of smaller ships such as ferries and offshore service vessels for maneuverability and slow-speed control, but also for cost-efficiency as regards both system installation, ship design and operation.

Not only does Azipod have the longest track record among the various, compet-

ing pod designs, its service experience encompasses the smallest applications to date for the generic type as well as the higher power concentrations. In fact, the system made its debut nine years ago in a waterway service vessel equipped with a 1.5-MW pod, and has also been fitted in unit sizes down to 560-kW, as used in an Austrian river icebreaker.

However, the Compact Azipod is distinct from its forerunner in form and certain, key features. In particular, the adoption of permanent magnet technology in the electric motor, and direct cooling to the surrounding water, has made for a simplified construction, compact dimensions and improved hydrodynamics. A low voltage frequen-

cy converter controls the permanent magnet synchronous motor, driving a fixed pitch propeller, which can be specified in either 'pulling' or 'pushing' configuration.

Circle 98 on Reader Service Card

NNS Fixes Paradise's Pod

When the 70,367-ton, 855 ft. (260.6 m) Carnival Paradise arrived at Newport News Shipbuilding for emergency repair on its Azipod propulsion system, it marked a milestone in ship repair history as no U.S.-

based yard had ever performed work on the advanced pod system. The vessel arrived for drydocking at the yard on July 25, where the NNS crew prepared it in time for its next scheduled sailing date on August 20. MR/EN had the opportunity to speak with **Becky Stewart**, NNS' director of ship repair, who provided an update of this premiere repair job.

For the past two-and-a-half weeks crews from various departments within Newport News Shipbuilding (NNS) have been grinding away around-the-clock seven days a week in order to rejuvenate the Carnival Paradise's Azipod propulsion system. The yard's rigging and machine shop crews, along with ABB (the manufacturers of the Azipod system) technicians worked together to ensure the 2,052-passengership's place back at its Miami, Fla. port by August 20. Once repairs on the Azipods are complete, the vessel will steam south to its homeport — resuming its scheduled itineraries to the Eastern and Western Caribbean.

First established in Europe, Azipods have been touted as innovative because of their ability to pull the ship through water rather than pushing it, as well as eliminating the necessity of rudders, long shaft lines, conventional drive units and stern thrusters.

The emergency repair job, the first of its kind in the U.S. was granted to NNS by Carnival after the two-year-old Paradise's starboard side seal deteriorated — flooding the electric-powered Azipod system. Since an electric system cannot operate in these conditions, Carnival



Becky Stewart, director of ship repair, Newport News Shipbuilding.

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tapped the expertise of NNS to remedy the situation. In addition, to removing the 45-ton rotor unit on the starboard side Azipods, as well as checking wiring, shafts and bearings, the yard was also asked to replace the vessel's portside bearings and rotor unit.

The rotors on both sides were extracted, according to NNS' **Becky Stewart**, by hydraulic transporters, which are able to move the pods quicker and easier. Stewart added that the transporters also cut back on time — anywhere between 10 and 12 hours a day of manpower because of their strength. In addition, the yard has all the capabilities to handle this job in-house, without having to solicit help from outside sources. Stewart added that if the yard did not have this ability, it could possibly add on extra time on Paradise's drydocking from three to five days. Since the cruise industry works on a tight itinerary schedule this was a plus for Carnival in that NNS had all its

equipment and materials directly on-site for a quick and accurate repair job.

Aside from this unscheduled emergency repair, NNS has a trio of Carnival vessels — Destiny, Fantasy and Triumph — scheduled for routine drydocking this fall. The first of the group to arrive will be Destiny on September 5, followed by Fantasy sometime in early September - October, and Triumph's premiere drydocking in October. The vessels will spend approximately seven to 10 days at the Virginia yard.

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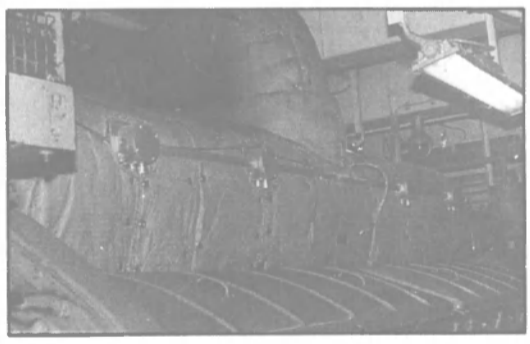
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Circle 231 on Reader Service Card

Propulsion Report

MTU Enters The Medium Speed Fray With The 8000

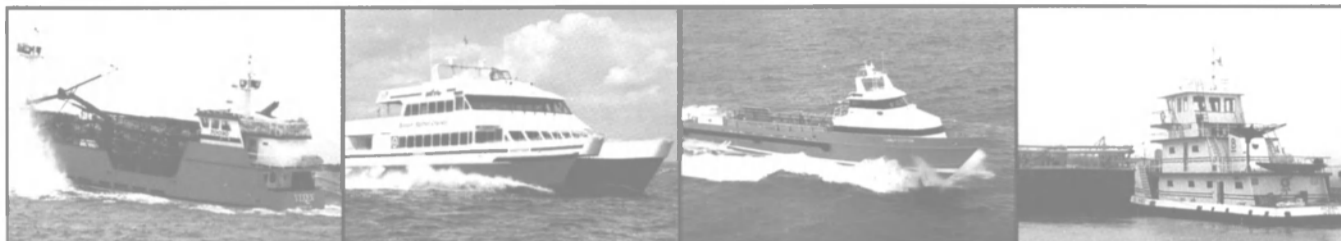
MTU Friedrichshafen plans to introduce a new 20V 8000 engine at this year's SMM. Able to produce 9,000 kW at 1,150-rpm, the model is the company's most powerful — moving MTU into the realm of medium-speed engines. The 20V can be utilized as main propulsion for large yachts and workboats, as well as for diesel-electric

propulsion and onboard power supply systems in cruise ships. The design of this series is versatile as it also allows its use in other fields such as decentralized power generation and in rail applications. Production on this new innovation is scheduled to commence this year in time for deliveries to begin in April 2001. Looking towards the future, MTU

plans to expand the series with a 16-cylinder version of the 20V with 7,200 kW.

Plans to manufacture in line engines as well as versions for gas and heavy oil are also in the works.

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U.S. Footprint In Germany

Integration of the showcase production hall of former eastern German engine builder Dieselmotorenwerk Rostock (DMR) into the MaK manufacturing system has provided a timely boost to output capacity for the medium-speed market. The conversion of the Warnemunde facility from its original two-stroke diesel building remit to a clearly defined, four-stroke role, has coincided with the decision of MaK's U.S. parent organization to underscore its identity with German diesel engine production.

Accordingly, from the outset of August, MaK Motoren's Kiel-based operations have been vested under the company name Caterpillar Motoren, while the modern facility brought into the network last December has been re-titled Caterpillar Motoren Rostock. Most importantly from a commercial standpoint, however, the individual MaK and CAT brand names are being retained for marketing and support of the German-made medium-speed range in the respective marine and power generation sectors.

The refocused Warnemunde plant has been allocated construction and testing of the M43, the most powerful design in the MaK portfolio, releasing capacity at the extensively upgraded Kiel factory for turning out the smaller M20, M25 and M32 series. Caterpillar's MaK arm is therefore better placed to attain the volumes fundamental to business economics in today's rigorously competitive market, and to realize the U.S. group's strategic objectives as to business expansion. Warnemunde provides the company with a strengthened manufacturing platform to realize the potential offered by the M43, which made its seagoing debut earlier this year.

By June 2000, sales of the in-line versions of the compact diesel had reached 56, including a fair proportion of twin and multi-engine installations. The existing range covers unit applications from 5,400-8,100-kW, but vee-type versions covering the band from 10,800 to 16,200-kW are under development, to extend the M43's market reach in areas

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such as cruise ship powering and land-based generation plant. The delivery program started from Kiel in the final quarter of last year, with propulsion machinery for chemtanker, deepsea fishing vessel and feedership tonnage. Ensuing sales have seen the design especially favored for the smaller classes of containership.

Representing one of the most sophisticated applications for the new generation of medium-speed machinery, two eight-cylinder and two seven-cylinder versions of the M43 plus a six-cylinder M32 form the powerhouse for TT-Line's diesel-electric RoPax newbuilds at Bremerhaven. The TT-Line ferries are further distinguished by the use of Siemens-Schottel pod propulsors. The M43 has subsequently been nominated for RoRo projects at Flensburger Schiffbau-Gesellschaft initiated by Faeroese company Smyril-Line and the progressive Turkish operator UND RoRo.

Circle 99 on Reader Service Card

MPI Introduces New Products

Marine Propulsion, Inc. has recently added a high-speed controllable-pitch propeller to its product line, with a power range of 600 to 2,000-hp. The new CP propellers are available in two versions: one is a full CP coupled to a Heimdal gearbox; the second is a two-pitch actuator, which can be used with conventional reverse reduction gears. MPI now also offers complete electric drive systems — both conventional and Z drive applications from 200 to 2,000-hp. To expand its reach, MPI has opened a sales office in Houston, electing **Syd Smelt** to run the office.

Circle 35 on Reader Service Card

Cincinnati Gear Introduces New Marine Reduction Gear

Cincinnati Gear recently introduced the MA-635, compact marine reduction gearbox. With the increasing demands of space-efficient engine rooms in today's mega yachts and the increasing acceptance of gas turbine engines, the desire for smaller, lighter gearboxes has become imminent. Cincinnati Gear has developed an innovative design to meet these new demands.



The MA-635 takes the same elements that made the MA-107 successful and condenses them to a smaller, lighter design package. The new design lightens the gearbox by 2,000-lbs. and reduces the size by 25 percent compared to the standard MA-107 design. While the MA-107 utilizes parallel shaft gear-

box technology, the MA-635 is a 2-stage epicyclic (planetary)/parallel shaft design, designed to make it more compact and efficient.

Output speeds range from 1,100 to 1,800-rpm. The gearbox was initially designed for use in mega yachts and patrol boats utilizing Honeywell's TF50 gas turbine engines, but has the potential to be used in many types of marine craft

with gas turbines of similar output torque.

Other features of the MA-635 include hardened and ground gearing, antifriction bearings, aluminum housing and complete lube system with optional disconnect clutch and PTO accessories.

Circle 32 on Reader Service Card

New Corvette Features TF50A

The first Swedish Navy Visby-class stealth corvette was launched powered by four TF50A marine aeroderivative gas turbines in a Combined Diesel Or Gas (CODOG) turbine configuration. Vericor Power Systems provided the TF50A propulsion packages.

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Ship Noise Guide Updated

Controlling shipborne noise is always a concern for vessel designers, builders and outfitters. The two most widely distributed documents are IMO's Resolution A.468(XII), "Code on Noise Levels Onboard Ships," issued in 1981 and the USCG's Navigation and Vessel Inspection Circular (NVIC) 12-82, "Recommendations on Control of Excessive

Noise," issued in 1982. These two documents generally discuss methods to reduce shipboard noise, recommend noise limits and describe how to measure noise on ships.

One year after the USCG issued the NVIC 12-82, a group of acoustical engineers from the consulting firm of Bolt Beranek and Newman (BBN), complet-

ed a report that is not as well known, which is still available from SNAME. The Design Guide for Shipboard Airborne Noise Control, Technical & Research Bulletin Number 3-37 - developed by **Raymond Fischer, Courtney Burroughs** and **Daniel Nelson** was issued in January 1983. While the guide includes some of the general information that was provided by the USCG and IMO — the T&R 3-37 went one signifi-

cant step further — it provided noise prediction methodology. The "SNAME Design Guide" provides a cookbook methodology to predict shipboard noise levels based on design information. According to Burroughs, who is a professor of acoustics at Penn State University, "The purpose of the design guide was to pull together all the information into one location and put it into a simple format for engineers without a background in shipboard acoustics." While the methodology requires only general design information — information about the types and sizes of the major machinery on the ship is required as well. This would include diesel engines, gas turbines, large pumps, compressors and HVAC equipment. The SNAME Design Guide is used by ship designers to determine what types of noise control treatments are required for a vessel. In 1991 **Fischer** started his own consulting firm, Noise Control Engineering, Billerica, Mass., to provide this service to many of the smaller shipyards in the U.S. "The SNAME Design Guide has helped my firm provide credible design information to many clients" said Fischer. "But, soon after the Design Guide was issued we starting improving the methodology and today, many aspects of the SNAME Design Guide have been modified to enhance prediction accuracy." Since its issue, the SNAME Design Guide was never updated until last year. With its eye on the Deep Water Project, the USCG stepped in and funded a guide revision. Due to the highly specialized nature of this work, a limited competition solicitation was issued by the USCG to the original firm that prepared the design guide, BBN and Fischer's firm, Noise Control Engineering (NCE). An award was made to Noise Control Engineering in October 1998.

Fischer's approach was simply not to just update the existing methodology, but to add prediction capability. In order to maximize the technical content, the Coast Guard funded preparation of a supplement. Fischer stated that, "the new document will also be published by SNAME, but it must be used along with the original Design Guide." One of the new topics that have been addressed is the prediction of hydroacoustic noise sources such as propulsors, thrusters and wave impact noise. In addition to the supplement itself, the Coast Guard was also given an acoustic database that included source levels and noise control material performance data.

Circle 170 on Reader Service Card

The supplement was co-authored by **Leonid Boroditsky**, a senior engineer at Fischer's firm. He contributed to sections devoted to noise in engine rooms and hydrodynamic noise sources. The wave impact algorithms were developed by Boroditsky during his 20-year career at the Research Institute of Shipbuilding Technology in Russia.



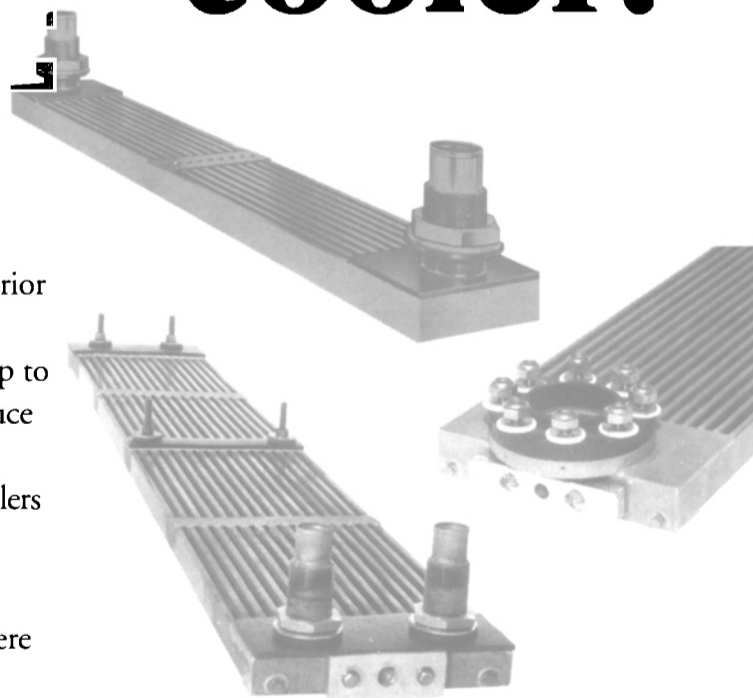
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COVER STORY: Maritime 2050

Barring the ability to transport mass amounts of cargo in a Star Trek-esque manner, it's reasonable to assume that ships and boats will continue to be the globes' hauler of goods for the foreseeable future. In the quest to make water transportation safer and more efficient, designers are constantly pushing the limits, and has led the editors of *Maritime Reporter & Engineering News* to ask such questions as ...

Can the Hinge Ship Work?

Hinge-Ship is a patented concept designed to combine the advantages of both deep draft and shallow draft shipping within the confines of a single vessel. The concept, if proven viable, could help to further the mandate of shaving valuable time from the transportation of goods from "point A to point B," as it would literally eliminate the need for storage at transshipment points and the transfer of cargo to other vessels, and all of the time and cost inherent in both.

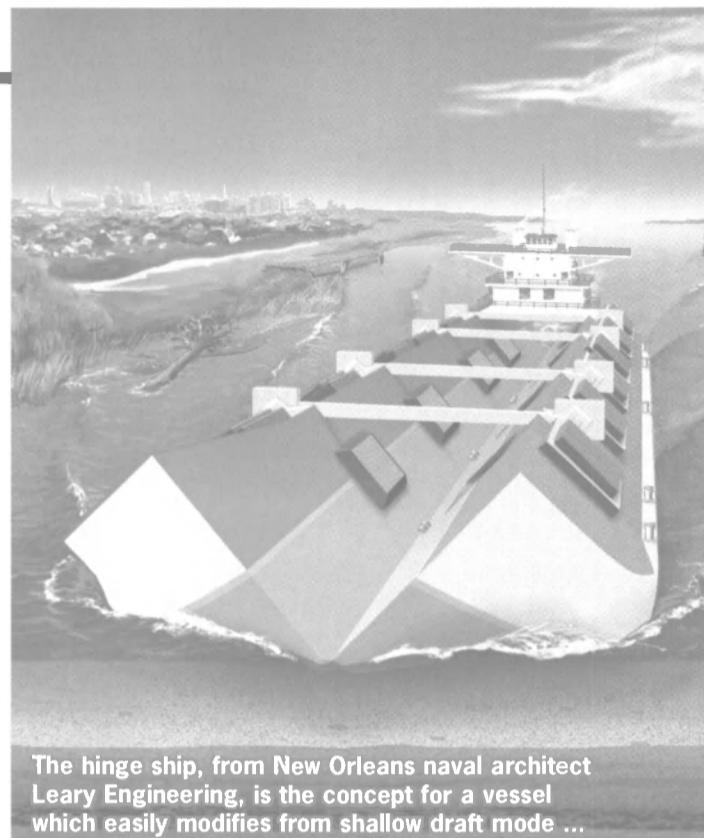
The essence of the design is that the vessel is split on centerline, and provided with a hinge. This arrangement, according to its designer John H. Leary, P.E., of Leary Engineering in New Orleans, allows the two separate port and starboard hulls to rotate relative to

each other and thus alter, for a given displacement, the vessel's waterplane area and draft.

Applications for the concept include dry bulk cargo, liquid bulk cargo, trailers and military vehicles.

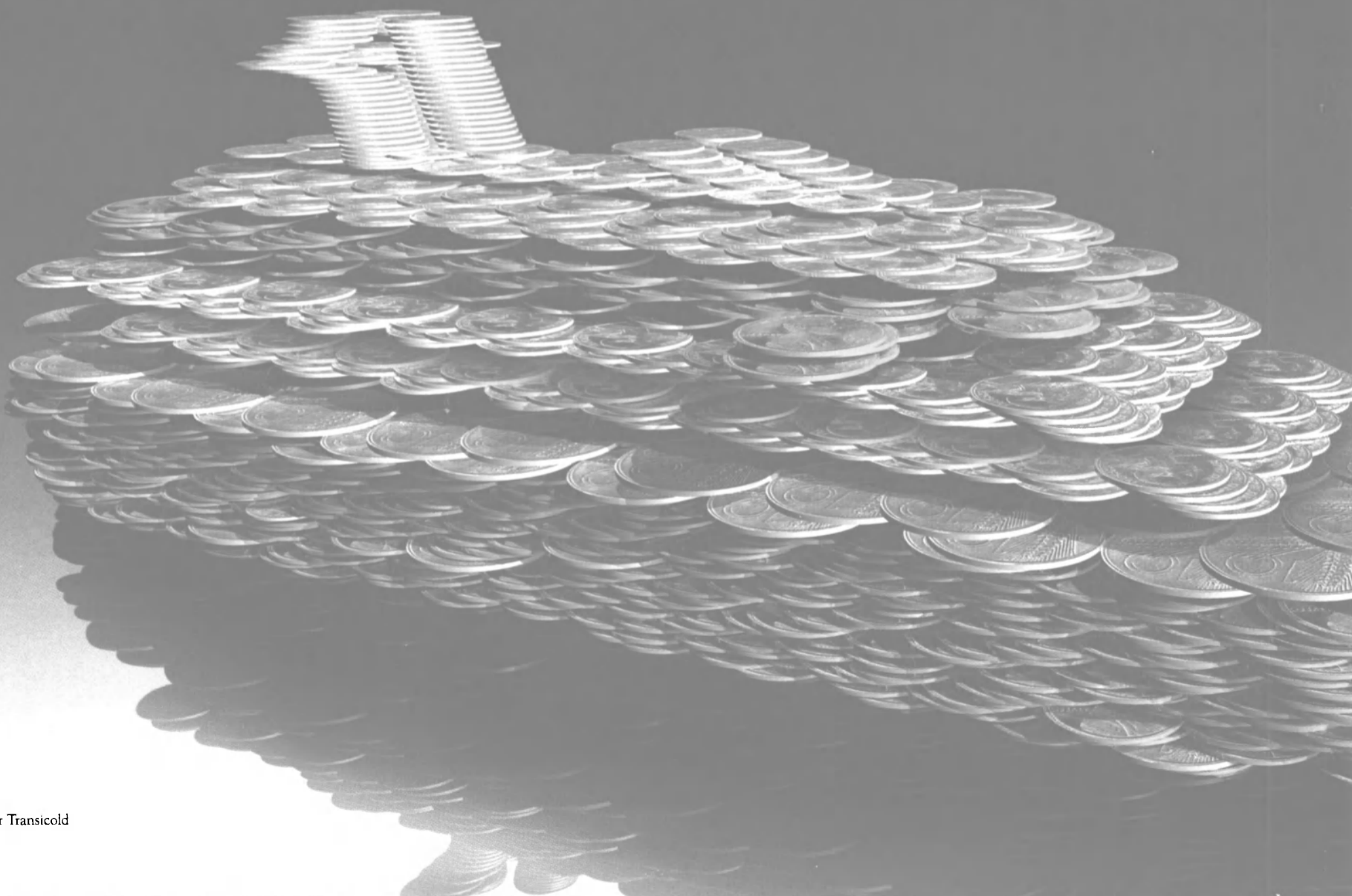
The "Hinge"

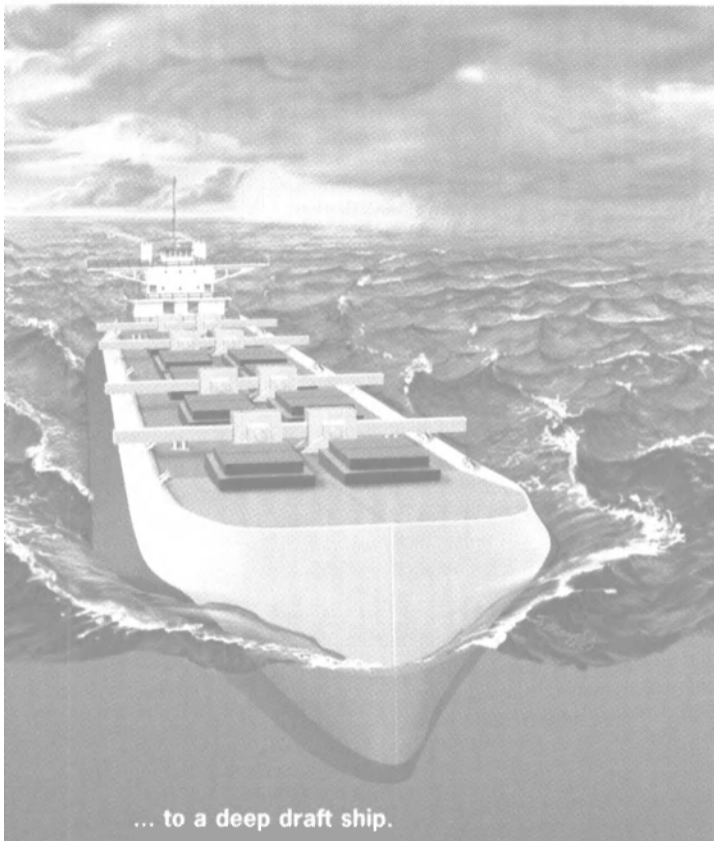
The rotation of the two hulls about the hinge is accomplished by using the beam and gear mechanism. This operation is greatly assisted by using water ballast in the double bottom spaces under the cargo compartments. Each double bottom is divided by a watertight longitudinal bulkhead at its center. Because the forces encountered in inland waters are relatively small, the hinges and beams alone are able to resist relative



The hinge ship, from New Orleans naval architect Leary Engineering, is the concept for a vessel which easily modifies from shallow draft mode ...

movement between the two hulls. However, the vessel's two hulls are brought together in the deep-draft configuration before it goes to sea. This engages the aligning devices (pyramids and sockets), which along with the beams and hinges, resist the longitudinal and vertical forces encountered at sea. Additional analyses confirmed the ability of the hinges to resist hull torsion at sea. The materials selected for the hinges and bearings are resistant to corrosion and binding.





... to a deep draft ship.

Economies of Scale

The advantages of owning and operating a vessel, which could readily transform from a deep draft configuration to a shallow draft arrangement are rather obvious in terms of savings of time and money. While the jury is still out regarding a potential owner/operator's view on having a hinge on its vessel, with all of the safety and maintenance questions that come with it, Leary presents a strong case for a radical design, which

could well fit the transportation bill of future generations. For example, the vessel offers economies not only to the owner operation, but also the shipbuilder, as the design concept can be built using barge building techniques at relatively small shipyards. The design calls for a deck, bottom and shell consisting almost entirely of stiffened flat plate and chines. The bow and stern are raked and resemble river barge rakes when the vessel is in its shallow draft mode. However, these rakes are shaped so that the bow and stern more closely resemble those of a ship's seagoing form when the vessel is in its deepdraft mode. These features are evident in the drawings of the vessel and in the photographs of the model.

The Initial Design

Drawings depicted throughout the ensuing pages depict a vessel of both a self-propelled (ship) and non-self-propelled (barge) version. The initial offering is of a vessel that would be suitable for the Mississippi River system, but should be duly noted that they are transferable for other dimensions and proportions as well. The principal dimensions of the prototype Mississippi River system vessel are:

Length	.....	595 ft. (181.3 m)
Breadth	.....	105 ft. (32 m)
Draft (inland)	.....	13 ft. (3.96 m)
Draft (ocean)	.....	28 ft. (8.5 m)
Cargo (ship)	.....	12,400 long tons
Cargo (barge)	.....	13,200 long tons

The vessel is capable of carrying additional cargo in its ocean configuration as follows:

Draft	.....	34 ft. (10.4 m)
Cargo (ship)	.....	21,000 long tons
Cargo (barge)	.....	21,800 long tons

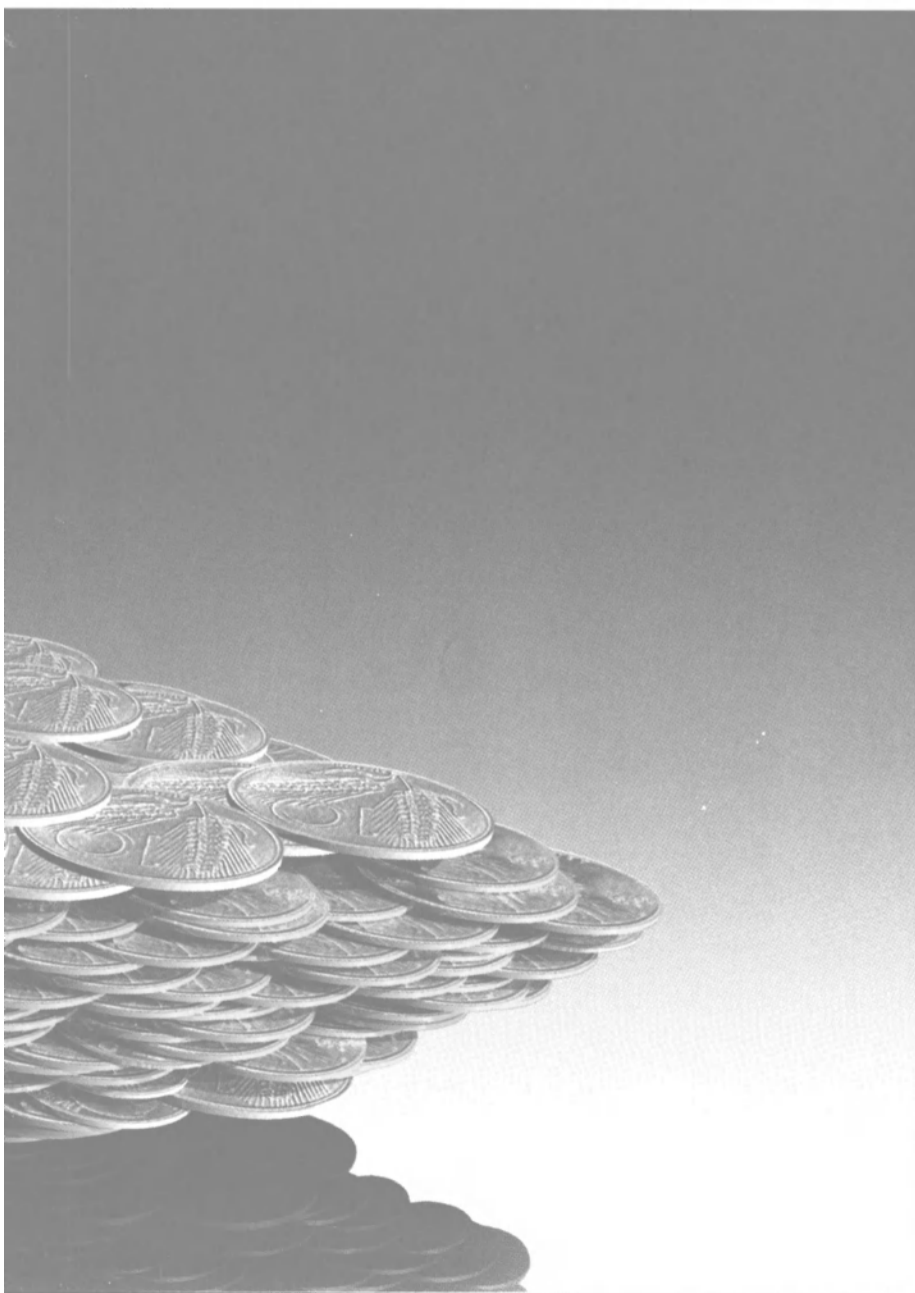
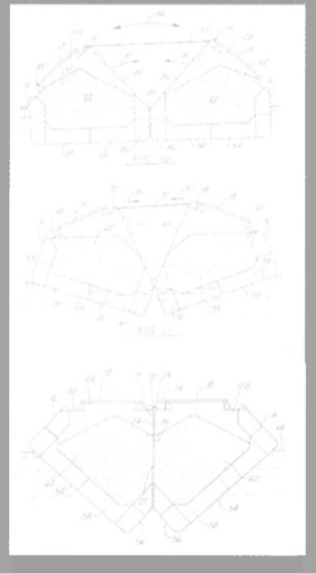
The 595 x 105 ft. (181.3 x 32 m) dimensions noted above — selected for a vessel operating on the Mississippi River system — are equivalent to nine (3x3) standard 195 x 35 ft. (59.4 x 10.6 m) or 200 x 35 ft. (60.9 x 10.6 m) river barges. The ship version is designed to navigate anywhere a tow of nine barges can navigate. Either the barge or the ship versions can be placed in a tow of standard barges being pushed by a standard towboat. The vessel's dimension also allows it to transit existing locks on the Mississippi inland river system. In addition, standard ocean tugs can tow the barge version at sea, and of course, the ship version can sail under its own power.

Power Requirements

Preliminary estimates of the 595 x 105 ft. (181.3 x 32 m) version of the vessel indicate the following speed and power relationship, according to Leary Engineering calculations:

Easy as 1 ... 2 ... 3

From patent drawings, the Hinge Ship goes from shallow to deep draft mode



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COVER STORY: Maritime 2050

Shallow Draft Configuration

Horsepower	Speed (knots)
6,000	7
9,000	8.3
12,000	9.4

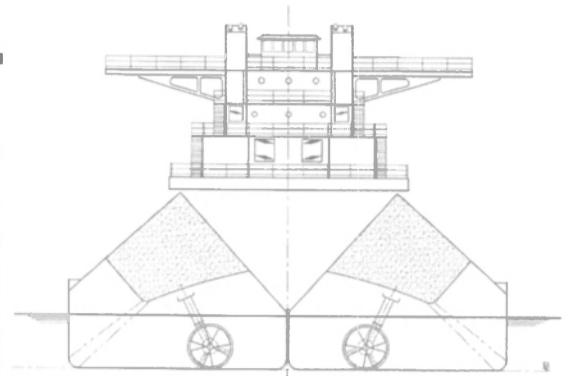
Deep Draft Configuration

Horsepower	Speed (knots)
6,000	9.3
9,000	11.2
12,000	12.7

Main propulsion machinery is designed to consist of electric Z-drive units, one port, one starboard. The steerable units, complete with propeller nozzle, would provide the maneuverability need in shallow drafts as well as the propulsive force needed in deepdraft mode. The electric motors are designed to be located in the aft machinery flat

above the Z-drive units. In either draft condition, the propellers are above the baseline protected from damage by grounding. This propulsion system combined with the stern hull shape eliminates the need for flanking rudders.

Circle 23 on Reader Service Card



Stern view of Hinge-Ship in shallow (left) and deep (right) draft mode.

The Many Modes of Hinge-Ship

Hinge-Ship is designed as a multi-functional and convertible vessel, which will help ship owners and operators meet a variety of needs in a safe, efficient and cost-effective manner. The following are details of the vessel types designed to date.

Dry Bulk Carrier

Each cargo hold has a large hatch with hydraulic operated hatch covers. In deep draft condition, the hatch openings are parallel to baseline and fully accessible for standard loading and unloading elevator equipment. In shallow draft mode, the inboard hatch coaming is sloped somewhat increasing the clear hatch opening. Loading the vessel in this condition is accomplished using standard grain elevator loading equipment.

Trailer Transport

The general hull design, propulsion and operating advantages are identical to that of the bulk cargo ship. The hold deck and the 'tween deck provide trailer stowage, separated by watertight transverse bulkheads. The hold deck has eight rows of trailers. Each row of trailers is positioned by deck guide rails located between dual tires. The hold deck and tween deck provide trailer stowage, separated by watertight transverse bulkheads. The tween deck has four rows of trailers throughout the cargo area, also separated by watertight transverse bulkheads.

Trailers are driven (using a special handling tractor) on the vessel via the side ramp into the positioning area where each trailer is aligned and backed into one of the rows.

Military

As a military transport, the vessel is capable of carrying a variety of rolling vessels and offers the advantages of trans-oceanic transportation with shallow water bow unloading. Beach landings are possible in the shallow draft condition, with side ramps port and starboard for loading and unloading. A standard compartmentized ballast system provides the needed trim for beach approach, and subsequent

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Unitor's new Boiler Water Management System provides continual and precise control of important boiler water and condensate system conditions by automatically monitoring acidity, conductivity, dissolved oxygen and turbidity.

Overdosing is eliminated and therefore any changes in boiler water chemistry are instantly recognised. Chemical use is more economical than with manual dosing because overdosing is eliminated.



Unitor's new Boiler Water Management System provides continual and precise control of important boiler water and condensate system conditions by automatically monitoring acidity, conductivity, dissolved oxygen and turbidity.

For the vessel operator, use of the system results in reduced corrosion, reduced maintenance and reduced system downtime. Additional benefits are that the system enables unmanned operations and reduces time spent on normal dosing and testing. With the new system, dosing of chemicals is calculated from real time measurements which are taken regularly. Any changes in boiler water chemistry are instantly recognised and the dosing rate is automatically changed when the analysis results differ from the user defined control parameters.

The system can monitor water from up to three boilers at one time and data is automatically stored for logging of the treatment plan. A user friendly, touch-screen interface displays trends for all analyses and chemical consumption, hotwell temperature and feed/make-up flow can also be viewed. System access is password controlled. With Unitor's New Boiler Water Management System control and maintenance of your onboard boiler system is provided at your fingertips.

Key Features

- Automatic control of boiler water pH chemistry
- Automatic control of feedwater oxygen concentration
- Automatic Total Dissolved Solids (TDS) control of blowdown valves
- Automatic control of chemical dosing
- Monitoring of boiler water usage and throughput (when flow meters are fitted)
- Data logging of all monitoring parameters for future graphical analysis
- Comprehensive self-check and monitoring facility
- Remote alarm system for unattended operation
- Alarms for all out of range parameters and low make-up chemical level
- Alarms for all system faults
- Automatic monitoring of system service faults

Other New Unitor Chemical Products

- AUTOTREAT
Effective, safe boiler water conditioning chemical formulated for the Unitor Boiler Water Management System.
- OXYGEN SCAVENGER PLUS
Low toxic, DEHA based liquid oxygen scavenger
- SPECTRAPAK 313
Test kit for boiler water treated with OXYGEN SCAVENGER PLUS
- SPECTRAPAK 315
Test kit for boiler water treated with AUTOTREAT/COMBITREAT in conjunction with OXYGEN SCAVENGER PLUS or OXYGEN CONTROL
- CONDENSATE CONTROL
Improved formulation for wider distribution and better protection
- ACC PLUS
Non-toxic cleaner for air coolers and turbochargers

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COVER STORY: Maritime 2050

Welcome "Lo Jack" For Ships

Epic proportions of automobile theft in the U.S. led to the creation a few years ago of an innovative product dubbed Lo-Jack, which is essentially a hidden transmitter placed in the vehicle which, when activated by a call of a stolen vehicle to the police, allows them

to track the vehicle rather quickly. The same concept was recently rolled out for ships, particularly targeting owners operating vessels in areas of high piracy activity. Piracy is a serious threat to ships and the personnel that crew them. With pirating activities running rampant in some parts of the globe — particularly the Far East — organizations from the

International Maritime Organization (IMO) on down are devising means and methods to keep ship and crew safe.

CLS, a satellite-based company believes it has the product — one that relies on high-tech electronics and satellite communications — to help locate and recover ships in the event of a hijacking. The company has therefore

created Shiploc, a new device developed in conjunction with the International Maritime Bureau (IMB), which is a major component in the fight against these acts of violence on the high seas. This small device, which is the approximate size of a shoebox can easily be hidden anywhere on a ship. Installed per the vessel's owner, who can track its position at any time via Shiploc, the system is unbeknownst even to the ship's master and crew for extra precaution. Since, according to **P.K. Mukundun**, IMB's director, "a vessel can move up to 15 positions a day," the owner can track its movement with Shiploc via Internet access on a personal computer.

Available in both normal and crisis mode, Shiploc allows vessel owners to track the positions of their ships through the Web site. When set in normal mode, Shiploc can also alert owners through both e-mail and the Web site as to whether their vessel arrived safely at its expected destination. If the owner logs on and finds that the vessel has gone off course, he can then kick the system in to crisis mode, which will alert IMB's Kuala Lumpur headquarters of a possible hijacking. Shiploc includes its own back up for extra protection, in case the vessel's power is cut off during a hijacking. Shiploc is designed specifically for the maritime industry, and is available to owners for \$280 a month including cost of satellite messages.

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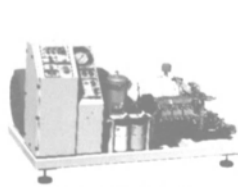


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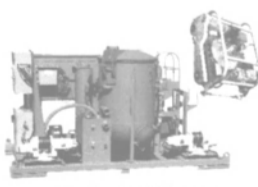
NOTHING REMOVES & CONTAINS COATINGS BETTER THAN NEW FORCE WATERBLAST SYSTEMS



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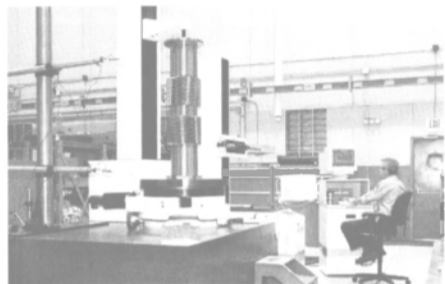
Barriers to communication between ship-to-ship and ship-to-shore are quickly dissolving with the break-neck speed at which the communications industry worldwide is expanding capabilities and service. Cruise ships — which cater to millions of individuals who increasingly find taking a full break from the "real" world tough if not impossible — are perfect trying grounds for communications solutions, both as a value-added benefit for communication craving guests and as a revenue generation opportunity for cruise lines. Maritime Telecommunications Network (MTN) and Digital Seas International (DSI) have executed a three-year contract to provide Renaissance Cruises' entire fleet with Internet Cafes. MTN will supply the cruise line with the high-speed IP satellite network to operate DSI's Internet services. After a successful trial between MTN and DSI on the R2, Renaissance Cruises decided to offer Internet services fleet wide for their guests.

Circle 26 on Reader Service Card

MarAd Elects New Shipbuilding Administrator

The U.S. Maritime Administration (MarAd) named **Jean McKeever** as associate administrator for Shipbuilding, responsible for overseeing the Administration's naval architecture, marine engineering and productivity costs. The position, which was created in 1999, melds MarAd's main shipbuilding-related functions under one manager.

Lynn Gear Plant Upgraded



GE Marine Engines will invest in substantial upgrades to grinding, inspection and hobbing equipment used at its Lynn, Mass., Gear plant over the next year. The first production pieces to be produced with this new equipment will be high-speed pinions and gears for the U.S. Navy's current DDG destroyer program. "We've taken a 20-year step forward with this large investment in new equipment, which translates into long-

term value such as greater grinding accuracy and gear reliability," said **Bill Gehr**, manager Gear Programs for GE Marine Engines. "With this sophisticated technology, GE will be able to produce quiet, more reliable gearing with enhanced load capacity by holding tooth tolerances within .00005 inches — about 1/60th the size of a human hair." The new CNC form grinding equipment replaces the generation grinding equipment GE installed in the 80s. This high precision machine will enable the use of a CBN cutting wheel technology to profile grind marine gearing.

Circle 172 on Reader Service Card

Saab Amasses Formidable Marine Consortium

Saab Marine Electronics has formed a new group of companies in order to supply the marine market with a total concept for modern applications. During a short period of time Saab Marine Electronics has acquired the share holding majority in three companies with complementary high performance equipment within ship automation, tank cleaning, and ballast and bunker tank monitoring. At the same time, Saab Marine Electronics has established marine sales and service companies in Singapore, Dubai, Russia and the U.K.

Circle 173 on Reader Service Card

PBCF Aids Propulsion Efficiency

Propeller Boss Cap Fins (PBCF) is a propeller enhancing device, which is designed to cut fuel consumption and exhaust gases by up to five percent while incurring no additional maintenance cost once installed. The unit, according to **H. Yumoto** Manager of PBCF Div. Mitsui O.S.K. Techno Trade, Ltd., is now operational on 720 ship worldwide. The PBCF rectifies the propeller hub vortex and recovers rotational energy otherwise lost in the propeller slip stream. Increasing propeller thrust by over one percent and reducing propeller torque by over three percent, the PBCF reportedly results in fuel savings of up to five percent or compared to vessels operating at equivalent speeds but without the PBCF, alternatively, a 1.5 percent increase in speed at the same engine output.



The PBCF is designed to eliminate propeller hub vortex, resulting in reduced stern vibrations, propeller noise, and noise contamination in marine acoustic equipment. It also reportedly resolves a number of rudder erosion problems.

The PBCF is a boss cap with fins made from the same material used in conventional boss caps and installed in the same way. This means the PBCF, like conventional boss caps, does not require additional maintenance once fitted, and can be easily replaced. A number of vessels, (oil tankers, containers, etc.), have been retrofitted with the PBCF whilst at sea.

When replacing conventional boss caps with the PBCF, no shaft design reviews are required by classification societies such as AB, CR, GL, KR, LR, NK, and NV.

About 40 percent of PBCF's sold to date have been retrofitted to running ships, the remainder have been fitted to newly built ships. By installing the PBCF at either the ship building stage, or during shaft inspection for running ships, extra shipyard costs can be avoided. The PBCF was developed jointly by Mitsui O.S.K. Lines, West Japan Fluid Engineering Laboratory Co. Ltd., and Mikado Propeller Co. Ltd., and is now patented in 12 countries. In 1994, the sales right of the PBCF was moved from Mitsui O.S.K. Lines (MOL) to one of her subsidiaries. A few subsidiaries have held the sales rights since then, but in April this year Mitsui O.S.K. Techno -Trade Ltd., PBCF Division took over responsibility for sales of the PBCF. Through license agreements, Mikado Propeller Co. Ltd., Nakashima Propeller Co. Ltd., and Samsung Heavy Industries Co. Ltd. have a restricted license to sell and produce the PBCF. Mikado Propeller Co. Ltd. has sold around 310 units, primarily to smaller domestic vessels including pleasure and/or fishery boats. Nakashima Propeller Co. Ltd. has sold 9 units to mainly medium sized vessels, and Samsung Heavy Industries Co. Ltd. has sold 9 units to larger sized vessels.

Circle 88 on Reader Service Card

Millennium Slated For NNS Visit

After evaluating several alternatives, Celebrity Cruises has decided to drydock its innovative gas turbine propelled ship, Millennium, this November to perform work on the vessel's stern hull design. Newport News Shipbuilding has reportedly won the contract, as announced at www.marinelink.com on August 31, 2000.

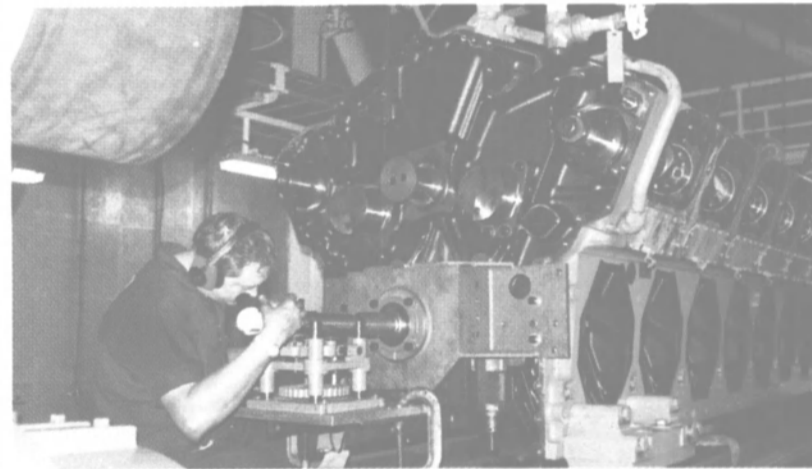
Millennium — featured on the cover of the July 2000 edition of *Maritime Reporter* — is significant because it is the first ever cruise ship with gas turbine main propulsion. Soon after it entered service, a vibration was detected in certain areas of the ship under certain sea conditions. This vibration has been linked to the design of the stern hull. Shipyard workers will use the drydock period to attach a buffer to the aft section of the hull, which is designed eliminate the vibration. Work is expected to take three weeks. Celebrity officials said that the unscheduled dry dock will necessitate the cancellation of one two-night and three seven-night Caribbean voyages. The company is continuing to review the matter with the ship's builder, Chantiers de l'Atlantique, and expects the bulk of any costs associated with the drydock to be covered by the builder.

Celebrity Cruises' president **Richard Sasso** likened the vibration to squeaky brakes on a new car. "It's not a safety issue and it's not a comfort issue, but, with a brand new ship, you want it fixed as soon as possible," Sasso explained.

Similar modifications will be made on Millennium's sistership, Infinity, while it is still under construction at the shipyard. Known as the next member of the Millennium Class of ships, Infinity is scheduled for a January 2001 delivery.

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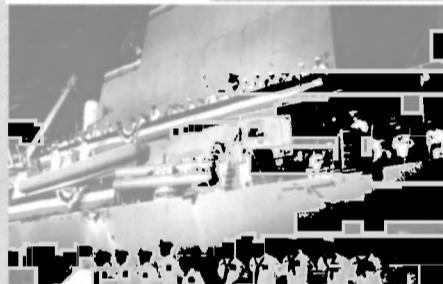
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First Of Modified Destroyers Commissioned



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tradition of the passing of the Long glass to the first officer of the watch.

The Flight 2A is a variant of the Burke class. It has full-up helo facilities, carrying up to two SH-60B Seahawk helicopters. The destroyer's first commanding officer is Commander **Paul C. Smith** USN and Executive officer Lieutenant Commander **Thomas F. Schwarz** USN. This magnificent ship, the 56th Aegis combatant, is named to honor marine Private First Class **Oscar Palmer Austin**.

Private first Class Austin was killed near Da Nang, South Vietnam on February 23, 1969, when he sacrificed his own life to save an injured companion. His act has been recognized with medals and decorations, which include the Purple Heart, the National Defense Medal, the Vietnam Service Medal with two bronze stars, the Republic of Vietnam Campaign Medal, and the Congressional Medal of Honor.

Oscar Austin was born January 15, 1948 in Nacogdoches, Texas and was raised in Phoenix, Ariz., where he joined the U.S. Marine Corps in April of 1968. Six months later, he was promoted to Private First Class and was transferred to the Republic of Vietnam where he served as Ammunitions Officer with Company "E", Second Battalion, Seventh Marine, First Marine Division (Rein), FMF.

During the early morning hours on February 23, Pfc. Austin's observation post was subjected to a fierce ground attack by a large North Vietnamese Army force using a heavy volume of hand-grenades, satchel charges and small arms fire. Observing that one of his wounded companions had fallen unconscious in a position dangerously exposed to hostile fire, Pfc. Austin unhesitatingly left the security of his fighting hole, and with complete disregard for his own safety, raced across the fire-swept terrain to assist the marine to a covered location. As he neared the casualty, he observed an enemy grenade land nearby and leaped between the injured marine and the lethal object, absorbing the effects of its detonation. Ignoring his own painful injuries, he turned to examine the wounded man and saw a North Vietnamese Army soldier aiming a weapon at his unconscious companion. With full knowledge of the probable consequences, Pfc. Austin threw himself between the casualty and the hostile soldier. In doing so, he was mortally wounded.

Marine Artist and forensic author Peter K. Hsu created this special drawing, commemorating Marine Private First Class Oscar Austin, Medal of Honor recipient. Well wishes to the men and women of the USS Oscar Austin (DDG 79) — Fair Winds and following seas.

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Chemoil Starts Supplying Fuel In Singapore

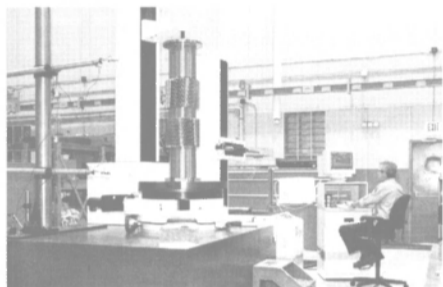
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Circle 174 on Reader Service Card

MarAd Elects New Shipbuilding Administrator

The U.S. Maritime Administration (MarAd) named **Jean McKeever** as associate administrator for Shipbuilding, responsible for overseeing the Administration's naval architecture, marine engineering and productivity costs. The position, which was created in 1999, melds MarAd's main shipbuilding-related functions under one manager.

Lynn Gear Plant Upgraded



GE Marine Engines will invest in substantial upgrades to grinding, inspection and hobbing equipment used at its Lynn, Mass., Gear plant over the next year. The first production pieces to be produced with this new equipment will be high-speed pinions and gears for the U.S. Navy's current DDG destroyer program. "We've taken a 20-year step forward with this large investment in new equipment, which translates into long-

term value such as greater grinding accuracy and gear reliability," said **Bill Gehr**, manager Gear Programs for GE Marine Engines. "With this sophisticated technology, GE will be able to produce quiet, more reliable gearing with enhanced load capacity by holding tooth tolerances within .00005 inches — about 1/60th the size of a human hair." The new CNC form grinding equipment replaces the generation grinding equipment GE installed in the 80s. This high precision machine will enable the use of a CBN cutting wheel technology to produce grind marine gearing.

Circle 172 on Reader Service Card

Saab Amasses Formidable Marine Consortium

Saab Marine Electronics has formed a new group of companies in order to supply the marine market with a total concept for modern applications. During a short period of time Saab Marine Electronics has acquired the share holding majority in three companies with complementary high performance equipment within ship automation, tank cleaning, and ballast and bunker tank monitoring. At the same time, Saab Marine Electronics has established marine sales and service companies in Singapore, Dubai, Russia and the U.K.

Circle 173 on Reader Service Card

PBCF Aids Propulsion Efficiency

Propeller Boss Cap Fins (PBCF) is a propeller enhancing device, which is designed to cut fuel consumption and exhaust gases by up to five percent while incurring no additional maintenance cost once installed. The unit, according to **H. Yumoto** Manager of PBCF Div. Mitsui O.S.K. Techno Trade, Ltd., is now operational on 720 ship worldwide. The PBCF rectifies the propeller hub vortex and recovers rotational energy otherwise lost in the propeller slip stream. Increasing propeller thrust by over one percent and reducing propeller torque by over three percent, the PBCF reportedly results in fuel savings of up to five percent or compared to vessels operating at equivalent speeds but without the PBCF, alternatively, a 1.5 percent increase in speed at the same engine output.



The PBCF is designed to eliminate propeller hub vortex, resulting in reduced stern vibrations, propeller noise, and noise contamination in marine acoustic equipment. It also reportedly resolves a number of rudder erosion problems.

The PBCF is a boss cap with fins made from the same material used in conventional boss caps and installed in the same way. This means the PBCF, like conventional boss caps, does not require additional maintenance once fitted, and can be easily replaced. A number of vessels, (oil tankers, containers, etc.), have been retrofitted with the PBCF whilst at sea.

When replacing conventional boss caps with the PBCF, no shaft design reviews are required by classification societies such as AB, CR, GL, KR, LR, NK, and NV.

About 40 percent of PBCF's sold to date have been retrofitted to running ships, the remainder have been fitted to newly built ships. By installing the PBCF at either the ship building stage, or during shaft inspection for running ships, extra shipyard costs can be avoided. The PBCF was developed jointly by Mitsui O.S.K. Lines, West Japan Fluid Engineering Laboratory Co. Ltd., and Mikado Propeller Co. Ltd., and is now patented in 12 countries. In 1994, the sales right of the PBCF was moved from Mitsui O.S.K. Lines (MOL) to one of her subsidiaries. A few subsidiaries have held the sales rights since then, but in April this year Mitsui O.S.K. Techno -Trade Ltd., PBCF Division took over responsibility for sales of the PBCF. Through license agreements, Mikado Propeller Co. Ltd., Nakashima Propeller Co. Ltd., and Samsung Heavy Industries Co. Ltd. have a restricted license to sell and produce the PBCF. Mikado Propeller Co. Ltd. has sold around 310 units, primarily to smaller domestic vessels including pleasure and/or fishery boats. Nakashima Propeller Co. Ltd. has sold 9 units to mainly medium sized vessels, and Samsung Heavy Industries Co. Ltd. has sold 9 units to larger sized vessels.

Circle 88 on Reader Service Card

Millennium Slated For NNS Visit

After evaluating several alternatives, Celebrity Cruises has decided to drydock its innovative gas turbine propelled ship, Millennium, this November to perform work on the vessel's stern hull design. Newport News Shipbuilding has reportedly won the contract, as announced at www.marinelink.com on August 31, 2000.

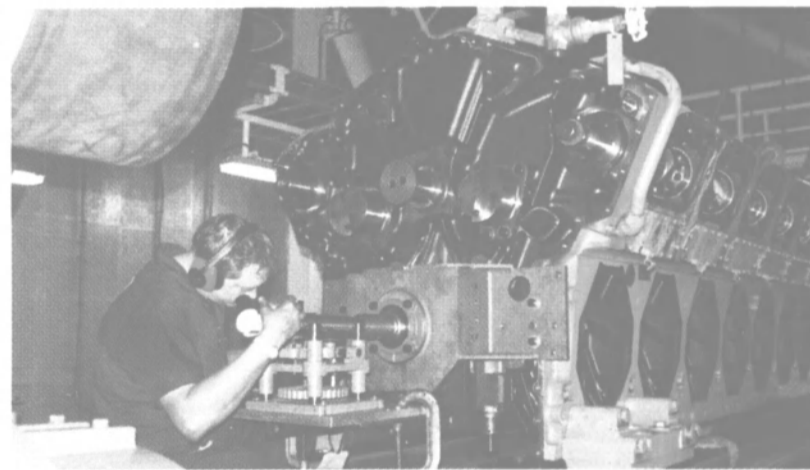
Millennium — featured on the cover of the July 2000 edition of *Maritime Reporter* — is significant because it is the first ever cruise ship with gas turbine main propulsion. Soon after it entered service, a vibration was detected in certain areas of the ship under certain sea conditions. This vibration has been linked to the design of the stern hull. Shipyard workers will use the drydock period to attach a buffer to the aft section of the hull, which is designed eliminate the vibration. Work is expected to take three weeks. Celebrity officials said that the unscheduled dry dock will necessitate the cancellation of one two-night and three seven-night Caribbean voyages. The company is continuing to review the matter with the ship's builder, Chantiers de l'Atlantique, and expects the bulk of any costs associated with the drydock to be covered by the builder.

Celebrity Cruises' president **Richard Sasso** likened the vibration to squeaky brakes on a new car. "It's not a safety issue and it's not a comfort issue, but, with a brand new ship, you want it fixed as soon as possible," Sasso explained.

Similar modifications will be made on Millennium's sistership, Infinity, while it is still under construction at the shipyard. Known as the next member of the Millennium Class of ships, Infinity is scheduled for a January 2001 delivery.

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Circle 174 on Reader Service Card

The more things change ...

The current situation of the German maritime industry is not far from that which has existed for each of the past several SMM exhibitions in Hamburg. The collective group of shipbuilders, repairers and marine equipment product and system suppliers are still widely regarded as one of the most technically capable and technologically advanced in the world, utilizing generations of accrued know-how to deliver safe, efficient and reliable vessels and systems.

According to the latest world shipbuilding statistics, Germany ranks fifth in the world in terms of new tonnage built per annum, but with a market share of only four percent and an increasing outflow of business — particularly an outflow of simpler ship-type construction — to lower cost competitors in developing nations and Korea, the prospects for bolstering its annual volume is not great. However, the German marine faction



MTU enters the medium speed fray, launching a new engine at SMM. See story on page 34.

does possess the enviable ability to consistently deliver products, systems and vessels to the aforementioned technological high, and it is this capability that separates it from its competitors and serves as the basis for expansion in the future.

Similarly, the situation regarding competition has not changed drastically in the last few years, specifically with regard to Korean shipbuilders who have continued to expand capacity, expansion in the face of stagnate (and many complain unprofitable) ship prices and massive financial losses by many of the Korean shipbuilder's parent corporations.

While an agreement between the EU and Korea regarding the elimination of shipbuilding subsidies has been agreed, there is still skepticism regarding not only the plan's ultimate implementation, but compliance. The situation is exacerbated by the fact that new ship orders have been on a record pace of late, with new-build demand jumping noticeably in 1999. A total of 1,523 ships representing 18.9 million-cgt were ordered last year, according to **Herbert von Nitzsch**, chairman of the managing board of Blohm + Voss. Healthy numbers were recorded throughout the shipbuilding world, with a total production of 17.5 million-cgt in 1999, and

an existing orderbook of 37.5 million-cgt.

Good signs that this trend will continue make the fact that newbuild prices are so low that much more vexing for shipbuilders.

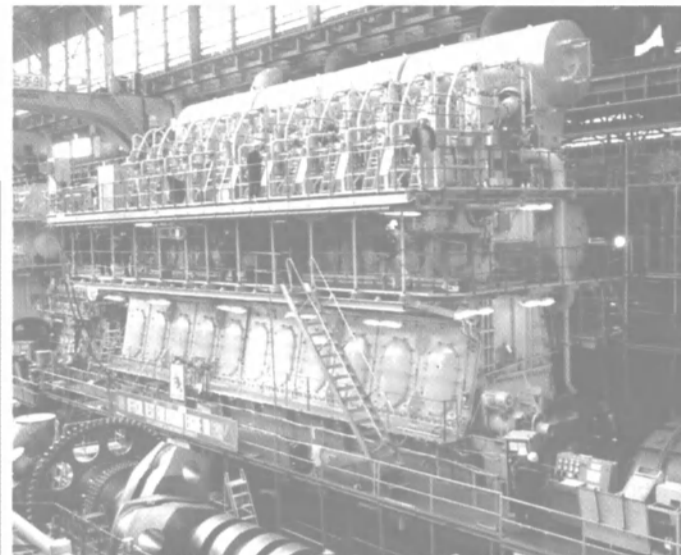
The trend toward containerization, particularly the proliferation of very large containerships with capacity for more than 5,000 TEU continues, and will most likely continue indefinitely with developments such as the 12,500-TEU vessels (see "Investment in Design," *Maritime Reporter & Engineering News*, August 2000, p. 8) currently under study. Safety matters, particularly when carrying oil or other potentially hazardous materials, will continue to drive new construction activities as well. Ripple effects from the Erika disaster off of France in late 1999 will continue to be felt for generations, with the immediate shake-out of older, single-skin vessels helping to bolster orderbooks in the near term. The continued stress on reducing a vessel's weight while increasing its performance, strength and reliability — particularly in the realm of fast, high-speed passenger craft — also bodes well for the German industry, in that it requires well-researched technological solutions.

Dressed for Success

The ability for one country's equipment supplier base to continuously perform at such an elevated technological level is rarely matched in any industry, and attributable in part the country's overall reputation for the production of superior engineered products.

The market for marine products and systems is, naturally, on the upswing along with the world orderbook. In fact, the German Association Marine & Offshore Equipment Industries (VDMA) estimates that the worldwide marine equipment market is in excess of \$65 billion per year for new ship construction alone.

Another positive market force — positive, that is, in the eyes of marine equipment product and system suppliers — is the push for increasingly safe and environmentally sound ships and boats. Increased reliability, particularly in times of tragedy; the ability to locate, identify and avoid trouble; and reduced emissions are just three of the factors driving marine equipment development, are three factors, which will increasingly play a role in how ships are designed, built, outfitted and maintained. The German marine equipment market, though, is going through the same rapid re-organization as that of many of its colleague countries, as the



An MAN B&W 10K-98 MC-C built by Hyundai Heavy Industries.

manufacturers are, of course, not insulated from the flows of international business trends. The mergers, takeovers, partnerships and consolidations that have become an industry hallmark are far from complete, as the price of competing effectively in the global marketplace is superior product combined with efficient production. One of the more notable examples of this is covered in **David Tinsley's** article on the Caterpillar takeover of MaK, beginning on page 34.

Trends driving the German maritime suppliers, though, are not unique to issues pushing the rest of the world, chief among them being innovations that clearly enhance the use and cost-efficiency of a ship over the entire life-cycle. In the area of propulsion, this means an increased view towards alternative power systems — including gas turbines and diesel electric arrangements — although diesel engines are, and will, continue to be the prime mover of ships for some time to come. The proliferation of very large cruise ships, and larger ships in general, have demanded that engineers and suppliers provide more quantities of and more reliable electric power.

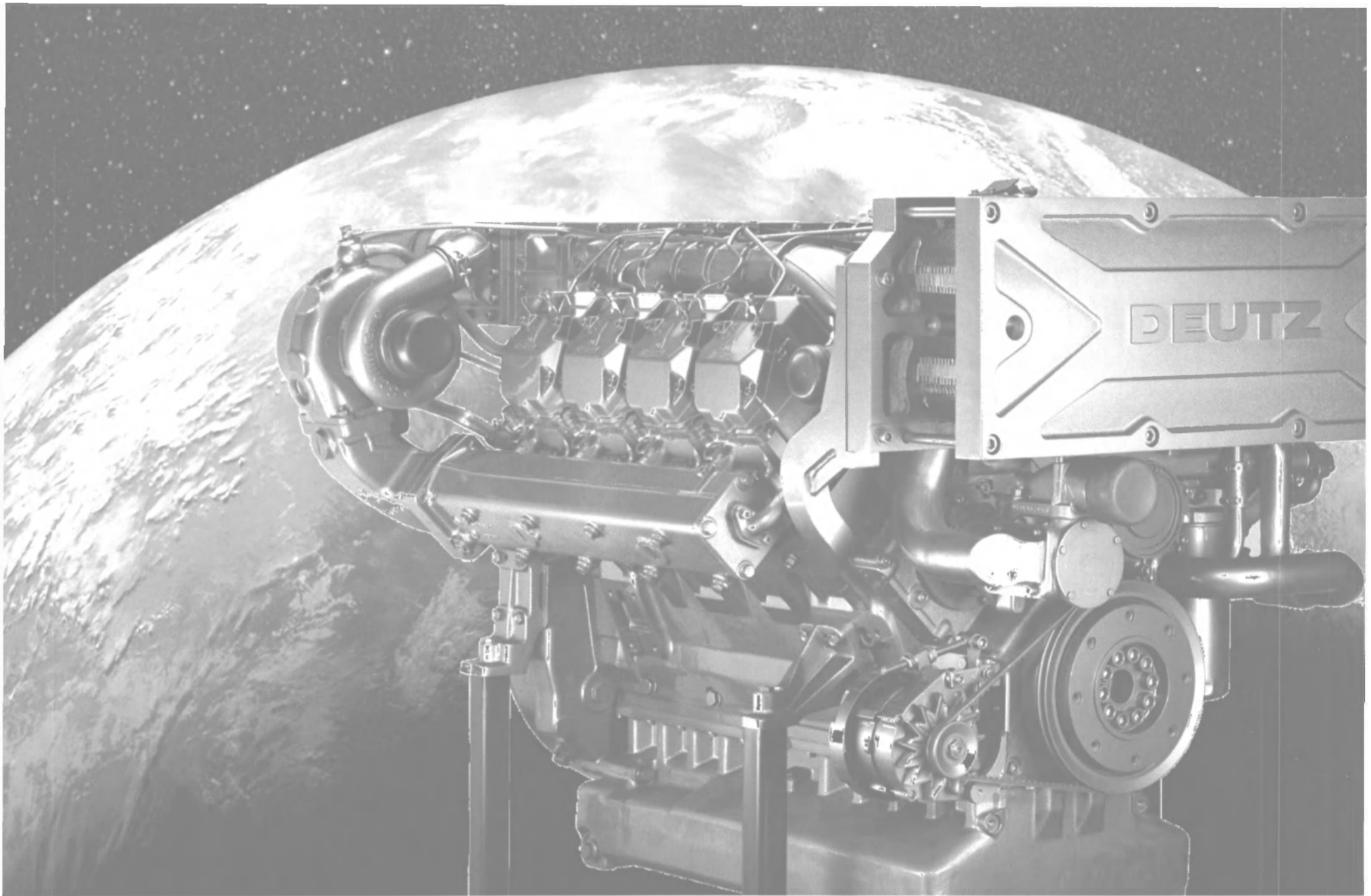
Looking at the broad spectrum of marine electronics, the evolution of the electronic chart is proceeding quickly, with full navigation via electronic charts the desired end.

Shipboard communications advances have perhaps most closely mirrored advances found in the consumer sector, i.e. there have been, and will, continue to be quantum leaps forward in the ability to quickly, safely and more cost-effectively transfer increasingly large amounts of data, as well as voice, fax and other traffic from ship to shore and vice versa.

CIMAC DAY 2000 At SMM

CIMAC Day 2000 will be held in conjunction with the SMM exhibition in Hamburg, Germany, and will focus on the topic of "Jumbo Engines for Jumbo Ships." In the last decade, there has been a remarkable development regarding size and speed of containerships and cruise ships in particular, a trend which seems likely to continue for some time. For example, the number of post panamax containerships (5,000-7,000 TEU) has increased from five ships in 1990 to more than 100 by 2000. Cruise ships with a capacity of 2,000 passengers, monohull ferries and catamaran ferries capable of speeds past 30 knots and 45 knots, respectively, have dominated the orderbooks for the past few years. Corresponding with this rise in size is, of course, the need for additional power for both main and auxiliary engines. The maximum power output per engine has increased to about 68,000 kW for low speed, 35,000 kW for medium speed and 8,000 kW for high speed diesel engines.

The panel will discuss future power demands and technical capabilities. For additional information contact CIMAC at: www.cimac.com; tel: +49 69 6603 1567; Fax: +49 69 6603 1566



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Engine type		BF4M1013E/C	BF6M1013E	BF6M1013EC	BF6M1013ECP
Configuration		in-line	in-line	in-line	in-line
No. of cylinders		4	6	6	6
Bore/stroke	mm	108/130	108/130	108/130	108/130
Displacement	l	4.76	7.15	7.15	7.15
Power ratings 1)	kW	81-118*	123-145*	148-174*	166-195*
at speed	min-1	2300	2300	2300	2300
Continuous power 2)	kW	81-105	122-128	146-155	-
at speed	min-1	1500/1800	1500/1800	1500/1800	-
Weight 3)	kg	600/650	750	800	800
Weight 4)	kg	500/550	650	700	700
Dimensions	mm	1050x850x910	1420x850x910	1420x850x910	1420x850x910

1015 Series

Engine type		BF6M1015	BF6M1015C	BF8M1015C
Configuration		V-engine	V-engine	V-engine
No. of cylinders		6	6	8
Bore/stroke	mm	132/145	132/145	132/145
Displacement	l	11.91	11.91	15.87
Power ratings 1)	kW	214-240*	261-425*	348-560*
at speed	min-1	2100	2100-2300	2100-2300
Continuous power 2)	kW	210-228	285-310	380-413
at speed	min-1	1500/1800	1500/1800	1500/1800
Weight 3)	kg	1300	1400	1800
Weight 4)	kg	880	950	1250
Dimensions (L x W x H)	mm	1205x1305x1021	1480x1305x1021	1673x1305x1021

1) For marine propulsion engines.
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SMM 2000 Set For Hamburg



Reporting this year's SMM 2000 Shipbuilding, Machinery & Marine Technology Exhibition as "booked out," Hamburg Messe is

dubbing the exhibition as one that is multi-cultural and lingual — the bi-annual conference is predicted to attract more than 1,000 exhibitors from 42 countries. Designating Spain as this year's partner country, the exhibition, which has been dubbed the leading trade fair of world shipbuilding, SMM 2000, will take place at Hamburg Exhibition Centre from September 26-30, 2000.

Holding a place as the main international forum for executives in the shipping and shipbuilding sector for many years, SMM has further consolidated its top position with its "Hall of Nations" strategy involving grouping national pavilions under one roof, which was implemented for the first time at SMM '98.

At SMM 2000, Korea and the Netherlands will, for the first time ever, mull the possibility of staging a joint presentation to achieve greater international presence — joining various countries — such as the People's Republic of China, the U.K., Japan, Russia and the U.S.

The growing number of joint ventures and alliances is meeting market requirements for complete systems in all areas of shipbuilding. The international trade audience of SMM 2000 will be able to observe this process for navigation and ship management systems, propulsion units, pumps, waste disposal plants and other types of equipment. In addition, the conference is receiving support of the Dutch Maritime Export Forum; Holland Marine Equipment Association (HME) is organizing a joint presentation on the international "stage" for the first time at SMM 2000. As many as 23 marine equipment suppliers have already registered for this joint stand, which will present marine electronics, automation and control systems, components for propulsion and rudder systems, refrigerating plants, lifeboats and workboats, as well as products in other areas.

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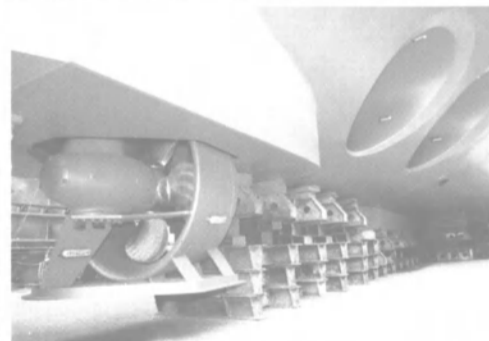
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vices is an advanced addressable monitoring system, which can control up to 32 addressable 4-20mA transmitters. The system will provide continuous monitoring of hydrocarbon, oxygen and hydrogen sulphide in cargo pump rooms as well as controlling temperature transmitters monitoring the cargo pump bearings in compliance with IMO, OCIMF, Exxon & Class rules/regulations on oil tanker pump room safety.

MasterSHIP CAD/CAM Seminar To Be Held In The Netherlands

From September 25-26, 2000, the MasterSHIP CAD/CAM seminar for shipbuilders and designers will take place in the Netherlands. The seminar, which is organized by Yachting Consult, the Dutch specialist in CAD/CAM software and engineering, will be held in Eindhoven, the Netherlands.

Floating Drydock Under Construction At Flender Werft

A new floating dock that allows future dock-

ing of ships with a dwt of up to 20,000 is being constructed throughout the next few months at Flender Werft. The steel structure, which measures 722 x 148 ft. (220 x 45 m) has already commenced; commissioning of the dock is scheduled for February 2001.

Litton Marine Systems Introduces ECDIS Software Kit

Litton Marine Systems has introduced a new Electronic Chart Display and Information System (ECDIS) software package for the international maritime industry. The new

ChartMaster ECDIS software, in kit form, is based on the company's Voyage Management System (VMS) software, and has been designed for easy installation on a wide range of hardware platforms.

Tribon Solutions Develops E-Commerce Solution For Shipbuilding Industry

Tribon Solutions (formerly Kockums Computer Systems) has announced the development of tribon.com, an e-commerce solution for the global shipbuilding industry, linking together shipyards, suppliers and ship owners in a comprehensive global network. The marketplace tribon.com will be launched at SMM in September. Centered around a Global Component Database, the tribon.com solution will contain extensive, standardized data about the full universe of shipbuilding components.

Centa Provides Complete Torsional Coupling Range

Centa will once again will exhibiting in its usual spot in Hall number six, highlighting its new Centax-Sec in sizes 91-96, which will expand the range for 660 kNm nominal torque. This design utilizes segmented rubber elements of high torsional and radical elasticity, combining with outstanding overall and internal ventilation without impairment of the rubber sections.

Pall Rochem Launches Marine Division

On June 1, Pall Corporation strengthened its commitment to the commercial and military shipping communities with the introduction of Pall Rochem Marine.

Previously operating as Pall Rochem, customers will be familiar with Pall as the sole patent owner and supplier of the widely employed Disc Tube (DT) module membrane reverse osmosis (RO) desalination systems fitted in over 2000 shipboard installations.

Deerberg Wins Grand Slam

Deerberg Systems was awarded \$25.3 million worth of orders from three countries for ship waste management systems. Following one year of negotiations, Oldenburg, Germany-based Deerberg obtained orders for the systems onboard ten luxury cruise ships. The vessels, which are being constructed at Aker MTW, Chantiers de l'Atlantique and Mitsubishi Heavy Industries, Nagasaki, all selected the Deerberg Multi Purpose Waste Management System.

Hatlapa Brings On Expanded Gears

Hatlapa Uetersener Maschinenfabrik GmbH & Co.'s steering gear program has been extended to the small- and medium-sized vessels, which are often constructed on European soil. Hatlapa has added specifically a selection of rotary vane steering gears. The series, which is known as HVT Hatlapa Vane Type, offers rudder torques from 50 kNm to 1,500 kNm with rudder stock diameters up to 520-mm. The gears, which will be displayed at Hatlapa's booth in Hall 12 at SMM, are designed as two or three vane types with rudder angles up to 65-degrees.

STN Atlas To Feature New Innovations

STN Atlas Marine will feature its selection of several major new developments as part of its display in Hall 12EG, stand number 12024, at this year's SMM Exhibition. Significant wares include a new series of proprietary NACOS integrated navigation command systems, which implement Atlas Radarpilot 1000 radars boasting enhanced clutter elimination as well as technologically advanced display and docking functions.



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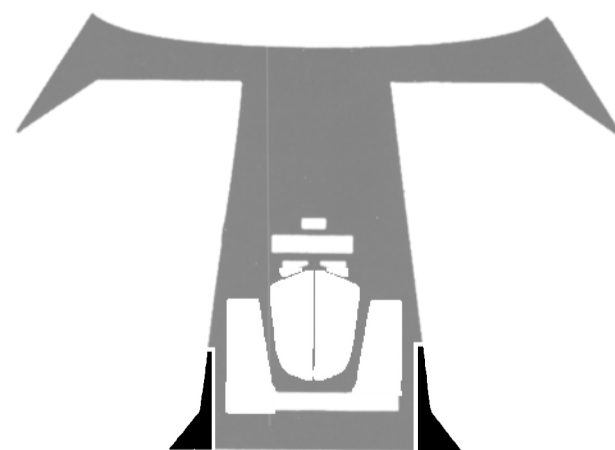
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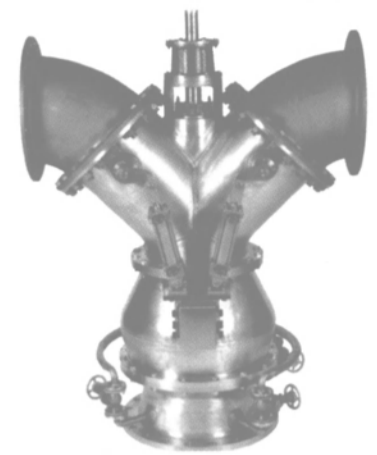
Omnithruster Continues To "Lead The Way"

The recent award from the Japanese Defense Agency for its two newest Coastal Mine Sweepers secures Omnithruster's position as one of the leading designers and manufacturers of advanced, low noise, shock hardened

thrusters.

The Omnithruster JT575AM, designed from the ground up for the Japanese Defense Agency, incorporates the patented Omniphaser noise masking system. This device uses some of the

thruster's own output to reintroduce a water/air mixture into the thruster inlet. The air bubbles compress and expand while traveling through the impeller absorbing incipient cavitation energy that normally emanates a noise. This



Omnithruster's JT575AM unit

reduction in noise is dramatic; enough in fact, for the U.S. Navy to begin the retrofit of the system to the Omnithruster JT1700-1AM's installed on the Mine Countermeasure Class (MCM) ships. The JT575AM is manufactured out of centrifugally cast Nickel-Aluminum Bronze and is completely non-magnetic. Custom hydraulic cylinders and stainless steel mechanical components are also utilized to minimize the magnetic content of the overall package, critical for use on a minesweeper.

The thruster design has been evaluated by DDAM (Dynamic Design Analysis Method) to insure that it meets the shock requirements of the U.S. Navy (NAVSEA 0908-LP-000-3010) and the Japanese Defense Agency. Figure 6-11 depicts the stress concentration of the steering valve and nozzles as the unit is subjected to a shock level specified in Design Data Sheet 072-01, "Shock

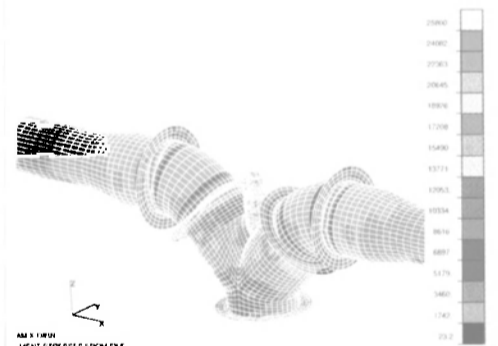


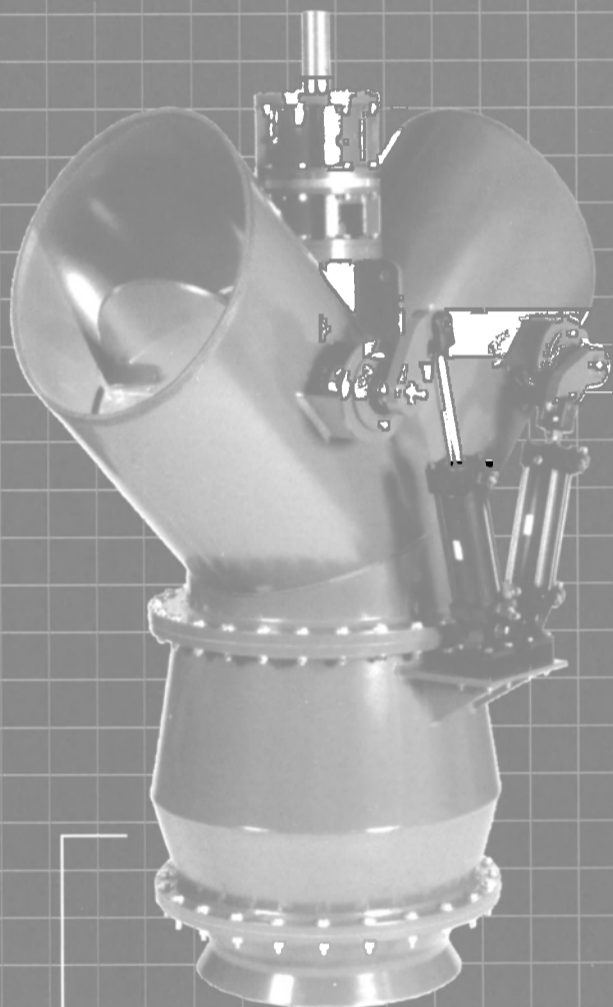
Figure 6-11: Vertical Shock, NRL von-Mises Stress — Control Valve and Nozzles.

Design Values" (U.S. Navy Confidential). The flanged connections are strengthened by using high strength fasteners. Metric fasteners were utilized throughout the design for ease of integration aboard the Japanese ship.

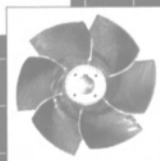
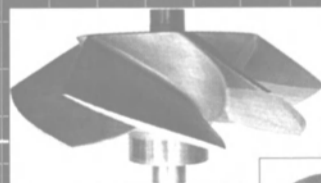
It is obvious that the JT575AM is a very specialized unit, but it goes to show just how adaptable the JT Series can be to a specific installation. Omnithruster's ability to offer a customizable commercial product that has been fully tested in the military environment puts it in a unique position amongst its competitors. The JT Series, and its smaller sibling the HT Series, continue to "lead the way" in waterjet thruster technology.



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MAN B&W Diesel Is One Of SMM's Largest

As in years past at SMM Exhibitions, MAN B&W Diesel will be housed in one of the largest exhibition areas in Hall 6. The diesel engine manufacturing group, which is headquartered in Augsburg, Germany, has supplemented its existing range of medium-speed engines with the lower output end in recent years. The company will display a 7L27/38 propulsion engine rated at 2,380 kW with remote control system and a gear, which had been developed specifically for this propulsion unit by MAN B&W Alpha Diesel, and a 7L 16/24 generator set to demonstrate Common Rail (CR) electronically controlled fuel injection.

RENK Offers New Propulsion Technologies

RENK AG, an enterprise of the MAN group will focus on new propulsion technologies for the construction of special ships — specifically ferries and naval vessels. The company's presentation will be reliant on gear units, slide bearings and couplings, and for manufacturing technologies to provide low-noise propulsion solutions.

Drew Marine's Fuel Mill System



At this year's SMM exhibit, Drew Marine will display a range of highly engineered systems and equipment incorporating advanced technology to serve particular shipboard needs.

The company will also feature its chemical treatment programs for optimizing the performance of critical shipboard systems. Drew Marine plans to introduce various upgrades to its AWT and ACWT Automated Water Treatment Systems.

Deutz To Premiere New Engine Series

Deutz AG, Cologne, will introduce its new high-speed marine diesel engines of the 1013 and 1015 series at SMM. Boasting power ratings between 163 and 560 kW, the engines complement the lower power range of the established Deutz 616, 620, 628 and 645 series engines. The new engine series will be joined by a redesigned engine of the classic 628 series with power ranges between 1,350 and 3,600 kW.

ABB To Show Latest Turbocharger

ABB will exhibit its most recent product

from the TPL line in Hall 6, Stand 6037 at SMM 2000 — the large turbocharger TPL80B. The TPL B turbocharger has been designed for two-stroke diesel engines as a robust and reliable platform for the most powerful marine applications ranging from 5,000 to 25,000 kW per turbocharger.

Transas at SMM 2000: Safety Through Integration

Transas Marine Limited in conjunction with Transas Europe GmbH, will display the latest range of high-tech products that are

designed to meet the rapidly changing and increasingly complex needs of the marine industry. Transas also innovates in the field of shore-based technologies. The company's latest developments will be displayed at this year's SMM stand (No. 11101, Hall 11), demonstrating the contribution that Transas has made to increasing safety at sea. The main focus will be a virtual bridge network system, based on its full mission shiphandling simulator, Navi-Trainer Professional.

Alfa Laval Provides Sep Solution

Bilgecon is an efficient, relatively low-cost

system based on both traditional centrifugal separation and chemical separation. The system comprises two Alfa Laval subsystems working in series — an MSPX sludge treatment system for desludging and de-oiling, with an Alpacon dosing module, and a module-mounted OWC-101 oily water treatment system. In both systems the oily sludge and the oily water are dosed with Alpacon, a range of patented separation conditioners developed by Alfa Laval.



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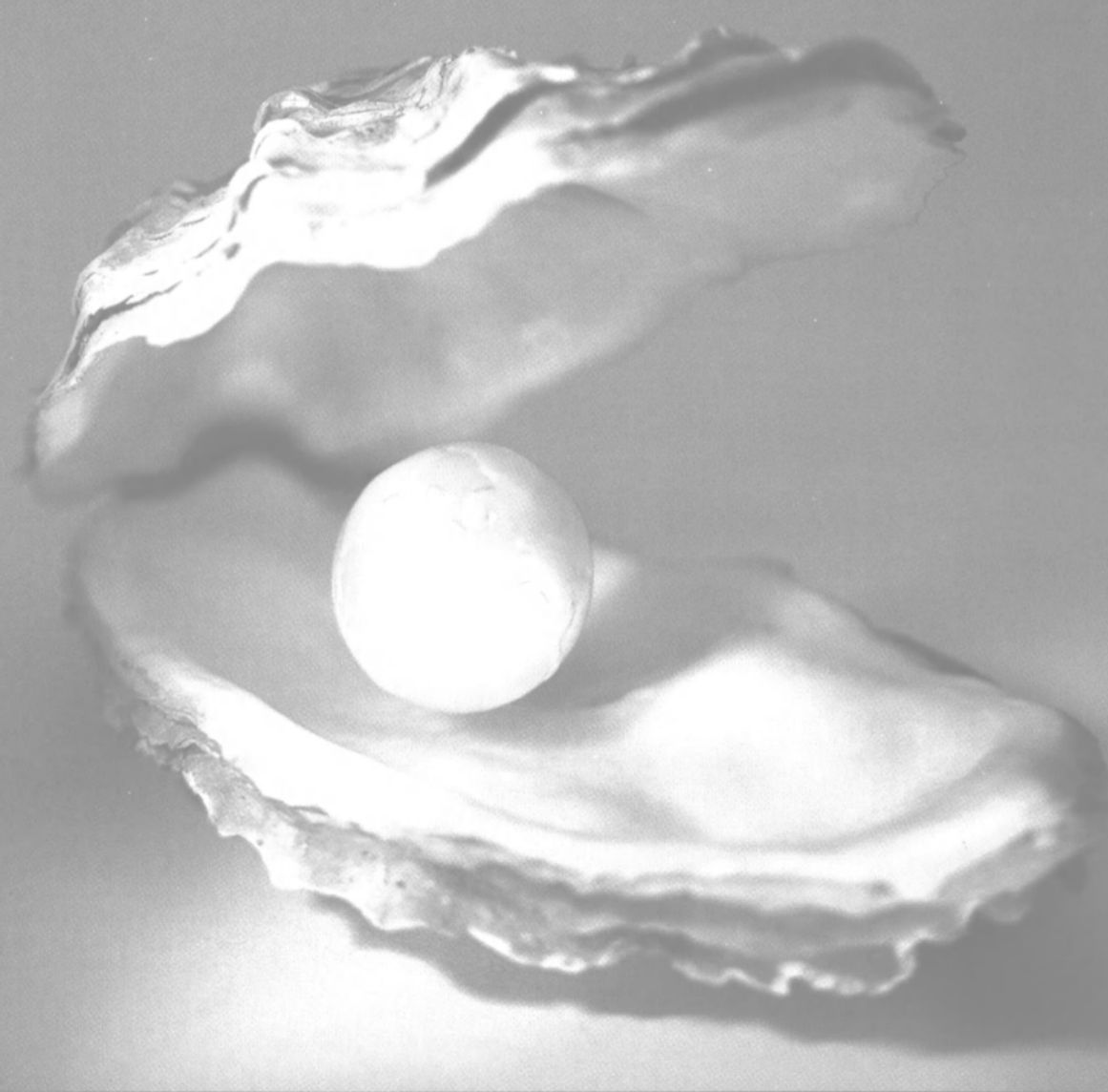
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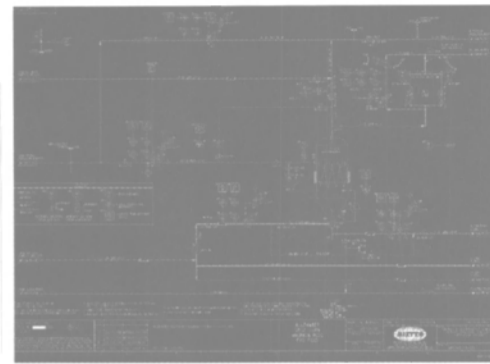
Vessel Focus: FPSO

FPSO Retrofit Design Accelerated With CAD

Software that automatically produces loop, cable, and termination drawings from information in piping and instrumentation diagrams (P&IDs) allowed Merpro Limited to prepare electrical schematics for an offshore retrofit twice

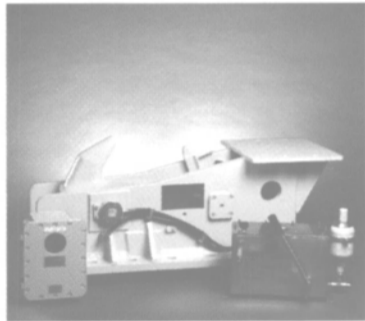
as fast as on previous projects. The retrofit involved a floating production storage and offloading (FPSO) tanker, the Bluewater Uisge Gorm, which was increasing the water cut and accumulating solids in one of its separators. Mer-

pro designed a system that addressed both problems. The documentation for the system included 78 electrical schematics, and in a time and cost-saving move designers created "intelligent" P&IDs containing equipment specifica-



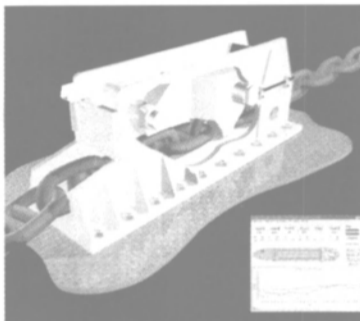
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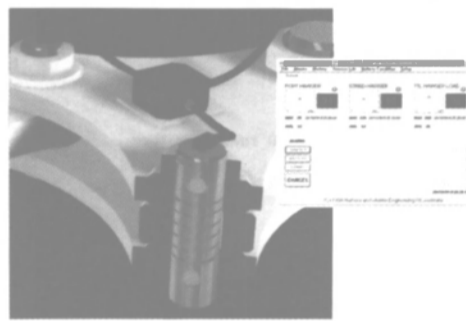
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- For class 1 zone 1 areas
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tions, engineering information, and other data. Then they created loop and junction box templates using the software's drafting system. The prototypes used "tokens" to represent information such as tag number, manufacturer, model number, and so on. The software automatically generated loop, cable, and termination drawings by replacing tokens with descriptive data from the P&ID instrument index master database, making it possible to complete the drawings in six weeks.

The Uisge Gorm is situated on the Furgus Fife Oil Field in the U.K. sector of the North Sea, close to the Norwegian and Danish sectors. During the initial two years operation, being a marginal field the water cut increased quite dramatically such that the field was producing almost as much water as oil and this would continue to increase as the age of the field increased. The high water cut meant that the produced water system was running near its limit and as such to achieve the oil in water overboard discharge legislative requirements production had to be cut back, this would result in a decrease in revenue. A second problem, one of sand production, was also encountered during this period with plant shut downs having to take place at more frequent intervals to remove the solids build up in the separation vessels. Besides the more frequent shutdowns to remove the solids, a potentially greater problem is the effect that sand has on the instrumentation and the erosive effects on pipework and valves. The existing plant like most installations in the North Sea had no facility to manage solids. Merpro Limited was contracted by Bluewater Engineering b.v. to design a system to meet the above needs.

Merpro specializes in the design and manufacture of oil and gas processing systems primarily for the offshore sector a two-part solution was proposed for the Uisge Gorm. In the past, Merpro would have generated the documentation for a project such as this by using one program to create P&IDs, AutoCAD to create electrical schematics such as junction box layouts and instrumentation loops, and a spreadsheet application to generate instrument and valve lists. Since there was no connection between any of the programs, each schematic was started from scratch and equipment lists were created manually on spread-



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sheets. For junction box layouts, each line from the terminals on an instrument to the terminal rail in the junction box had to be drawn individually. To make loop drawings, someone had to draw each loop, including field devices, terminal strips, and controls, and then manually type in information such as tag number, model number, calibrations, and so on. Typically, he or she was working from the spreadsheet equipment list when making the loop drawing. The process was time-consuming, and also inaccurate since it was possible to forget a loop, double allocate terminals etc.

On this project, Merpro decided to take a different approach. The company had recently purchased AutoPLANT from Rebis, in Walnut Creek, Calif. This family of 2-D and 3-D plant design software runs as an add-on to AutoCAD. One of the reasons Merpro purchased this system was because they could buy only the modules they wanted. They purchased the P&ID module, the Instrumentation system, and the Data Manager. Rather than simply drawing geometry to indicate process lines and equipment as they would with a CAD system, the new system would allow them to create intelligent P&IDs that also maintained a textual database with detailed specifications on all equipment and lines. Equipment lists could be generated automatically from the information in the P&ID database. And because Instrumentation and P&ID share a common database, once a P&ID has been produced, all other required documentation such as loop, cable, and termination drawings can be generated automatically. When changes are made to a P&ID, they instantly ripple through the entire documentation package.

Intelligent process

After the process flow diagram and process schematic were completed, they were turned over to the designers who created the P&IDs. Rather than drawing equipment and lines, adding bubbles, and putting text in the bubbles, they were able to insert pre-created equipment blocks provided by the Rebis software into the drawings. The blocks included intelligence about the equipment they described. For example, after a designer inserted a pump block, the software placed its tag number on the drawing and a description of the pump in the equipment list. As designers added equipment to the drawings, either by using pre-made blocks or by drawing their own, the master database was being populated so that when the P&ID was complete, the database was as well. Some of the textual data was generated by the software itself. For example, if a tag number started with certain letters, it knew that this was a transmitter and it

filled in the instrument description automatically. In other cases, engineers entered information into the data sheet module from which instruments' purchase requisitions are generated.

Once the P&IDs were finished, valve and instrument lists were automatically generated from the information in the P&ID database, eliminating several weeks of manual data entry and potentially costly mistakes. Once design and

documentation was finished, the 130-ton system was manufactured at Merpro's facility in Montrose. It was installed offshore, minimizing downtime for the FPSO.

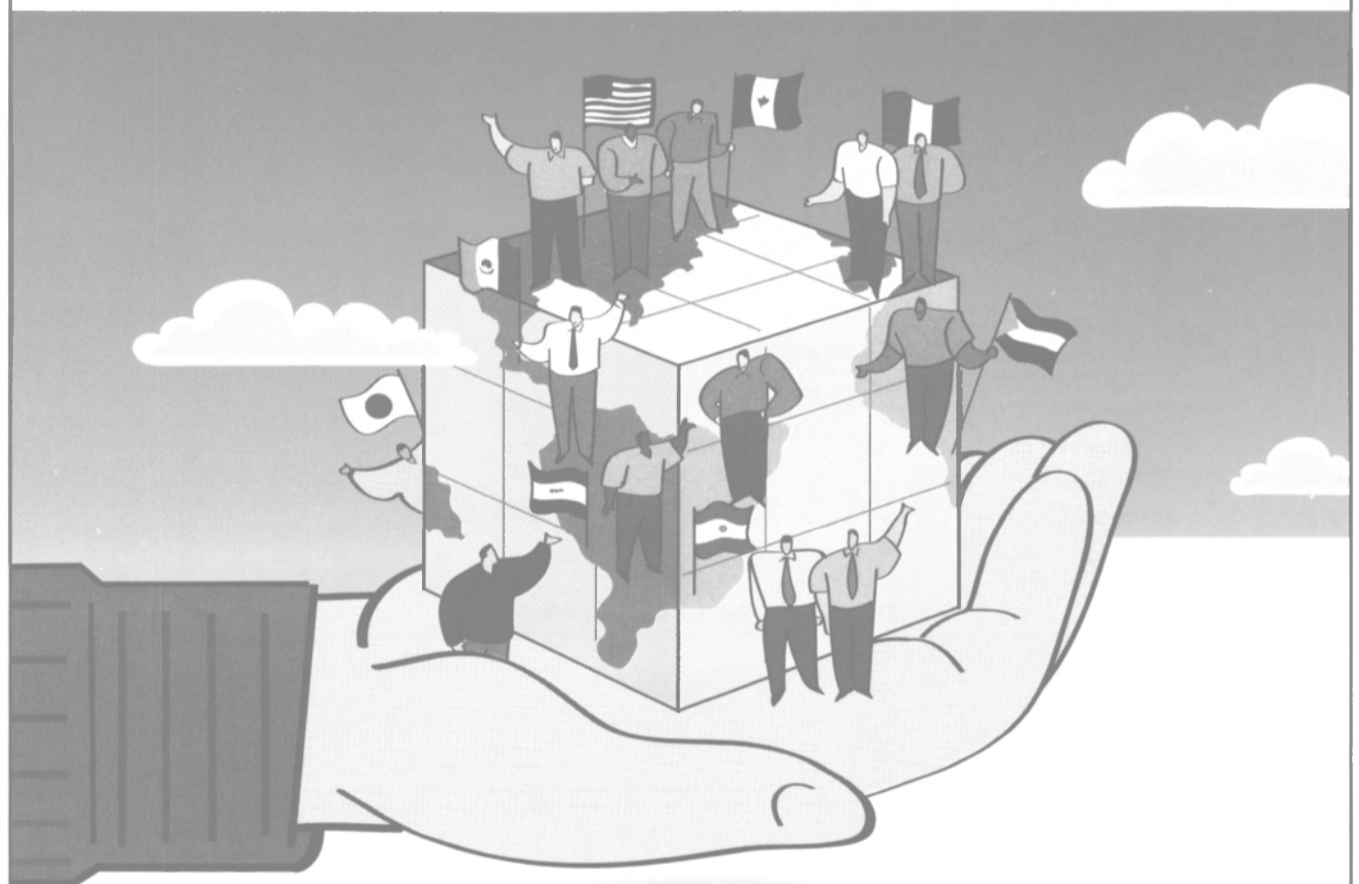
Since installation of the Merpro module, flow rates to the existing process package have been increased from 80,000-bpd to almost 110,000-bpd, with resultant increased oil production of some 10,000-bpd. Solids are treated and

disposed with no loss of production, and the produced water treatment package, designed for 45,000-bpd, has effectively treated up to its design limits and met the very tight environmental and legislative limits.

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by Ken Perkins, drawing office manager and Adrian Clay, design engineer Merpro Limited, Bristol, England

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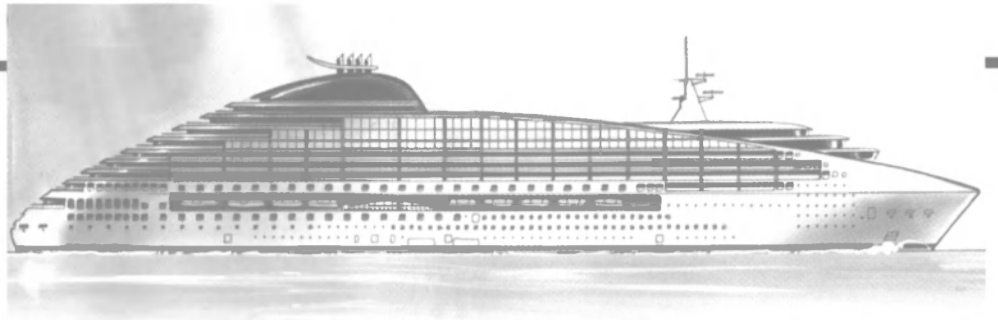
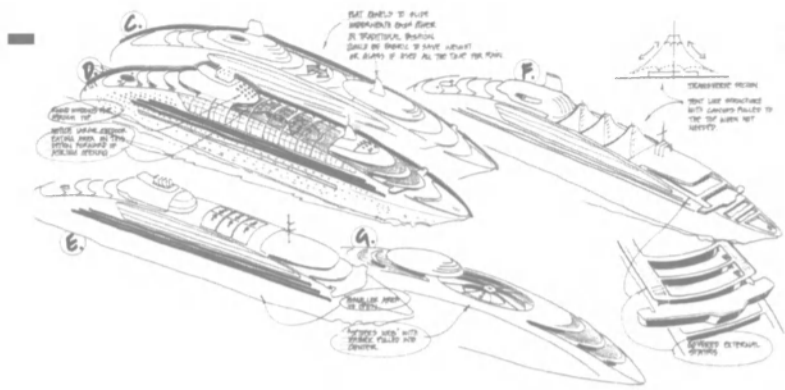
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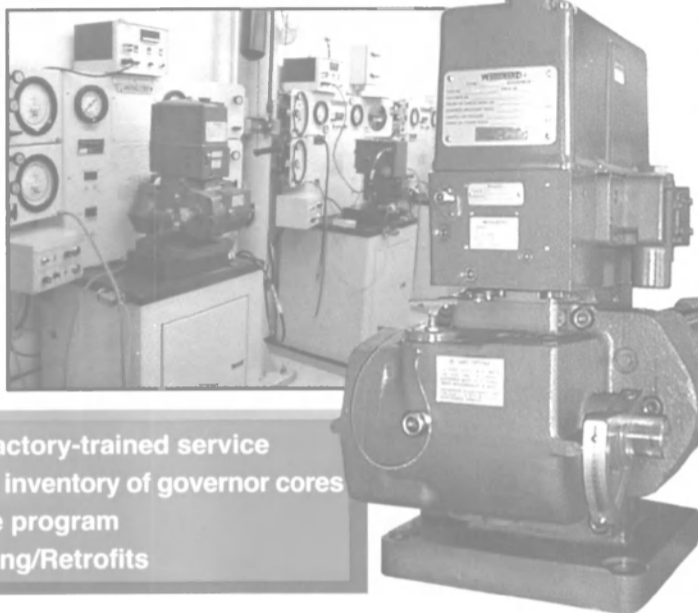


Left: Never-before-seen solutions for a magradome, which is designed to cover a ship's sun deck; **Above:** The Fastship — Tillberg Design's rendering of a futuristic cruise ship.

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(Continued from page 10)

had with the various European shipyards over the years. Johannsson is a gifted asset to the firm because of his technical background and experience in dealing with shipyard engineers — a talent that, according to both Tillbergs is a necessity.

"It's an important part of our jobs to have good relationships/operations with the yards," **Tomas Tillberg** interjected.

This is most likely the reason for the locale of Tillberg's European offices, since the four major cruise ship yards are based in Finland, Italy, France and Germany — allowing Tillberg to split the work between his London and Viken outlets, which also provide a fairly easy airplane commutation on occasions when Robert must join his son at the Florida office. With the Tillberg style having grown in Europe, the American operation was not far behind. According to Tomas, the company opened its Florida operation in 1999 with 1.5 floors, and recently purchased an additional floor to accommodate the hiring of additional designers.

Tomas, as well as Robert, felt that the need for a U.S.-based operation was imminent not merely because most of the major playing cruise lines are headquartered in South Florida, but also many U.S.-based suppliers are now entering into the cruise shipping game — mostly due to the recent boom of U.S.-based cruise shipbuilding. Tomas felt the best way to reach these new potential clients would be to establish ties that were closer to them. U.S.-based suppliers may one day even become so competitive in the cruise-shipping arena that they will outnumber the already-established European manufacturers.

"The resources and possibilities are astounding for cruise companies," Tomas said. "They (cruise lines) will want to stay with American suppliers."

In fact, some of the European based companies have followed Tillberg Design's strategy by establishing U.S.-based offices of their own. One example is Brinton — a U.K.-based carpet manufacturer, which purchased a full carpet mill in the Southeastern U.S. for carpet production, undoubtedly to be closer to the cruise ship owners and the U.S.-based shipyards — many of which are located in the Southern part of the U.S.

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The eloquently designed Crystal Plaza entranceway onboard Crystal's Symphony.

Passing the Torch

Like his father, Tomas completed his formal education in Stockholm, but chose to venture off more towards painting, sculpting and art history, rather than furniture construction — at one time, he shared that he even desired to make his living as a painter.

Upon graduating from Stockholm's Academy of Arts, Tomas ventured to the travel and tourism business, beginning his career at a Swedish engineering company setting up contracts for renovations of luxury hotels throughout Europe. While it wasn't what he had initially desired, which was designing ships with his father, the position allowed Tomas to gain experience on both sides of the operation— even if it was for land-based entities, rather than the floating hotels known as cruise ships.

"I have thorough experience on both sides of the business (creating and running)," Tomas said. This allows me to understand the business from an artist's perspective, and from a contracting perspective when dealing with yard engineers."

It was approximately five-and-a-half years ago, that Tomas' dream of being able to collaborate with his father became a reality, when it was decided by both Robert and the firm's managing director, **Lennart Ekstedt**, that a U.S. presence was imminent to allow Tillberg Design to fully embrace their new U.S. shipbuilding projects such as the new "floating trade show" ship being constructed for Sea America. The vessel, which is scheduled for a 2003 delivery, will be able to accommodate 1,800 passengers, who are traveling for both business and pleasure purposes. The company has completed the majority of the vessel's basic designs, which were delivered to the builder, Litton Ingalls, on August 11. Headed by Tomas, with **Jean-Louis Stutzmann** as project manager, the Sea America design team was comprised of a mixture of American and European designers based in the Fort Lauderdale office. The vessel's theme, which according to Tomas rests on the firm's passenger/itinerary basis, is geared toward a professional, who enjoys mixing business with pleasure.

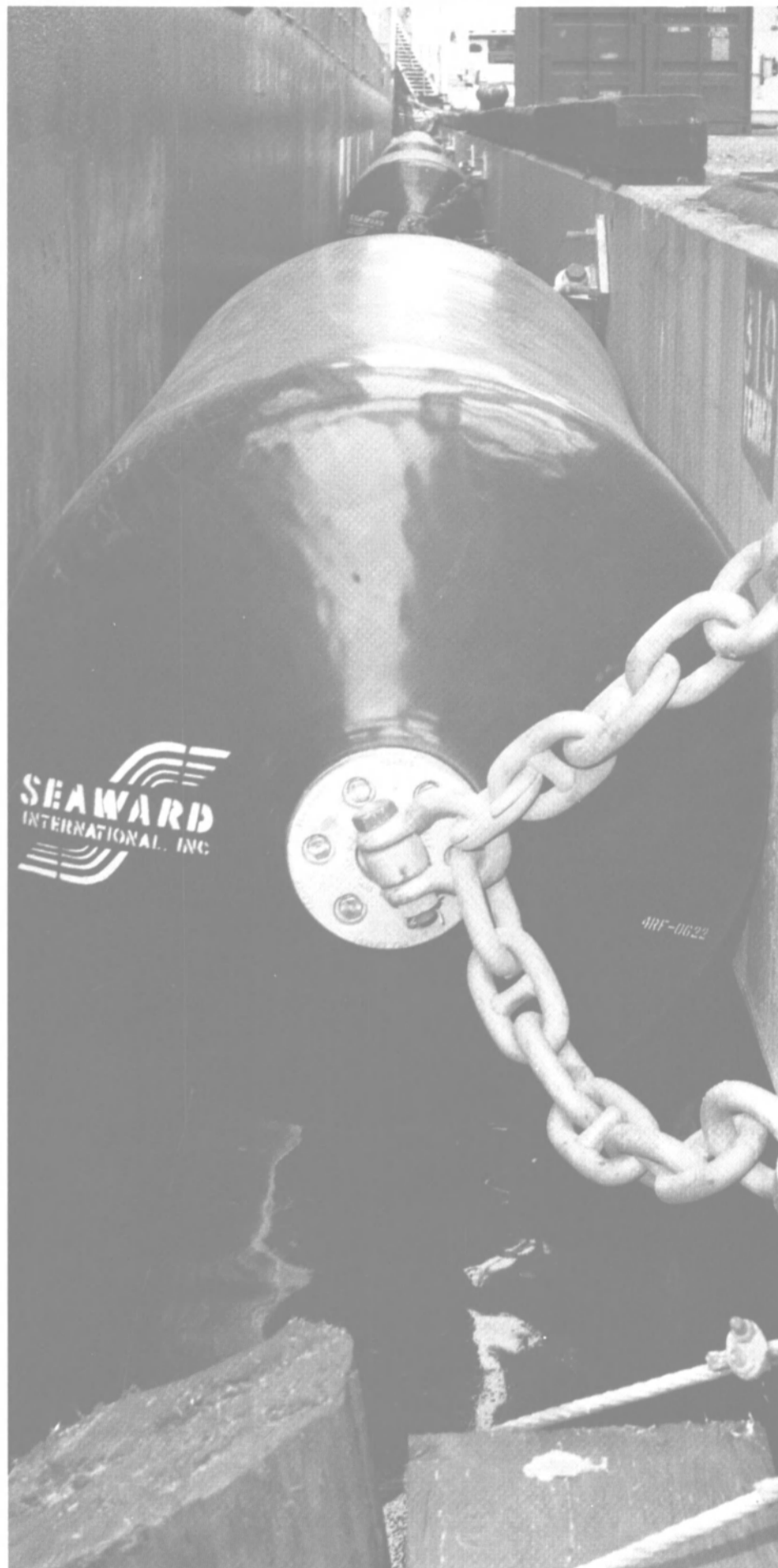
New Companies Seeking Themes

Tillberg Design has fastidiously made a name for itself within the internationally based cruise companies that have taken the market by storm in the last six years. New companies such as Crystal Cruises and Star Cruises — wanted to create a product that was fresh — and they wanted Tillberg Design to help them formulate an image that would

grab potential passengers' interest.

The 1990's also marked the beginning of the Crystal Cruise Lines project. The vessel pair Harmony and Symphony, which were constructed at Mitsubishi Heavy Industries (MHI), and Kvaerner Masa-Turku, respectively for Crystal's owner — Japanese Shipping Company Nippon Yusen Kaisha (NYK) — allowed the Tillberg team to get its feet

wet for an additional project that would await them — an exclusive contract with Malaysian-based Star Cruises for the design of all newbuilds. Since the line wanted to market itself as touting non-Caribbean and European itineraries to the up-and-coming Asian customer base — rather than the traditional Caribbean or European excursions typically geared toward the American or



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Cunard's Queen Mary 2

European cruiser — Tillberg focused on designs that would present multiple themes with Asian influences on Star's premiere vessel Superstar Leo.

Similar to the U.S. Lines project, Tillberg went a step further in trying to capture the Asian culture by having its designers travel to Kuala Lumpur and Hong Kong to then emulate the atmos-

phere of these locales into Star's vessels.

Back in the U.S., Tillberg faced another challenge with Celebration, Fla.-based Disney Cruise Lines, who was a new cruise line, but unlike Crystal and Star — already had in mind the type of product they wanted Tillberg to take from paper to reality. Although the firm designed only the staterooms and the

Palo Restaurant on Disney's Magic and Wonder, Tomas notes that it was probably one of the most challenging projects undertaken by the firm.

"Disney was unusual because it was almost like entering another world," he said. "Even though they were a new cruise ship builder, it was unusual that they knew exactly what they wanted and had specific ideas."

The Tillberg creativity was put to the test on this project, but the firm came through in stellar form for Disney. Tillberg even managed to create a new innovation on the Disney ships that had never before been implemented on a cruise ship — a split bathroom in the family cabins and outside standard cabins. These special bathrooms hold a bathtub, shower and sink in one room — attached to an adjoining room with a toilet and sink, thus enabling one person to use the toilet or wash their hands, while the other person can shower privately. Tillberg thought that since Disney has a reputation of attracting family vacationers that this design would be most conducive.

Melding Tradition With Technology

Presently, Tillberg Design is mixing tradition while still focusing on the development of possible futuristic designs. The firm has been signed on as the lead designer for the \$600 million, 1,131 ft. (345 m) Queen Mary 2. Scheduled for delivery in 2003, the 2,800-passenger vessel, which will be constructed by Chantiers de l'Atlantique, is being touted as the world's largest cruise ship ever built. While Tomas and Robert are not at liberty to discuss the project's specifics, the vessel's design will lean towards "the thrill of the classic oceanliner — or the big sister to QEII."

"The Queen Mary 2 will be built to handle the severe weather of the North Atlantic," Tomas said. "The front will have a strong, long, narrow bow stretched to the front of the ship, while the front end of the superstructure will be able to handle an Atlantic storm at 28 knots."

Since the letter of intent between Carnival Corp.-owned Cunard and Chantiers occurred in March, Tillberg Design has been assisted by Cunard's senior executives, **Larry Pimentel**, president; and **Pamela Conover**, COO, as well as Carnival's technical team in London led by senior naval architect **Stephen Payne** to develop preliminary designs that will capture the dream of a luxury liner.

According to Robert, the designs of the White Star Line era were actually considered forward thinking of that time — employing an even further sense of heightened technology and engineering beneath Queen Mary 2's bowels.

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In an age of the new millennium, where gas turbines are becoming all the rage in the cruise industry, and owners are requiring quicker construction turnaround times, Tillberg Design is focused on rolling with the trends of the industry that sometimes change on a daily basis.

Continuing to employ its expansion efforts with added designers to meet the bottom lines set out by cruise owners, the company has gone beyond the current trends with the development of some futuristic design on their drawing tables. Although these images have not yet been adopted and/or bought by cruise owners, new technology enables designers to create images such as these so that when owners are ready to embrace the future, Tillberg Design will be fast to meet their needs.

"The idea we have developed is to present a very fast, sleek looking ship to owners," Tomas said. "But," he cautioned, "If you have to step too far into the future, you step out of practicality."

The practicality that Tomas is referring to is lack of funds, as these technologically driven designs could end up costing owners more than what can fit into their budgets.

However, though, Tomas predicts that eventually evolution will occur and owners will want to implement these futuristic creations.

"If there's hesitation that it wouldn't work, then it (the ship) doesn't get built," Tomas said. "There has to be an evolution — maybe someone will be interested — perhaps in possibly five to ten years."

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Tillberg's rendering of Sea America, which is scheduled for a 2003 delivery.



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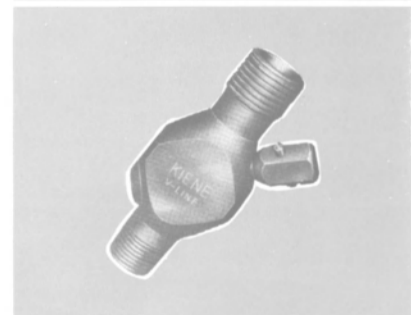
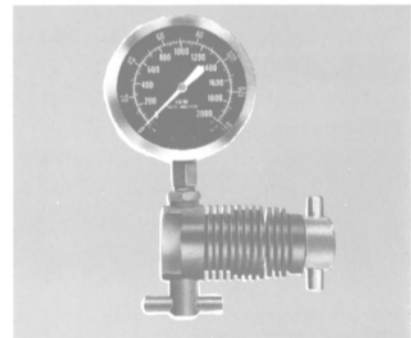
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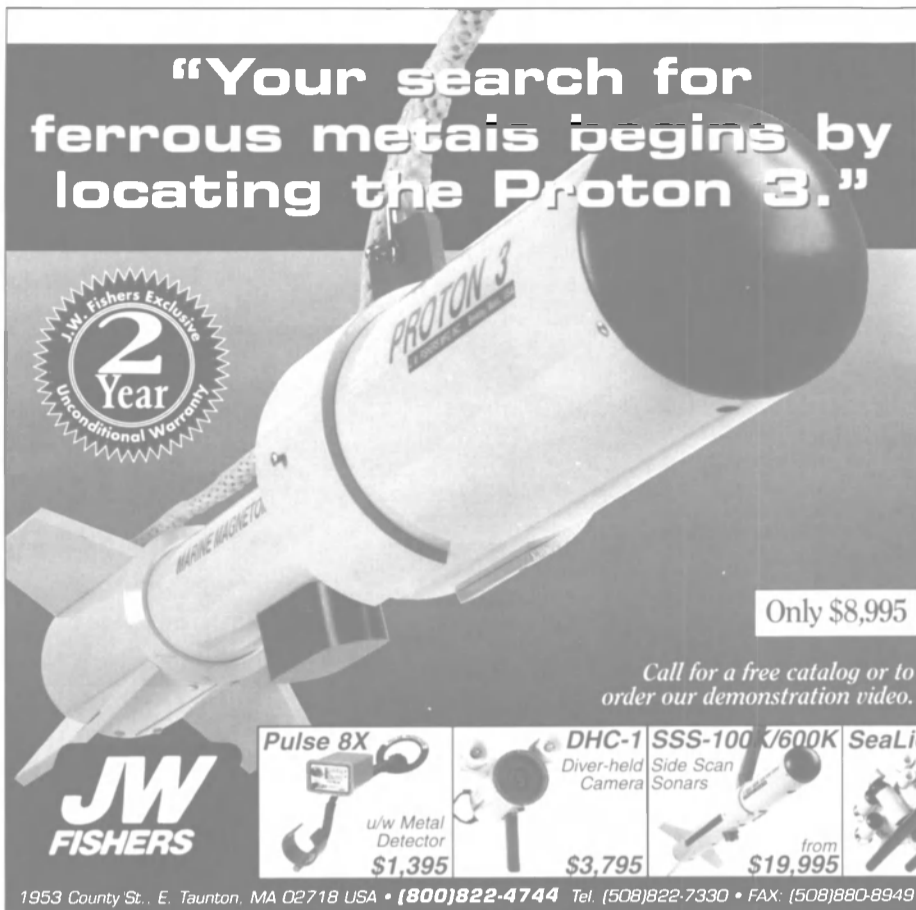
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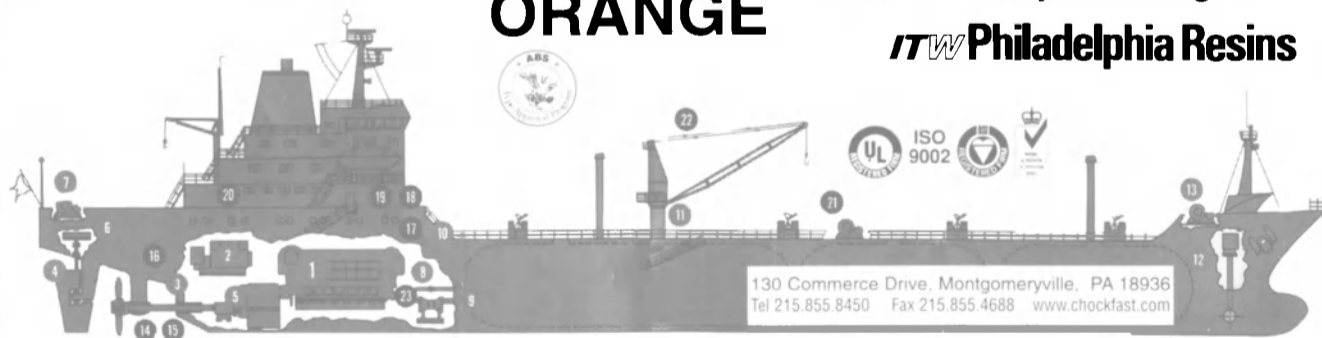
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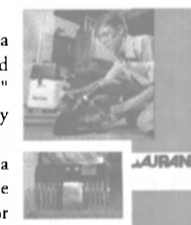
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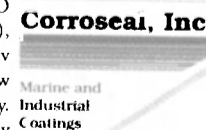
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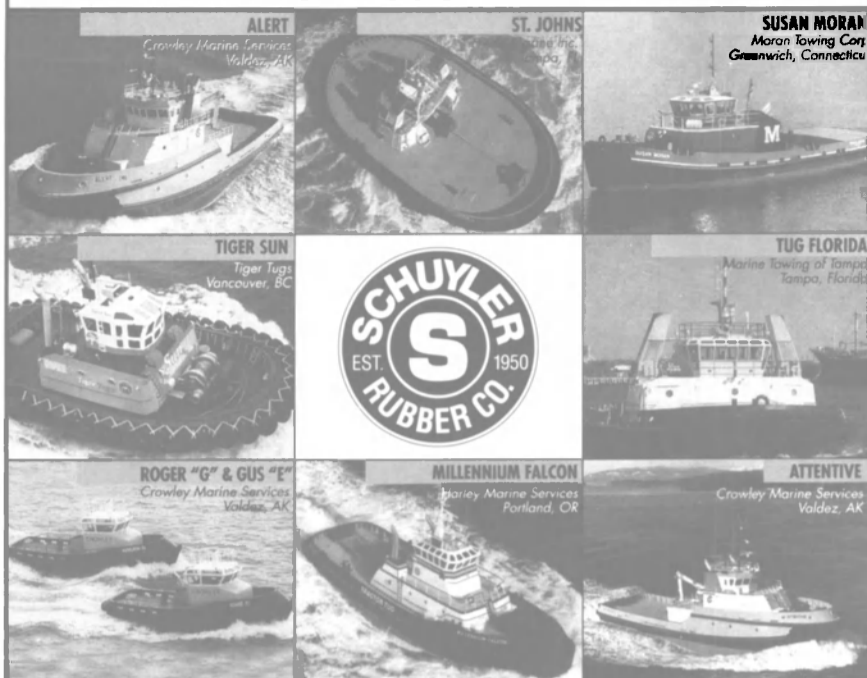
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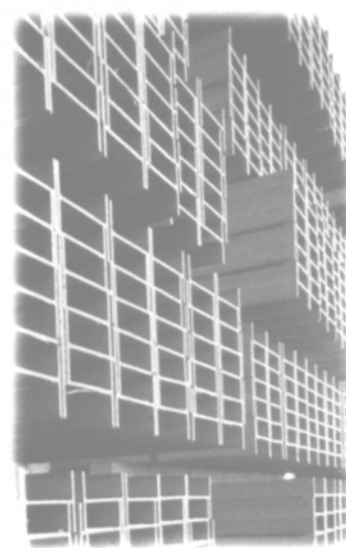
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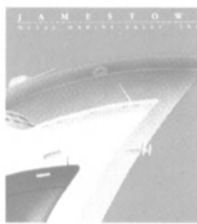


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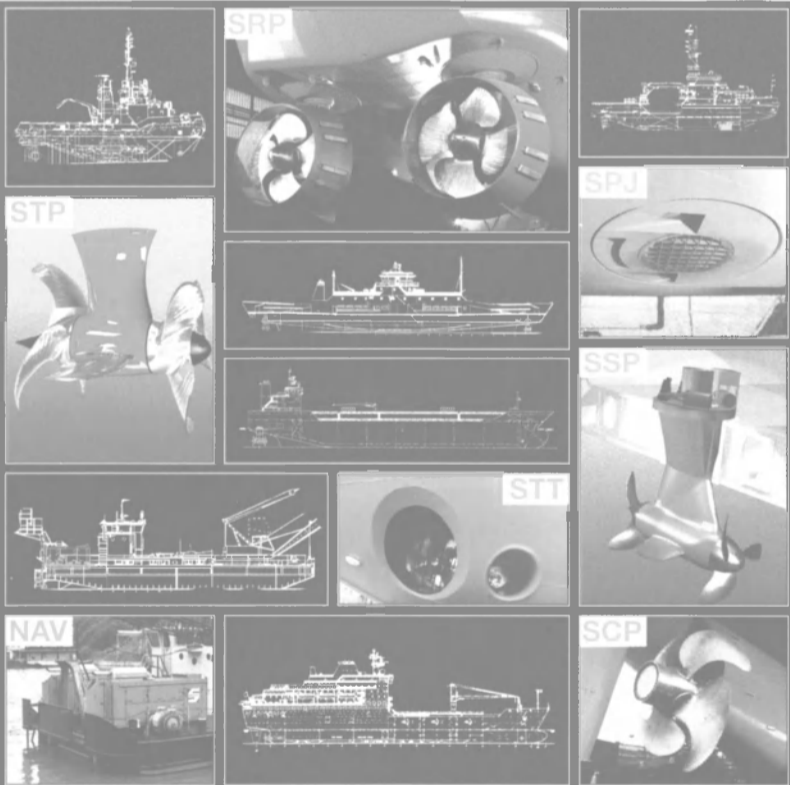
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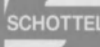
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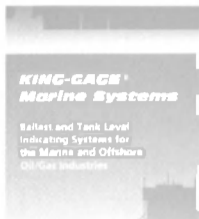
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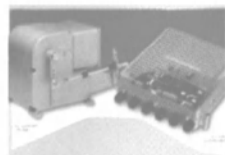
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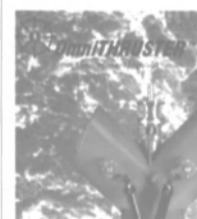
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Microphor — A Wabtec Company
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Circle No. 126



Raytheon Debuts VHF with DSC
 Raytheon Marine recently introduced the new RAY53 fixed mount VHF radio. Continuing in Raytheon's tradition of rugged and reliable VHF technology, the RAY53 offers an impressive array of features. Most important of the RAY53 features is the built-in SC-101 DSC* (Digital Select Calling) which provides, amongst other SC-101 features, extra security in emergency situations. The Distress Call message incorporates the user-entered Maritime Mobile Ship's Identifier (MMSI) which provides vessel information, the boat's position if NMEA data is input, and the UTC time that the call was sent, into a digital "packet" of information.

Circle No. 127

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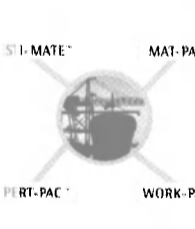
Scotty Tele-Transport
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Seabulk Systems
Seabulk Systems of Canada has developed unique bulk materials handling systems for the marine industry. Three Panamax self-unloaders built in China use Seabulk-patented controlled flow gates; a prototype semisubmersible transhipper is a Seabulk-patented invention that is transshipping coal. The company is also involved in ports and self-unloader projects.
Circle No. 145



Seven Seas Communications
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Sure Seal
Sure Seal connectors are rugged, low-cost and environmentally sealed. The free guide is a complete design resource providing applications overview, technical specifications, detailed test data,

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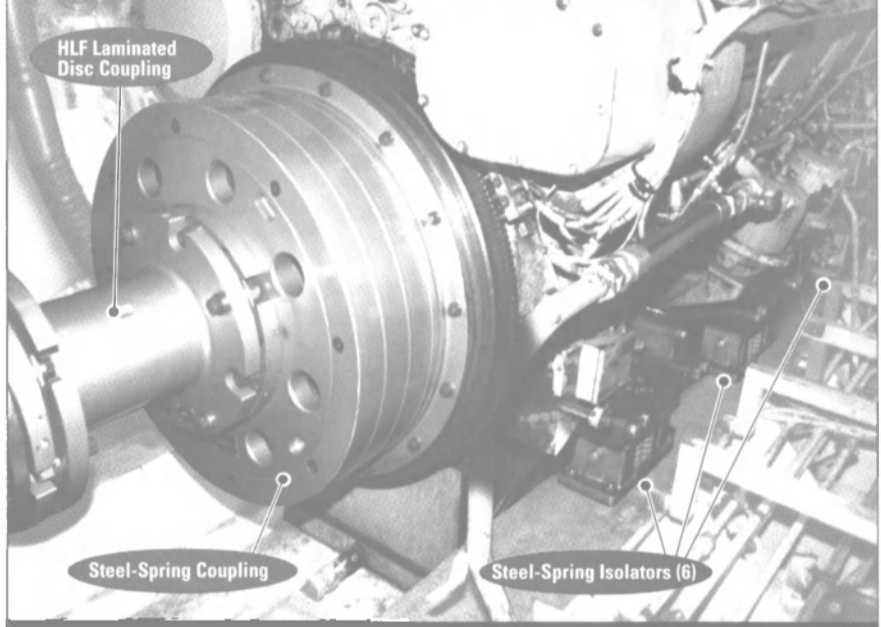


Vessel Type:
Scientific, Ocean Research

Registered:
Federal Dept. of Fisheries & Oceans, Canadian Coast Guard Division.

Vessel retrofitted with:
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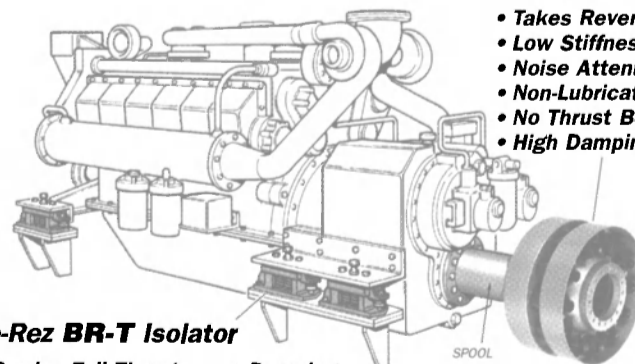
Installed: April 1997.
DNV Certification.
Torsional analysis: T.W. Spaetgens.



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Albert Mullowney Sr. Project Engineer,
C.C.G. St John's NF, March 2000

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Canada, DNV et al) and meets the requirements of IMO/SOLAS resolutions. Thermax is sold, distributed, warehoused laminated in North America by PSI. **Circle No. 133**



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The primary mission of the USMMA Global Maritime and Transportation School is to offer leading-edge education and training programs that will benefit professionals from the maritime and transporta-



tion industry (private-sector, military and government). Through its education and training initiatives, the USMMA GMATS is dedicated to optimizing America's economic and strategic intermodal transportation system and its global transportation interest. **Circle No. 135**

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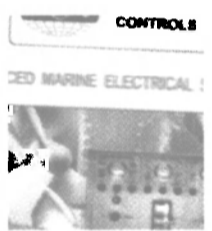
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Correction:

In the July 2000 edition in the story "Station 12 Strives to Corner Satcom," it was reported that Station 12 was the largest shareholder in Inmarsat. In reality, Comsat is the largest shareholder in Inmarsat.

Ballast Water

Ballast Water Management & Treatment Take Center Stage

While ballast water environmental issues have been news for decades, a renewed focus on the marine industry, specifically the effects ships and boats have on the aquatic environment, is picking up steam and not looking to slowdown. Per an executive order from President Clinton, the U.S. Invasive Species Council is finally getting off the ground, a council which will study the problem and make recommendations regarding treatment. A recent report from the General Accounting Office (GAO-RCED-00-219) found that the U.S. federal government spent \$513 million in FY '99 and will spend \$631 million in FY '00 for activities related to invasive species. Tack on an additional \$232 million spent by seven individual states in FY '00 combatting the problem, and it is easy to surmise that the Invasive Species issues are barreling towards \$1 billion+ per year. Table 1, excerpted from a paper presented by Michael T. Bohlman, director of marine services, CSX Lines, details some of the more notable invasive species problems.

According to the International Maritime Organization (IMO), there is an estimated annual transfer of nearly 10 billion tons of ballast water, carrying an estimated 3,000 species daily. In the Great Lakes alone, it is estimated that zebra mussel has already caused more than \$5 billion in damage to water pipes, boat hulls and other surfaces. While there is no concrete answer to the problem, a number of solutions have been considered and proposed, including the exchange of ballast water in the Ocean, as well as the use of filtration methods, including thermal, chemical and radiation treatments.

This past August, funding from grants made by the State of Maryland Port Administration and the National Oceanic and Atmospheric Administration (NOAA) will support the rigorous testing of the patent pending Ballast Water Treatment System from Maritime Solutions Inc. The funding exceeds \$650,000 and will support a larger public/private sector initiative to test the Maritime Solutions' treatment system.

Maritime Solutions, working in cooperation with the University of Maryland, has additionally won the support of the U.S. Maritime Administration (MarAd), which will allow the testing program to take place aboard the 39,000-dwt Cape May, a U.S. Ready Reserve fleet ship. The ship will provide for realistic ship-board testing of the Maritime Solutions' treatment system utilizing its ballast system while taking water from the Chesapeake Bay. The Maritime Solutions' Ballast Water Treatment System consists of two stages: a first stage

patented "voraxial" separator manufactured by Enviro Voraxial Technology, Inc. of Deerfield Beach, Fla., and a second stage treatment of ultraviolet irradiation (UV) manufactured by Aquionics, Inc. located in Erlanger, Ky. or, alternatively, the chemical biocide 'SEAKLEEN,' developed by Garnett, Inc. of

Watkinsville, Ga.

Maritime Solutions believes that UV irradiation is the secondary treatment of choice for container vessels, passenger ships, and certain other merchant and combatant vessels with ballast flow rate requirements up to 2,000 tons-per-hour. For larger merchant vessels including

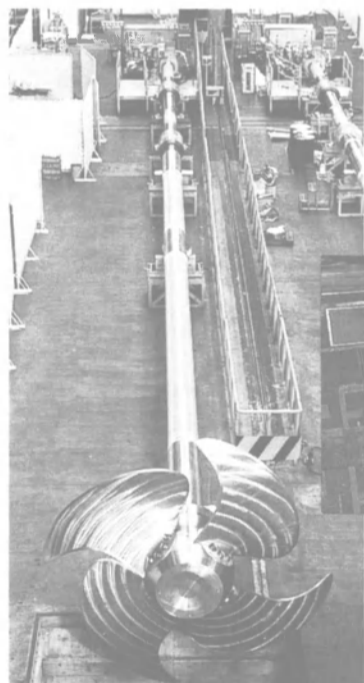
tankers, bulk carriers, and OBOs with ballast flow rate requirements between 2,000 and 20,000 tons-per-hour, Maritime Solutions believes that the biocide 'SEAKLEEN' would offer a more economical and effective treatment. The biocide will be introduced into the ballast water flow utilizing a chemical dosing unit provided by one of the world's leading marine chemical distributors.

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SIDE THRUSTER

Table 1
Invasive Species Role Call

Critter	Origin	Introduced to	First Sighted
Zebra Mussel	Eurasia	Great Lakes	1980s
Ruffe	Eurasia	Great Lakes	1980s
Tropical Green Algae	Tropical Seas	Mediterranean Sea	1980s
Comb Jelly	U.S. East Coast	Black Sea	1970s
Giant Fan Worm	Mediterranean Sea	Southern Australia ports	1980s
Northern Pacific Seastar	Japan & Alaska	Tasmania, Australia	1986
Northern Pacific Kelp	Northern Pacific	Tasmania, Australia	1987
European Stone Crab	Europe	San Francisco Bay	1990s
Round Goby	Caspian & Black Seas	Great Lakes	1995
Mitten Crab	China	San Francisco Bay	1992

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tions' ballast water system centers on the inclusion of the EVTN separator as the first stage where more than 95 percent of the silt, sediment and larger marine organisms are removed and returned to the source water. The 'clean' water is then treated in the secondary stage, where 'residence time' is significantly reduced due to the pre-cleaning of the water, with UV or SEAKLEEN. UV technology for eradicating unwanted organisms and viruses has been well established, however, in order to ensure an even higher 'kill' rate, Maritime Solutions, working with the University of Maryland and Aquionics, has specified a UV system specifically designed for ballast water treatment. Combining the advantages of the EVTN separator and the specified UV system, a 'kill' rate approaching 99 percent is envisioned. The biocide 'SEAKLEEN,' patent pending, is a proprietary, natural product specifically formulated for ballast water use and has a half-life of 14 - 17 hours. As a result of the pre-cleaning provided by the EVTN separator, dosage approaching 1 PPM will be sufficient to produce an effective 'kill' rate approaching 99 percent. Once tested and accepted for use by the U.S. Coast Guard as an approved alternative to ballast exchange, Maritime Solutions will begin offering its system to the shipping industry. Application will also be made to the International Maritime Organization (IMO) for approval as an accepted alternative to ballast exchange.

For more information on
Maritime Solutions 81
Enviro Voraxial Technology, Inc. 82
Aquionics 83
Garnett, Inc. 84

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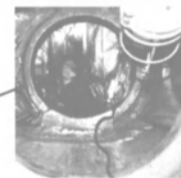
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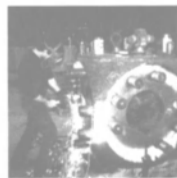
Stitching a severely cracked engine block.



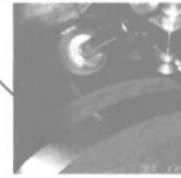
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Maritime Reporter/Engineering News

Princess Selects Advanced Ballast Water Treatment

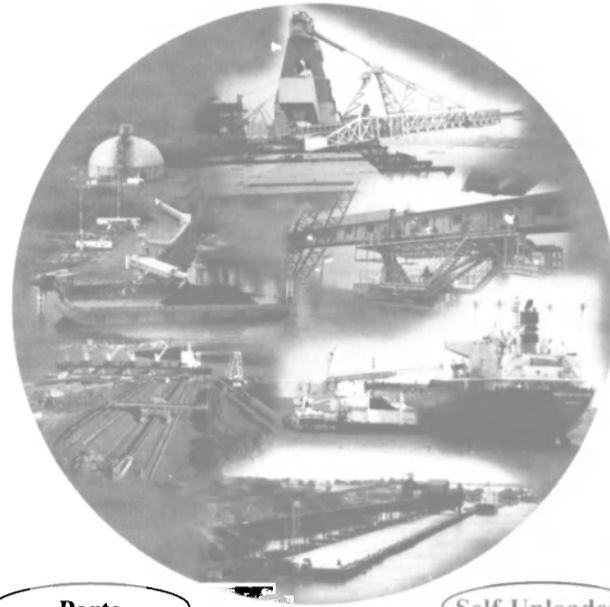
Hyde Marine, Inc and OptiMarin Marketing A/S delivered the first ballast water treatment system aboard an operating vessel, Princess Cruises' Regal Princess. The system is designed to remove and destroy/inactivate biological organisms including zooplankton, algae, and bacteria from ballast water without affecting the normal operation of the ship. This system was installed during a regular scheduled two-week cruise from Southern California, with no interruptions to the ship's normal operations. In addition, the ship's existing ballast piping system, ballast pump(s), and control valves are used as much as possible to minimize the total installation cost. Princess chose the Optimar Ballast Water Treatment System to address the problem of non-indigenous species in ballast water at a realistic total installed cost. The cruise ship takes on and discharges ballast water at a rate of 200 t/hr (880 U.S. gpm) as fuel and other consumables are used. Ballast water is pumped through the Optimar system, which separates solids and irradiates the water with UV light in two stages. The patented MicroKill Cyclonic Separator removes heavier particles larger than approximately 40 microns and the MicroKill Ultraviolet light treatment system kills or inactivates biological organisms with UV radiation. The UV system can also be used during de-ballasting to ensure that all organisms have been killed or inactivated when they are discharged from the ship. All system components are proven reliable, safe and easy to maintain.

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For more information on the Invasive Species problem and related government activity and spending, visit www.marinelink.com

For a copy of the recent GAO report to Congress on the matter, visit www.gao.gov and search for report RCED-00-219

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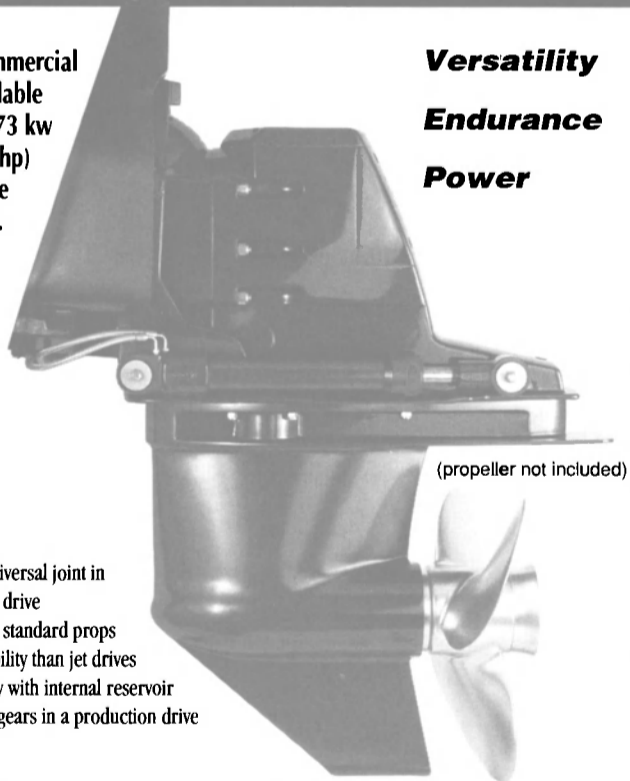
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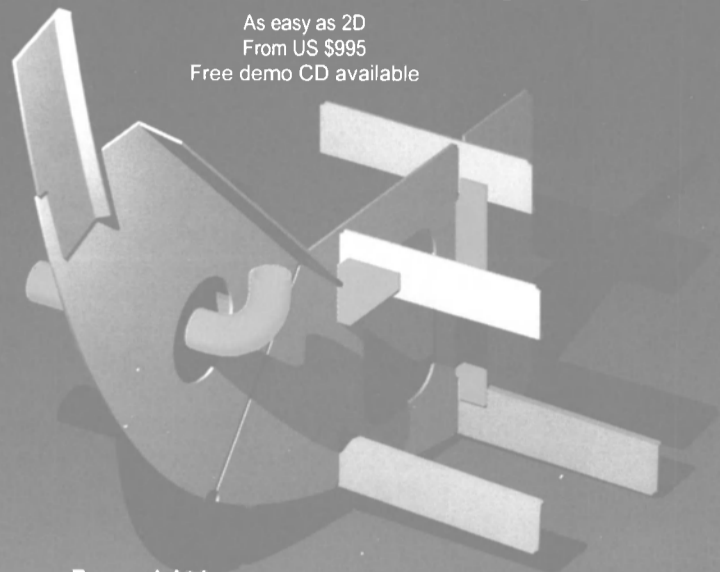
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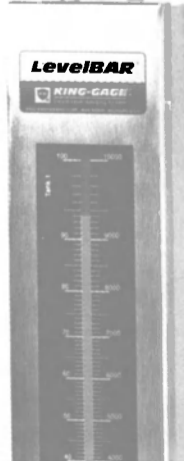
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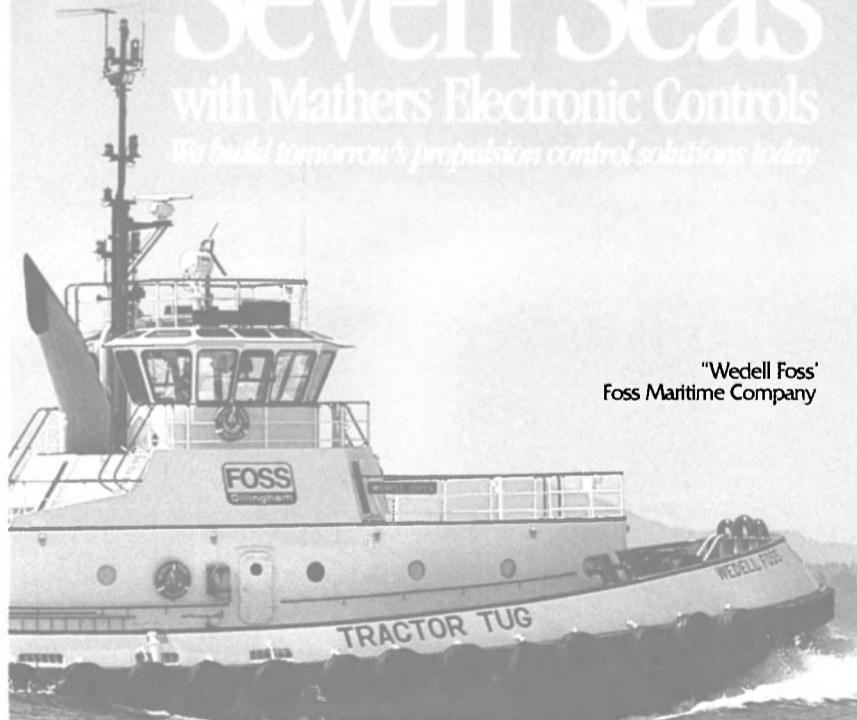
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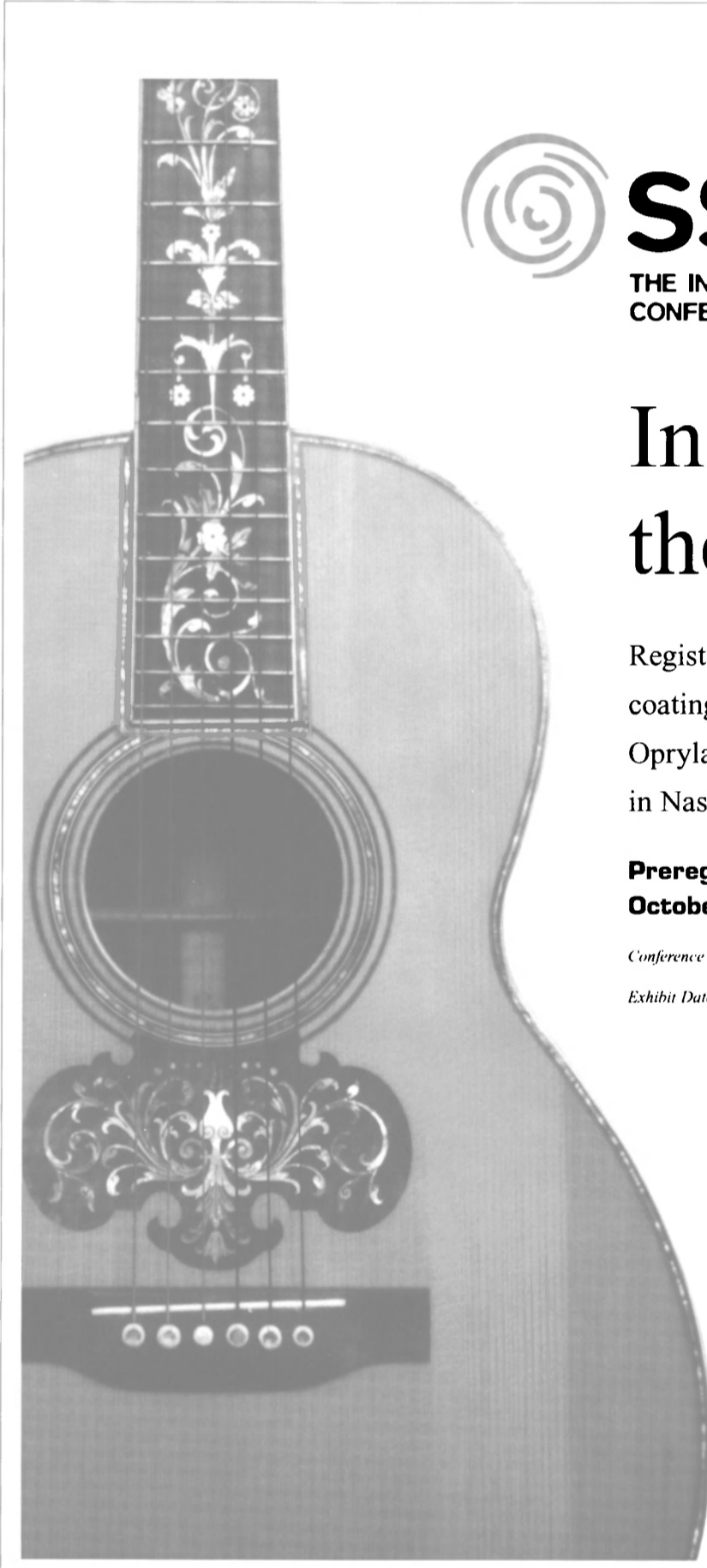
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Railway Specialties Corp., 2979 State Rd., P.O. Box 29, Bristol, PA 19007
Beclawat Manufacturing Inc., #2200 Jameson Bone Rd., Belleville
Ont. Canada K8N 5T3
DRY DOCKS-Design
Conrad Industries, 1501 Front Street, P.O. Box 790, Morgan City, LA 70381
Crandall Dry Dock Engineers Inc., P.O. Box 505804, Chelsea, MA 02150
Heger Dry Dock Engineers, Inc., 13 Water St., Holliston, MA 01746

DUCTORS

Vita Motorator, 566 Parker St., Newark, NJ 07104
Vacu-Blast, P.O. Box 37, Fresno, TX 77545

ELECTRICAL EQUIPMENT

L. F. Gaubert & Co., Inc., P.O. Box 50500, New Orleans LA 70150
MMC International, 60 Inp Dr., Inwood NY 11096
Semco Marine Inc., 3721 SW 47th Ave., Ste 309, Ft. Lauderdale, FL 33314

ELECTRONIC INFORMATION SUPPORT

Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolboten, NORWAY
Scientific Marine Svcs., 101 State Pl., Ste. P, Escondido, CA 92029

ELECTRICAL INSTRUMENTS

Seico USA, 2508 Lake Brook Ct., Atlanta, GA 30360

ELECTRICAL MOTOR DRIVES

Tech Power Controls, 10507 Fallstone, Houston, TX 77099

ELECTRONIC CHARTS

C-Map Commercial 133 Falmouth Rd., Mashpee, MA 02649

ELECTRONICS

Azonox Corp., 900 Middlesex Tpke., Billerica, MA 01821
C-MAP, P. O. Box 212, 4371 Eggers Road, Vancouver, BC, Canada V6R 1G5
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607

ELEVATORS

Jered Industries Inc., P.O. Box 904, Brunswick, GA 31521
C-Map Commercial, 133 Falmouth Rd., Mashpee, MA 02649

EMPLOYMENT

Boat Crews, 1 Sene Court, Suite 309, New Orleans, LA 70114
Manne Jobs, Inc., 800 Downtowner Blvd, Ste 111, Mobile, AL 36609
Peter D. Juan ESQ., 14 Lafayette Court, Greenwich CT 06830

ENGINEERING SERVICES / MARINE ENGS

NKF Engineering, Inc., 4200 Wilson Blvd., Arlington VA 22203
Maritime Design, 13000 Sawgrass Village Circle, Ponte Vedra Beach, FL 32082
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
U.S.M.M.A. 300 Steamboat Rd., Kings Point, NY 11024
Vibtech, Inc. Box 435, N. Kingston RI 02852
DB Engineering, 1000 South Main St., Mansfield, Texas 76063
ENGINE HEATERS
Kim Hotslat Mfg P.O. Box 11245, Spokane WA 99211-0245
ENGINE ROOM LIGHTING/MONITORING & CONTROL SYSTEMS
Mackay Communications, 2721 Discovery Dr. Raleigh N.C. 27616-1851
Mathers Controls Inc., 675 Pease Rd., Burlington WA 98232
Radio-Holland USA, 8943 Gulf Freeway, Houston TX 77017
G.R. Bowler, 2261 Lake Rd., Ontario, NY 14519
ENGINE ROOM REPLACEMENT PARTS
Mariso USA, Inc., 100 Davidson Ave., Sommerset, NJ 08873
ENGINES
GE Manne Engines, 1 Neuman Way, Cincinnati, OH 45215
Fairbanks Morse, 701 White Ave., Beloit, WI 53111
WARTSILA NSD CORPORATION, Box 252, Vasa Finland Fin-65101
EVACUATION SYSTEMS
DBC, 12351 Bridgeport Rd., Richmond, BC Canada
EVAPORATORS
Sasakura Engineering, 7-32 Takeshima, 4-chome, Nishiyodogawa,
KY, Osaka555, Japan
Alfa Laval Separation, Inc., 955 Meams Rd., Warrminster, PA 18974
EXHAUST GAS CLEANER
Gyro Chemical, P.O. Box 853, Deer Park, TX 77536-0853
EXPANSION JOINTS
Silex Inc., 6659 Ordan Dr., Mississauga, Ontario L5T1K6
Applegate Industrial, 1440 Government Street, Baton Rouge, LA 70802
FAIRING COMPOUND
Philadelphia Resins, P.O.B. 309, Montgomeryville, PA 18936
FANS - VENTILATORS - BLOWERS
Dry Air Technologies, 313 N. Oak St., Burlington, WA 98233
Jon M. Luss Associates, Inc., 411 Borel Ave., San Mateo, CA 94402
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Jamestown Distributors, P.O. Box 348, Jamestown, RI 02835
Superbolt, P.O.B. 683, Carnegie, PA 15106
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Plastic Pilings Inc., 1485 South Willow Ave., Rialto, CA 92376
Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Duramax Manne, 16025 Johnson St., P.O. Box 67, Middlefield, OH 44062-0067
Seaward Intl P.O. Box 96, Clearbrook, VA 22624
Viking Fender Co., 1180 State St., Perth Amboy, NJ 08861
Ultra Poly, Inc., 2926 South Steele St., Tacoma, WA 98409
Urethane Products Corp., 17007 South Broadway, Gardena, CA 90248
Schuyler Rubber Co., 16901 Woodruff Rd., Woodville, WA 98072
FILTERS/FILTER SYSTEMS
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Boll-Filter Corp., 15 Inlt Dr., E. Granby, CT 06026
Luber-Finer, Inc., 200 South 4th St., Albion, FL 62806-1313
G.E.T., Inc., 3135 Golden Avenue, Long Beach, CA 90806
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Hamburg 1, GERMANY
U.S.A. Reps: Simplex-Turmar Inc., P.O. B. 675, Tonawanda, NY 14151
FINANCING
Summit Bank, 65 Madison Ave., Morristown Ave., NJ 07960
FIRE HOSE BOXES
American Custom Yachts, 6800 S.W. Jack James Dr., Stuart, FL 34997
FIRE & SAFETY PRODUCTS
Brookdale International, 1-8755 Ash St., Vancouver BC V6P6T3
Fr. Fassmer & Co. D-27804 Berne-Moeten, Germany, IndustriestraBe2
Norsale AS, P.O. Box 115, N-4818 Faerikv. Norway
Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358
Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136
Willard Manne Co., Inc., 1250 N. Grove St., Anaheim, CA 92806
Zodiac of North America, P.O. Box 400, Stevensville, MD 21666
LIFEBOATS REPAIR
Nautical Safety Products, P.O. Box 590462, Houston, TX 77259
Wilem Pot, P.O. B. 29102, 3001 GC Rotterdam
LIFESAVING EQUIPMENT
MGI International, 119-225 West 1st St., North Vancouver, B.C. CANADA
Steam Manufacturing, P.O. Box 1498, St. Cloud, MN 56302
Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136
Zodiac of North America, PO Box 400, Thompson Creek Rd.,
Stevensville, Sparks, MD 21152
LIFT EQUIPMENT
JLG Industries, Inc., JLG Drive, McConnellsburg, PA 17233-9533
LIFT EQUIPMENT TESTING
Water Weights Inc., 5139 Brooks St., Suite E, Montclair, CA 91763
LIGHTING SYSTEMS / EQUIPMENT
ACR Electronics, Inc., 5757 Ravenswood Rd., Ft. Lauderdale, FL 33310-5247
Archway Marine, 4501 Swan Ave., St. Louis, MO 63110

Fuel Dynamics, 707 Mullet Dr. #110, Cape Canaveral, FL 32920

GALLEY EQUIPMENT

Cosovich Refrigerator Co., 949 Industry Rd., Kenner LA 70062
Duchess Baker's Machinery Co., 1101 John Ave. Superior WI 54880
Jameson, Meta Manne Sales, Inc., 4710 Northwest Second Ave., Boca Raton, FL 33431
Lang Manufacturing, 6500 Merrill Creek Pkwy., Everett, WA 98203
Richard Galley Supply, PO Drawer 4035, Houma, LA 70361

GANGWAYS, LADDERS

Schoellhorn-Albrecht, 575-105 Rudder Rd., St. Louis, MO 63026
SlipNot Safety Flooring, 2545 Beaufall St., Detroit, MI 48207
Wooster Products Inc., 1000 Spruce St., P.O. Box 896, Wooster, OH 44691

GASKETS/CLEATS

Harbor Industries, Inc., 9471 Baymeadows Rd., Ste 307, Jacksonville, FL 32256

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Nico Manne Specialties, 39 Louisiana St., West Wago, LA 70094
The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492
Manne Gears, P.O. Box 689, Greenville, MI 38702
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227
GENERATOR
Insulidne Recycling B.V., Deccaweg 3, 1042 AT Amsterdam, NETHERLANDS
GMDSS
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017
GOVERNORS
Governor Control Systems, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315
Motor Services Hugo Stamp, 3190 S.W. Lauderdale, FL 33315
HATCHES AND DOORS
Schoellhorn-Albrecht, 575-105 Rudder Rd., St. Louis, MO 63026
Juniper Intl., 72-15 Metropolitan Ave., Middle Village, NY 11379
Railway Specialties Corp., 2979 State Rd., Bristol, PA 19007
Baer Hatch Co., 16901 Wood-Red Rd., Woodville, WA 98072
Manly Manne, P.O. Box 86788
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Alfa-Laval Separation Inc., 955 Meams Rd., Warrminster, PA 18974
Compulube (Bntarna Heat Transfer) Ltd., 15-20
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Crane Healex, 17 Grandview Ave., West Orange, NJ 07052
Traner, Inc., P.O. Box 2289, Wichita Falls, TX 76307
HEAT TRANSFER FLUID
Paratherm Corp., 1050 Colwell Rd., Conshohocken, PA 19428
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Holly Host Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086
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Archime Mfg Co. Ltd., 5478 267th Street, Gloucester Industrial
Estate, Langley B.C. Canada V4W 3S8
Kahlenberg Bros Co., P.O. Box 358, Two Rivers, WI 54241
Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062

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Hamilton Jet, P.O. Box 509, Christchurch, NEW ZEALAND
Offshore Inland, Inc., 3521 Brookdale Drive, Mobile, AL 36618
Ultra Hydraulics Limited, Cheltenham Road East, Gloucester, GL2 9QN ENGLAND
Demarac Inflatable Boats, 410 Oak St., Friendsville, MD 21531
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INCINERATORS

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Zodiac of North America, P.O. Box 400, Thompson Creek
Road, Stevensville, Sparks, MD 21152

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Bohm & Voss Light Insulation, Bartels & Ladens GmbH,
Nordereilstrasse 15, 20457 Hamburg GERMANY
Panel Specialists, Inc. Theraux, 3115 Range Rd., Temple, TX 76501
Insulations, Inc., 1101 Edwards Ave., Harahan, LA 70123
Mascoat Products, 3500 E. T. C. Jester, Suite N, Houston, TX 77018
Pacor, Inc., P.O. Box 107, Westville, NJ 08093x

INTEGRATED MONITORING SYSTEMS
Datastar, Unit 100, 18 Gostick Place, N. Vancouver, BC Canada

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Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Waynesboro, VA 22980
Hopeman Brothers, 1 E. Broward Blvd., Ft. Lauderdale, FL 33301
Insulations, Inc., Rt. 5, 12360 Lesure Road, Baton Rouge, LA 70807
Jameson Metal Manne Sales, Inc., 4710 NW Second Ave., Boca Raton, FL 33431
Building 7, Jacksonville FL 32257
Maritime Services Corp., 3457 Gugnard Drive, Hood River, OR 97031

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JET BOWTHRUSTERS

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JOINER - Watertight Door - Paneling - Ceiling System - Decking
All Alpha Intl., Inc. P.O. Box 498985, Cincinnati, OH 45249
Branton Ind., 1101 Edwards Ave., Jefferson, LA 70181
Custom-Ship Interiors, Inc. P.O. Box 882, Solomons MD 20688
Hopeman Brothers, Inc., P.O. Box 820, Waynesboro, VA 22980
Insulations, Inc., 1101 Edwards Ave., Harahan, LA 70123
Maritime Services Corp., 3457 Gugnard Drive, Hood River, OR 97031
Panel Specialists, Inc. Theraux, 3115 Range Rd., Temple, TX 76501
Walz & Krenzer, 91 Wilenbrock Rd., Unit B4, Oxford, CT 06478

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Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
The Walter Machine Co., Inc., 84-98 Cambridge Avenue, Jersey City, NJ 07307

LASER ALIGNMENT

Boiland Industrial & Consulting Services, P.O. B. 91360, Mobile, AL 36691

LAUNDRY EQUIPMENT

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Fr. Fassmer & Co. D-27804 Berne-Moeten, Germany, IndustriestraBe2
Norsale AS, P.O. Box 115, N-4818 Faerikv. Norway
Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358
Viking Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136
Willard Manne Co., Inc., 1250 N. Grove St., Anaheim, CA 92806
Zodiac of North America, P.O. Box 400, Stevensville, MD 21666

LIFEBOATS REPAIR

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Wilem Pot, P.O. B. 291

Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
MIL Systems, 200-1150 Morrison Drive, Ottawa, Ontario K2H 8S9
John J. McMullen Associates, Inc., 4300 King St., Suite 400, Alexander, VA 22302
Marine Design & Operations, Inc., 225 E. 1st Ave., Roselle, NJ 07203
Maritech, Seadiff, Bay Road, Newmarket, NH 03857
Maritime Design, 13000 Sawgrass Village Circle, Ponte Vedra Beach, FL 32082
R.J. Melius & Co., 71 Hudson St. New York, NY 10013
Nautical Designs, Inc. 2101 S. Andrews Ave Suite 202, Ft Lauderdale FL 33316
M. Rosenblatt & Son, Inc., 2341 Jefferson Davis Hwy, Arlington, VA 22202
Sargent & Herkes, 225 Baronne St., Suite 1405, New Orleans LA 70112
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
Sea School, 10812 Gandy Blvd, St. Petersburg, FL 33702
Seaworthy Systems Inc., P.O. Box 965, Essex, CT 06426;
George G. Sharp, Inc., 100 Church St., New York, NY 10007
MSCL Inc., 1452 Duke Street, Alexandria, VA 22304
Sea Transport Corp., PO Box 1043, Southport Qld 4213 Australia
Vibtech, Inc., Box 435, N. Kingston, RI 02852
Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544

NAVIGATION & COMMUNICATIONS EQUIPMENT

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C-Map, P.O. Box 212 4371 Egersund Norway
Corelec Inc., Prince Charles Bldg., 120 Torbay Rd., Suite E100, St. Johns, Newfoundland, Canada A1A 2GB
Electronic Marine Systems, 800 Ferndale Pl., Rahway, N.J. 07065
Furuno USA, Inc., 4400 NW Pacific Rim Blvd., Camas, WA 98607
ICS Electronics Ltd., Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex, UK
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017
Raytheon Marine Co., 22 Cotton Rd., Nashua NH 03069
Scandinavian Micro Systems P.O. Box 155, N-1411, Kolbotn, NORWAY
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Waterway Communications System, Inc. 453 E. Park Pl., Jeffersonville, IN 47130
Offshore Systems International, 5013 Pacific Hwy East, File, WA 98424
Offshore Systems International, 107-930 W 1st St., N Vancouver, BC Canada V7P3N4
Liton Marine Systems, 1070 Seminole Trail, Charlottesville, VA 22901-2591
Magellan Systems Corp., 960 Overland Cr., San Dimas, CA 91773-1742
Icom America, Inc., 2380 116th Ave. NE, Bellevue, WA 98004
KVH Industries, Inc., 110 Enterprise Center, Middletown, R.I. 02842-5268

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Soundcoat, 1 Burt Dr., Deer Park, NY 11729
Noise Control Engineering, 799 Middlesex Turnpike, Billerica, MA 01821

NOZZLES/NOZZLE SYSTEMS

Harrington Metals, 6720 124th Ave., Fonnville, MI 49408
Schmidt, P.O. Box 37, Fresno TX 77545

OFFSHORE BUILDINGS

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Alfa-Tec, Inc., 4027 21st Ave. West, Seattle, WA 98199
Blohm & Voss Industrie GmbH, P.O. B. 100720, D-2000 Hamburg 1, GERMANY.

Hydroxyl Systems Inc., 9800 McDonald Park Road, Sidney, Bc V8L 3S8 Canada
Fast Systems, 3240 North Broadway, St. Louis, MO 63147
MMC International, 60 Inip Dr, Inwood NY 11096

PAINTS/ANTI-FOULANTS

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Wasser High Tech Coatings, 8041 South 228th St., Kent, WA 98032

PARTS LOCATOR SERVICE

Inventory Locator Service, 3965 Mendenhall Road, Memphis, TN 38115

PIPE FITTINGS/CUTTINGS/CONNECTING/ SYSTEMS

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POLLUTION CONTROL PRODUCTS

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POWER SUPPLIES

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Kahlenberg Bros, P.O. Box 358, Two Rivers, WI 54241
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Averdale Industries, Harvey Quick Repair, P.O. Box 116, Harvey, LA 70058

American Air Filter, P.O. Box 35690, Louisville, KY 40432
ABB Drives Inc., P.O. Box 372, Milwaukee, WI 53201-0372,
ABB Industry Oy, P.O. Box 185, 00381 Helsinki, FINLAND
ABB TURBOCHARGER, INC., 1460 Livingston Avenue, N. Brunswick, NJ 08902

Aquamaster-Rauma Ltd., Box 220, SF-26101, Rauma, FINLAND
Karnewa America Inc., 106 Park Place, Suite 200, Covington, LA 70433, USA
Karnewa AB, Box 1010, S-68129, Kristinehamn, Sweden

Karnewa Finland Oh., "Aquamaster", Box 220, FIN-26101 Rauma, Finland
Kawasaki Heavy Industries, Ltd., Tokyo Head Office World Trade Center Bldg., 4-1 Hamamatsu-cho 2-chame, Minato-ku, Tokyo 105-6116 Japan
Konrad, 1421 Hanley Road, Hudson, WI 54016-9376

Mak America, Inc., 3450 Executive Way Miramar Park of Commerce
Miramar, FL 33025

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Brunvöl A/S, P.O. Box 370, N-6401, Molde, Norway
ZF Marine 3131 SW 42nd St., Ft. Lauderdale, FL 33312

Caterpillar, 100 NE Adams Street, Feoria, IL 61629-2320
Centa Corp., 8185 Cass Ave., Darien, IL 60551
The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492

Fincantieri, Diesel Engines Div.—G.M.T., Bagnoli della Rosandra 334, Trieste ITALY
Jan Verhaar Omega Thrusters, P.O. Box 119, 2340 AC Oegstgeest, NETHERLANDS

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Harrington Metal, 6720 124th Ave. Lennville, MI 49408

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Kaplan and Association, 30808 Crest Forest, Farmington MI 48331
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Lohmann & Stolterfoht, P.O. Box 1860, D-58408 Witten, Germany
Lo-Rez Vibration Control, 186 West 8th Ave., Vancouver, BC CANADA, V5Y 1N2

Mapeco, Inc., 91 Wilenbrock Rd., Unit B4, Oxford CT 06478
Markisches Werk, P.O. Box 1442, D-5884 Halver GERMANY
MAN B&W Diesel, 17 State St., New York, NY 10004
MAN B&W Diesel A/S, Ostervej 2, DK-4960 Højeby, DENMARK
MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15, DK-9900 Frederikshavn, DENMARK

MAN B&W Diesel GmbH, Stadtbachstrasse 1, D-86153 Augsburg 1 GERMANY

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Stewart & Stevenson, 1400 Destrehan, P.O. Box 8, Harvey LA 70059-0008

Thrustmaster of Texas, P.O. Box 840189-12227 IFM 529, Houston, TX 77284-0189
Ustein Bergen Diesel A/S, P.O. Box 924, N-5002, Bergen, NORWAY
Ultra Hydraulics Limited, Cheltenham Road East, Gloucester, GL2 9QN, ENGLAND

Voith Hydro Marine Technology, P.O.B. 1125, D8950S, Heidenheim, GERMANY
Marine Propulsion Inc., 1505 Cobrin Ave., Hammond, LA 70403

The Cincinnati Gear Company, 5657 Wooster Pike, Cincinnati, OH 45227
U.S. Rep: Voith Schneider Marine Inc., 121 Susquehanna Ave., Great Neck, NY 11021

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Scardana Americas Bkg, 502 Empire St., Greenfield Park, J4V1V7 Canada

Advanced Environmental Systems, 2 Sutton Rd., Webster, MA 01570
Hamworthy Marine, Inc., 1129 Hospital Dr. Ste 3C, Stockbridge, GA 30281

Via Motivator, 566 Parker St., Newark, NJ 07104

PURIFIERS

American Ship Repair, 1011 38th St., Brooklyn, NY 11219

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REFRIGERATION COMPRESSOR REPLACEMENT PARTS

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Zodiac of N. America Thompson Creek, P.O. Box 400, Stevesville, MD 21666

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Pelican Rope Works, 4001 W Carriage Way, Santa Ana, CA 92704
Rasmussen Equipment Co., P.O. Box 81206, Seattle, WA 98108

ROTATING EQUIPMENT

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RUDDER BEARINGS & BUSHES

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Thoron Bearings, Inc., 3225 Manway, Burlington, Ontario Canada L7M 1A6

SAFETY PRODUCTS

Brookdale International, 1-8755 Ash St., Vancouver, BC, V6P6T3
MGI International, Ste. 113-980 West 1st Street
N Vancouver, BC CANADA V2P 3n4

Viking Life Saving, 1625 N Miami Ave., Miami, FL 33136
New England Marine & Industrial, 200 Spaulding Turnpike, Portsmouth, NH 03801

Nautical Safety Products, P.O. Box 590462, Houston, TX 77259
Norwegian Maritime Equip. AS, Box 244, NO-5460 Husnes, Norway

SANITATION DEVICES—Pollution Control

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Exceltech International Corp., 1110 Industrial Blvd., Sugarland, TX 77478

Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111
Hydroxyl Systems Inc., 9800 McDonald Park Road, Sidney, Bc V8L 3S8 Canada

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6	ABB Turbo Systems AG	marine equip. & supplies	201	65	Lo-Rez Vibration	propulsion engines	261
68	Air Products AS	marine equip. & supplies	202	4	Mackay Marine	communications equipment	263
61	Airchime Mfg Co.	sound signal systems	203	26	Man B & W	diesel engines	264
70	Albacore Research	CAD-CAM	204	49	Man B & W UK	diesel engines	265
16	Algae-X International	diesel fuel decontamination	205	62	Marcon International Inc.	brokers	266
61	Allied Shipbuilders	ship construction	206	7	Marex	on line marine marketplace	267
24	Alstom DEL. MCS	propulsion equipment	207	14	Marine Machinery Association	association	268
64	American Vulkan	couplings	208	25	Marine One Corp	electronic controls	269
61	Anchor Marine	marine equip. & supplies	209	2	Maritel Marine	communications	271
37	Astilleros Espanoles, S.A.	shipyard	210	70	Mathers Controls	propulsion	272
62	Azonix Corp.	electronics	211	56	Matrix Desalination	desalination equipment	274
54	B & V Industrietechnik	seals	212	68	Metal Surgery	cast iron repair	275
16	Barkemeyer-Schifftechnik GmbH	manoeuvring equipment	213	9	MGI International	marine safety products	276
32	Bollinger	shipyard	214	17	MIL Systems	naval architects	270
47	Brunvoll A/S	marine equip. & supplies	215	58	Nera Satcom AS	communications	277
30	CADMATIC	CAD/CAM	216	31	Norwegian Maritime Equipment	marine equipment & supplies	278
35	Carhartt	marine workwear	217	64	Offshore Systems International	navigation	279
40/41	Carrier Transicold	refrigeration	218	52	Omnithruster Inc.	thrusters	281
29	Centa Corporation	coupling & shafting systems	219	48	Pall Rochem	filtration	280
10	Cortland Cable Co.	ropes	220	60	Philadelphia Resins	coatings	282
ifc	Craft Bearing Co.	bearings	221	59	Prisma Teknik AB	deflection indicator	nrsn
15	Creative Systems	computer software	222	50	PTC	CAD/CAM	284
39	Crowley Marine Services	marine services	223	62	Redland Genstar	ballast crete	286
34	Cummins Marine	diesel engine manufacturer	224	53	Rolls Royce	engines	285
12	Damen	ship building	225	38	RW Fernstrum	cooling products	287
46	Deutz Corp	diesel engine mfg	226	10	Saskura Engineering Co.	fresh water generator	289
27	Electronic Marine Systems	technology	228	62	Schottel Inc.	propulsion equipment	290
29	Electronic Marine Systems	technology	229	62	Schuyler Rubber	fenders	291
31	Electronic Marine Systems	technology	230	69	Seabulk	auto self unloading systems	309
33	Electronic Marine Systems	technology	231	66	Sea Trade	exhibition	322
11	Eletson	tanker owners	262	8	Sea Transport	design	292
17	Excelsum Industrien B.V.	cleaning services	232	57	Seaward International	fenders	293
1	ExxonMobil	synthetic lubricants	233	60	Sener	ship building software	294
20	F.R. Fassamer & Co.	fire & rescue equipment	234	16	Serck Como GmbH	fresh water generator	295
44	Flow International Technology	waterjet cleaning	235	58	Servogear a.s.	marine equipment	296
42	G E Marine Engines	engines	236	33	Ship Tech	design	297
59	G.J. Wortelboer	chains	237	27	Siemens	electrical motor drives	298
21	Geislinger GmbH	cranes	238	60	Skookum	deck machinery	299
56	Governor Control Systems	repairs	239	71	SSPC:Soc For Protective Coatings		325
54	Harbor & Marine Engineering	mooring	324	20	Soundcoat	noise control	301
22	Harbormaster	propulsion systems	240	62	Spar Associates	software	300
61	Harrington Marine	propulsion equipment	241	23	Stork Kwant	heat/air/ventilation	302
15	Houston Marine	marine training services	242	33	Superior Energies Inc.	manufacturing & contracting	303
31	HRP Thruster Systems BV	thrusters	243	51	Tampa Bay Shipbuilding	shipyard	304
29	Hydroxyl	waste water treatment	323	25	Tech Power Controls	electrical motor drives	305
36	I M O	maritime publications	244	64	Teknotherm A S	marine refrigeration	306
68	Icom	marine equipment & supplies	245	22	Thermax	bulkhead panels	307
44a	In Place Machining	crankshaft repair	246	28	Thordon Bearings Inc	rudder bearings	308
70	Intercontinental Engineering & Mfg.	deck machinery	247	43	Unitor Chemical Service	chemical service	310
55	Inventory Locator Service	parts locator service	248	13	Urethane Products Corp.	foam filled fenders & buoys	311
16	Jan Verhaar Omega Thrusters	thrusters	249	5	USMMA	merchant marine academy	312
28	Japan Radio	marine electronics	321	13	Van Hall Health	medical management	313
15	Jeamar Winches	sheaves & blocks	250	62	Viking Life Saving Equipment	life saving equipment	314
ibc	Jotun Paints	coatings	251	33	VingCard AS	locks	315
60	JW Fishers	underwater cameras	252	15	Vita Motivator	eductors	316
23	Kahlenberg Brothers	air horns	253	47	Volmar	ultrasonic homogenizers	317
29	Kaplan & Associates	propulsion products	254	18/19	Wartsilia NSD Corporation	propulsion	318
obc	Karl Senner	propulsion equipment	255	64	Waterman Supply	marine equipment & supplies	319
67	Kawasaki Heavy Industries, Ltd.	marine equipment & supplies	256	47	Westad Industri A/S	cranes	320
59	Kiene Diesel	diesel engine test equip	257				
70	King Engineering	tank leveling gauges	258				
69	Konrad	stem drive	273				
69	L C Doane	lighting systems & equipment	259				

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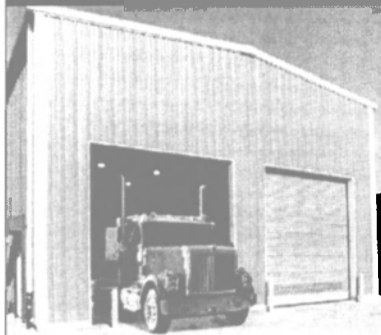
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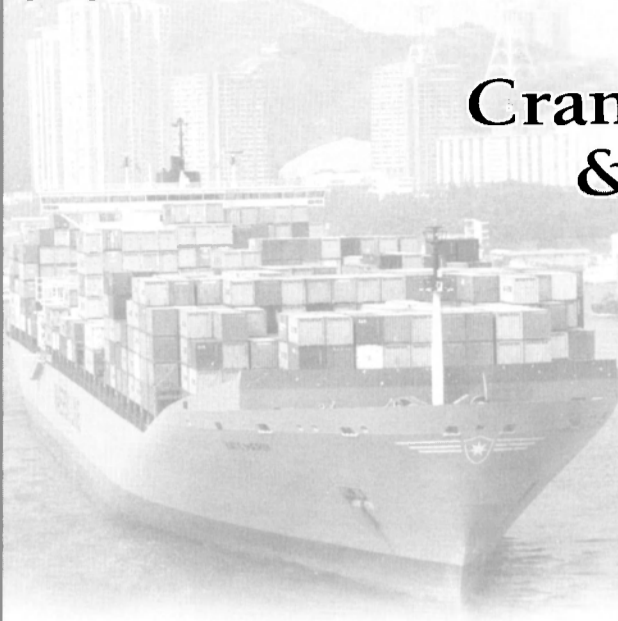
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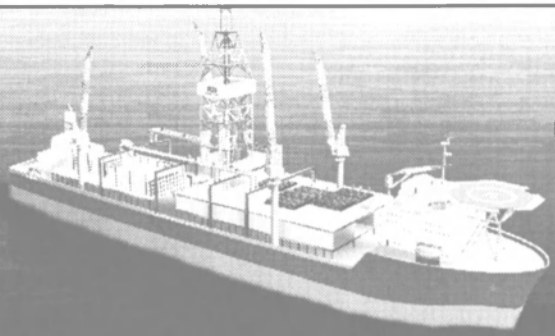
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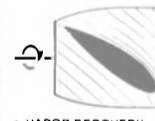
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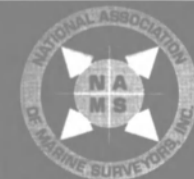
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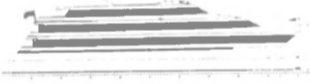
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