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TAPIAS

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Landmark LNG Launched in Bilbao

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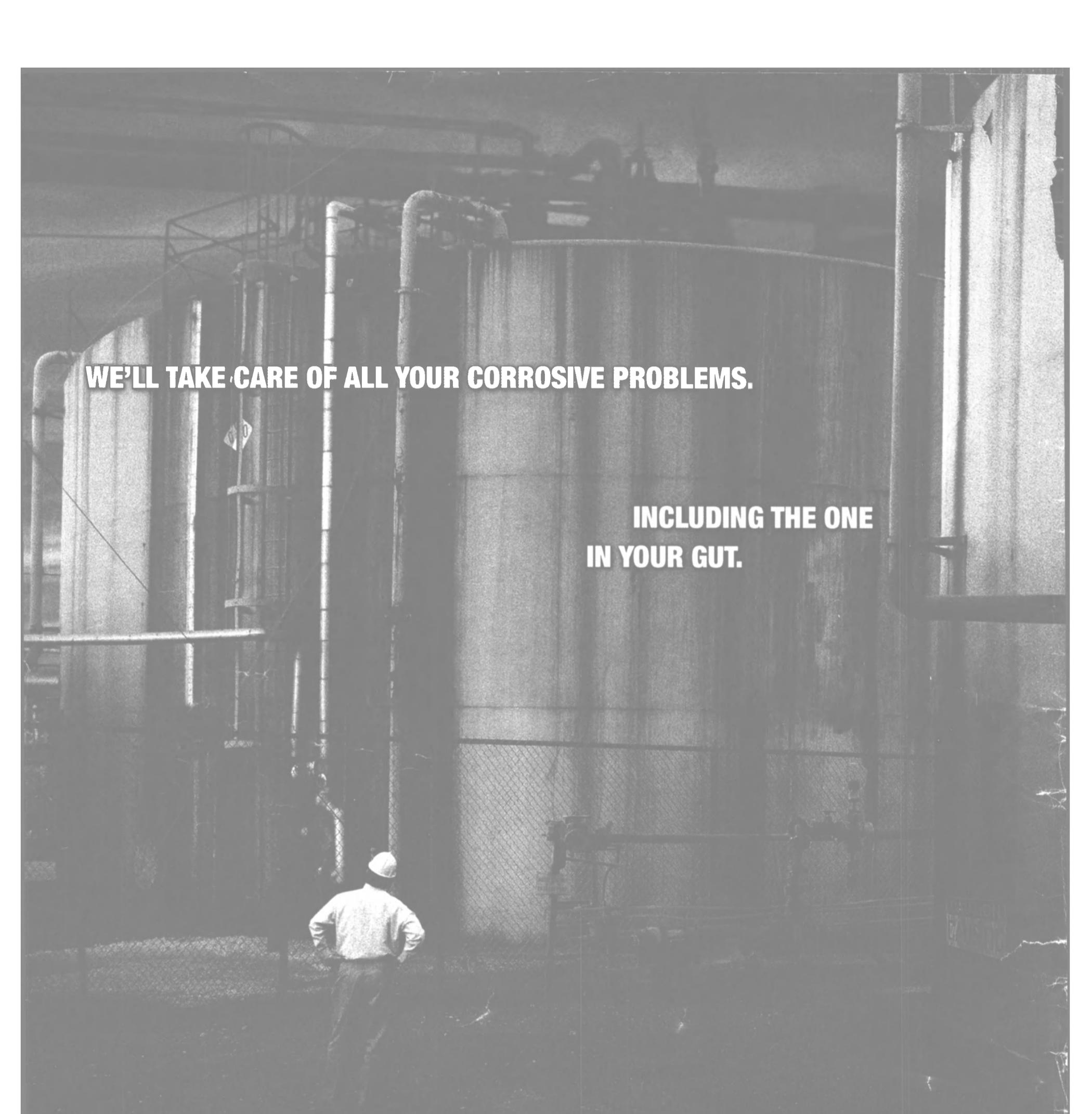
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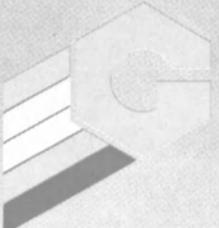
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Features

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Miami Diver's unique, universal underwater bonding method could be dubbed the next generation of underwater ship repair.

24 The Electronic Era Has Arrived

First it was diesels, then the age of the gas turbine, now the electronic engine has grabbed a foothold as the newest innovation in marine propulsion technology. — by David Tinsley, technical editor

27 From Steam To Gas

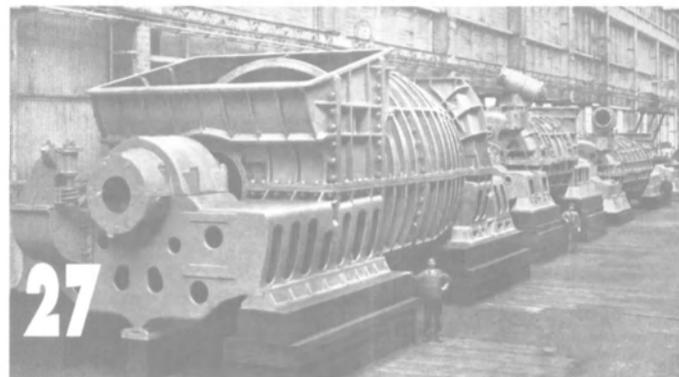
From quadruple expansion engines, to Wartsila's EnviroEngines and GE's gas turbines, technology in the engine room has come a long way. — by Jessica DuLong, contributing writer

28 IZAR Stamps its LNG Mark

MREN had the opportunity to witness the launching of Inigo Tapias, a new 138,000 cu. m LNG carrier that was christened at IZAR's Sestao shipyard in Bilbao this past January. Measuring 933 ft., the vessel is a symbol of Spain's testament that the LNG market is in full force — by Greg Trauthwein

46 Fleet F77 Is on Inmarsat's Horizon

Known as the original mobile satellite communications provider for the maritime industry, Inmarsat reports that its systems are at all-time high — perfectly coinciding with the release of the company's new Fleet F77 Mobile ISDN and Mobile Packet Data services. — by Ruth Ling



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On the Cover



A firsthand account: *MREN* was invited to attend the launching of Inigo Tapias, a new 138,000 cu. m LNG carrier that was christened on January 29, 2002 at IZAR's Sestao

Shipyards in Bilbao, Spain. The 933-ft. vessel, which exemplifies the technological and financial know-how of the Spanish Maritime market, is the first of a series of five LNG's that will be built at IZAR's Sestao and Puerto Real yards. (Photo Credit: Greg Trauthwein).

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Smit Salvage has developed a new, innovative wreck cutting system that was used to raise the doomed Russian sub Kursk.

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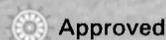
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Leica

Smit Develops High-Powered Wreck Removal Cutting System

Smit Salvage has developed a new, patented wreck removal cutting system that is designed to be fast and cost effective, and was used during the successful recovery of the Russian submarine Kursk last year.

The new system utilizes a special abrasive cutting wire — a series of grit-covered bushes mounted along a high-tension steel cable. This wire can then be positioned over a wreck and connected up to a drive system producing a sawing motion. Highly efficient, this cutting system can be used as an alternative option to the traditional chain-cutting method that uses heavy steel chains and floating sheerlegs.

According to **Theo Hak**, Smit Salvage Logistics and Technical Support Manager, "The new system can reduce project duration by up to 30 percent, and in addition, is easy to transport and suitable for a wide range of salvage and wreck removal tasks."

The cutting system was developed in association with Widia Nederland, a Rotterdam-based manufacturer of tungsten carbide tools, and T.N.O. Neder-

land. The original prototype was developed as a surface-based system for salvaging shallow-water wrecks at depths of up to 99 ft. (30 m). Subsequent to the Kursk contract, Smit modified the system for deep-water work and added an underwater drive system. Cutting wire was also strengthened to increase wear resistance. Prior to its deployment for the Kursk operation, the system's efficiency was demonstrated during trials in Rotterdam when it was used to cut an obsolete dredger into scrap.

Following an explosion in August 2000, the Kursk and its crew were lost in the Barents Sea. As a result, the submarine's bow sustained severe damage and had to be removed prior to the lift.

This practice was a challenging one, due to the water depth 354-ft. (108-m), adverse weather conditions and the thickness and hardness of the submarine's hull.

Cutting then commenced with the positioning of the wire over the Kursk's bow. The wire was then connected to two anchor points on the seabed — positioned 66 ft. (20 m) to each side of the



Smit's new patented cutting system in action during the removal of the Kursk's bow section.

hull. Each anchor point was comprised of a hydraulic cylinder and suction pump — the actions of the pumps caused the anchors to "bury" themselves into the seabed. As the seabed was penetrated by the pumps, pressure was exerted on the cutting wire, which moved in a sawing motion across the submarine's bow section. Despite the adverse conditions, the system was able to complete the cutting operation in 31 hours on September 13, 2001. The

seabed's high stone content caused significant friction, thus causing several guide cables to part. This was corrected through the installation of closing plates around the sheave assembly — thus preventing direct contact with the seabed. Concurrently, the cutting wire demonstrated greater wear resistance than indicated in the initial tests and was replaced after 12 hours of intense cutting.

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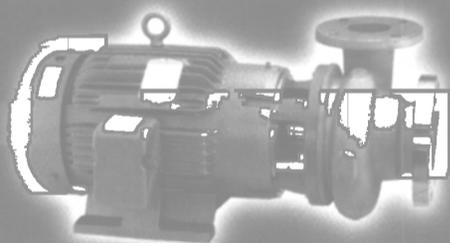
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Port and maritime security matters continue to dominate the agenda list of marine companies and organizations. While an unprecedented international effort to thwart terrorist attacks has seemingly had some positive impact, the heightened awareness has exposed fissures in the system.



At a meeting of the IMO Maritime Safety Committee's Intersessional Working Group on Maritime Security (ISWG), the group fast-forwarded a number of topical matters, including an agreement to discuss the accelerations of the implementation schedule for the mandatory fitting of Automatic Identification Systems for all ships of 500 gross tonnage and above, on international voyages. While such talk undoubtedly makes the hearts of marine electronics manufacturers swoon, it gives vessel owners, and operators — which must ultimately foot the bill and pass along the cost — cause for pause.

Congruent with this security theme, a collection of leaders from the military, the U.S. Senate and industry met in Washington, D.C. on February 26 to lobby for an additional \$2.9 billion in the FY 03 budget for the purpose of building more new Navy ships. The president's proposal, which requests \$6.1 billion for the procurement of five new Navy vessels, is a slap in the face of estimates which say between 10 to 12 new ships per year are needed to maintain a healthy fleet. For too long the Navy has been told "next year we'll make it up," but leaders such as Northrop Grumman's Phil Dur; Senators Thad Cochran, (R-Miss.), and Jack Reed, (D-R.I.); and Admiral Robert Natter are determined to make next year *this* year.

Security and Navy aside, the commercial marine business remains a viable venture, though consolidation and a sour economy have colluded to cloud that reality. Technology remains the driver of the marine market, as highlighted in this month's Tanker Technology section. Spain's IZAR very proudly launched its first LNG ship in more than three decades — the Inigo Tapias — a marker that surely serves as a signal supporting IZAR management's contention that this is the "decade of gas." With five such ships on order and four more slots to fill, IZAR is making a run in a market niche that has slid to yards in the Far East.

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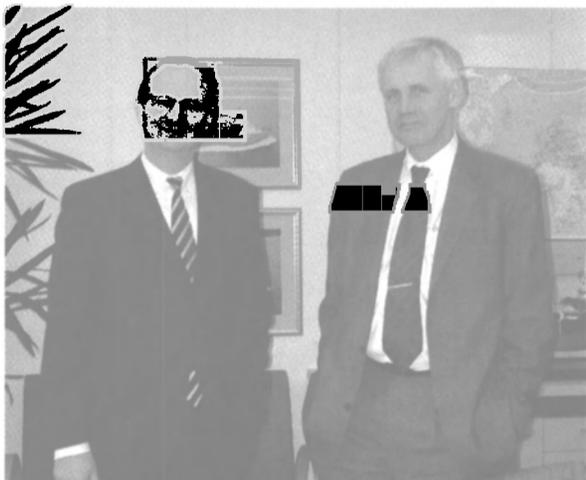
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Fokkens to Replace Ulstein At Rolls-Royce



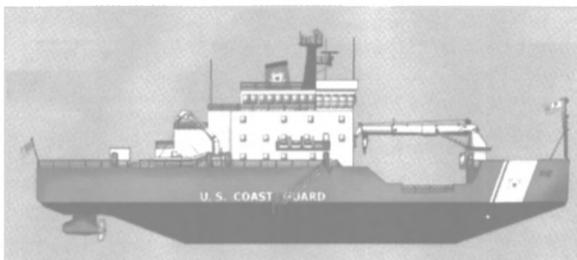
Changing of the guard: **Morten Ulstein** (left), will be replaced by **Andreas Fokkens** (right) as Rolls-Royce's president of commercial marine in June 2002.

Rolls-Royce has appointed **Andreas Fokkens** as president, commercial marine, a post he will assume in June when the outgoing president **Morten Ulstein** completes his three-year term in charge of the business.

Fokkens, who was previously with ABB, is currently managing director, marine electronics, a post he has held since last September. He is responsible for electronic systems, which includes all power electronics and automation and control systems.

KMY To Consult on Icebreaker

Kvaerner Masa Marine (KMM) and Masa-Yards Arctic Technology Center (MARC), both part of the Kvaerner Masa-Yards Group, were recently awarded a contract to provide ice breaking consulting services



and model testing for the USCG Great Lakes Icebreaker currently being designed by Marinette Marine Corporation (MMC) a division of Manitowoc Marine Group. The new icebreaker will be named Mackinaw in honor of the heavy icebreaker that it is replacing.

The new Mackinaw will be a multi-mission vessel,

measuring approximately 239 ft. (73 m) with a 60-ft. (18.3 m) beam, and displacing 3,500 tons. The ship will break ice to keep the Great Lakes shipping lanes open in the winter and service aids to navigation in summer. The vessel will perform search and rescue, pollution control, security and law enforcement as well. The vessel employs azimuthing podded electric drives, which were pioneered by Kvaerner Masa-Yards in conjunction with ABB Industry Oy.

The icebreaking consulting services to be provided to MMC will include a hull form feasibility study, and ice performance, powering, stability, seakeeping and maneuvering performance evaluations. One of the hull forms to be studied will be the Double Acting Concept patented by Kvaerner Masa-Yards. MARC will also be carrying out an extensive ice model test program at its model ice tank in Helsinki and KMM will supervise the open water model tests to be carried out at SSPA in Sweden.

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Bollinger To Build Three Boats for Chouest

Bollinger Shipyards signed a contract for three 145 x 36-ft. (44.1 x 10.9-m) supply/utility boats with Edison Chouest Offshore. The vessels will meet new regulatory standards and will be less than 100 gt and less than 500 GT registered tonnage, and will have a maximum draft of 11.5-ft. (3.5-m); normal operating draft will be eight ft. (2.4 m). Delivery of the first vessel will occur in Summer 2002, with the remaining vessels following in October and December 2002.

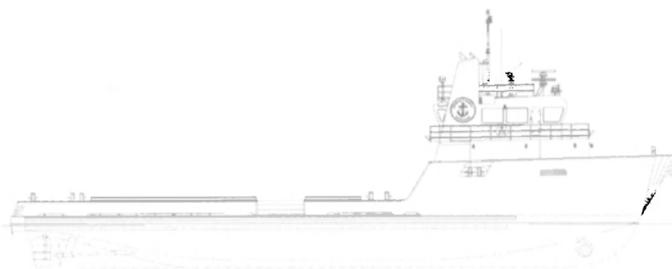
A pair of Cummins KTA-38MO diesel engines rated 750 bhp at 1,600 rpm were selected to power the vessel, driving Bollinger 72 x 57 in., four-blade, stainless steel propellers through Twin Disc MG5301 reverse/reduction gears with a ratio of 4.96:1. The second and third vessels will be powered by two Caterpillar 3508B-diesel engines rated at 855 bhp at 1,600 rpm, driving 72 in., four blade Nibral propellers through Twin Disc MG 5301 reverse reduction gears with a ratio of 4.96:1. International Marine Systems Hydraulic steering will be installed at two pilothouse stations and a 272 hp Schottel, STT-110 bow thruster will aid steering on all three vessels.

The engines feature a package that meets new IMO emission standards. The boats' electrical power will be provided by two Cummins 6CTA8.36 diesels driving two Cummins 99 KW generators with direct drive liquid mud pumps off of the generator engines thereby eliminating belt systems.

Each of the new Chouest OSV's will be equipped with four liquid mud tanks and two Methanol tanks.

The vessels' large 95 x 32 ft. (28.9 x

9.7 m) aft decks will be able to carry up to 390 long tons of cargo, and crew/passenger decks will emphasize crew comfort with larger staterooms and living quarters with extra sound proofing and carpeting, as well as 20 tons of Carrier air conditioning and 25kW heating.



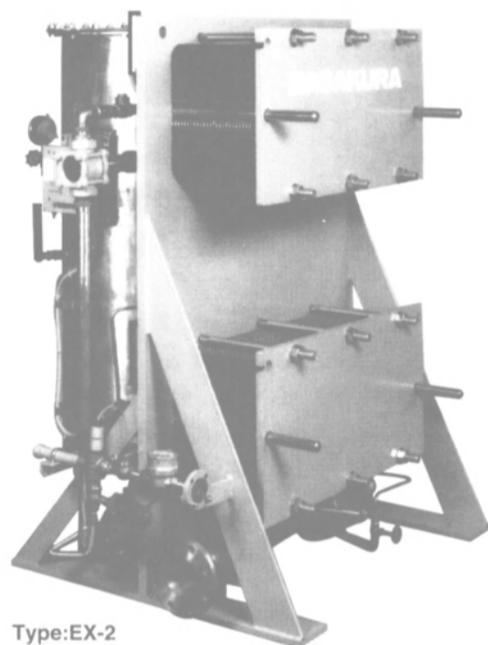
MAN B&W Engines Will Power Rodriguez Ferry

Four MAN B&W Diesel Ltd. 18VP185's each rated at 3,700 kWb will be supplied for a new 269-ft. (81.9-m) Aquastrada monohull ferry to be built in Messina, Sicily by the Italian shipbuilder, Rodriguez Cantieri Navali.

The aluminum hulled fast ferry will be able to carry up to 1,246 passengers. The high speed engines are located at the aft end of the ship, allowing for greater optimization of the garage space.

Top-loaded speed will be in the region of 39 knots and the quadruple VP 185 engines will drive LIPS waterjets through Reintjes gearboxes. Waterjet propulsion is reported to have reduced draft and excellent maneuverability.

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Harvey Gulf Intl. Receives M/V Harvey Thunder

Harvey Gulf International Marine, Inc., has received the second member of its new 13,500 hp class offshore tug, M/V Harvey Thunder, which was constructed by Eastern Shipbuilding.

This state-of-the-art-towing vessel is equipped with a 500 hp bowthruster for improved station keeping capabilities while working with semi-submersible drilling rigs.

Harvey Gulf presently has M/V Harvey War Horse under construction, which is a 16,000 hp class anchor handling/towing vessel slated for delivery by March 15, 2002.

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Stelmar Shipping Gets Double Hull Tanker

Stelmar Shipping Ltd., recently received M/T Pearlmar, a newly built Panamax tanker from the Daewoo Shipbuilding and Marine Engineering Company Ltd. in South Korea.

The first of a series of four sister ships being constructed for the company by Daewoo, the vessel has entered into a previously announced two-year time charter with Adam Maritime Corporation.

Including these vessels, Stelmar now has 20 vessels on time charter — including the three other Panamax tankers and the product tanker, which are all scheduled to be delivered in the first half of 2002.

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Gladding-Hearn To Build High-Speed Catamaran

Hy-Line Cruises, a division of Hyannis Harbor Tours, Hyannis Mass., has ordered a new 300-passenger high-speed catamaran from Gladding-Hearn Shipbuilding, the Duclos Corporation. This is the third Incat-designed fast ferry built by the shipyard for the Cape Cod tourism company, and the 27th high-speed catamaran built by Gladding Hearn. M/V Grey Lady III, scheduled for delivery next year, will replace the smaller Grey Lady II and provide year-round passenger service between Hyannis and Nantucket Island.

The new, all-aluminum ferry measures 144 ft. (43.7 m) in length, 35 ft. (10.6m) at the beam, draws 6.5 ft. (2m), and is powered by four Cummins KTA50M2 diesel engines, each delivering 1,800 bhp. The vessel is propelled by four Hamilton water jets through Reinjtes WVS730D gearboxes. According to Peter Duclos, Gladding-Hearn's director of business development, its top speed is more than 38 knots when fully loaded at a dwt of 40 tons. "The boat's top speed will give the operator about a five knot margin on the schedule. With all four engines running at the continuous horsepower rating, the vessel will comfortably keep the schedule at a speed of 33 knots. In the event of a failure on one of the propulsion systems, the boat will still keep the schedule, but will require full power from the remaining engines. This kind of margin is just prudent business for a ferry service that operates in excess of 5,000 hours per year."

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Townsend Bay Launches Alaskan Grandeur

Townsend Bay Marine LLC (TBM), a yachtbuilding and repair company based in Port Townsend, Wash., has launched Alaskan Grandeur for Glacier Guides, Inc. The 68-ft. (20.7-m) composite vessel has a 21.5-ft. (6.5-m) beam and is based on a limit seiner hull. Designed by John L. Anderson Yacht Design of Kingston, Wash., to be independent of shore support for periods of up to three months, Alaskan Grandeur will be used for hunting and fishing charters in Alaskan waters, and will be provisioned at the beginning of the season for cruising to remote locations without returning to base. Accommodations include four double staterooms for guests and two double cabins for crew.

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Main Particulars

Power	..Caterpillar 3406, rated 310 hp @1,350 rpm
Displacement 226,000 lbs. (102.7 tons)
Cruising speed 8-9 knots
Range 3,600 miles at 8 knots, 4,900 at 7 knots
Water capacity 2,000 gallons (plus watermaker)
Fuel capacity 3,960 gallons

Control Units

STORK-KWANT

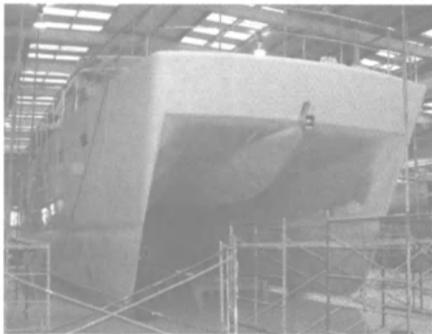
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Knight & Carver Launches Loco Buzzard III

Knight & Carver YachtCenter has launched its latest luxury yacht, Loco Buzzard III, a custom-designed, custom-crafted 65 ft. (19.8-m) cruising catama-



ran yachtfisher co-designed by Knight & Carver and Morrelli & Melvin of Newport Beach, Calif. The launch occurred on January 21, 2002, at Knight & Carver's facility in National City, Calif. where the vessel's owner, **Buzz Sands**, christened the \$2.8 million vessel, which is the second custom-built and designed yacht provided by Knight & Carver for the Southern California-based yachtsman.

Following the christening, Loco Buzzard III will undergo a series of sea trials with final delivery expected by mid-February.

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Main Particulars

Length, (o.a.)	65 ft. (19.8 m)
Beam	24 ft. (7.3 m)
Displacement	105,000 lbs.
Power	2 x 660 hp Caterpillar, 3196 diesel
Fuel capacity	2,000 gallons
Top Speed	27 knots
Cruising Speed	20 knots

Alabama Shipyard Delivers Second ATB



Alabama Shipyard has delivered another articulated tug and barge (ATB) unit to Reinauer Transportation Companies of Staten Island, N.Y. The Christian Reinauer and the RTC 143 is the second ATB unit built for Reinauer at Alabama Shipyard's facility in Mobile. The first ATB unit, the Nicole Leigh Reinauer, and the RTC 135 was delivered by Alabama Shipyard in December 1999.

The 7,200 hp twin-screw ocean-going tug, which is able to push a load barge at approximately 11 knots, has a length of 124 ft. (37.7 m) and features the patented Intercon tug/barge coupler system

designed and built by Intercontinental Engineering and Manufacturing Corporation of Kansas City, Mo.

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Austal Secures Contract With U.S. Military

Austal USA has secured a deal via its majority-owned parent company, Austal

Ltd., for a three-year, \$31-million contract with the U.S. Military Sealift Command chartering a 330-ft. (100.5-m) high-speed catamaran.

Designated as a Theater Support Vessel, the ship has already completed a proof of concept charter that began in July 2001.

This is the first time that the U.S. Military has contracted a commercial vessel

of this type for operational military support. Known as WestPac Express, the vessel will be utilized for operations supporting the Third Marine Expeditionary Force (III MEF) of the U.S. Marine Corps, stationed in Okinawa, Japan — where it has already served effectively on its initial charter.

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● SJD-1206 IRCS Workstation

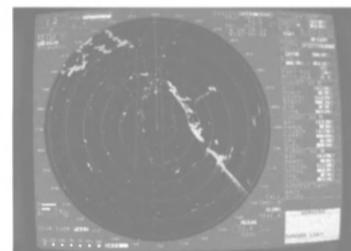
With this one workstation it is possible to operate a multitude of radio communication facilities. A user-friendly design ensures easy operation by all operators.

● JMA-9800 Color ARPA Radar

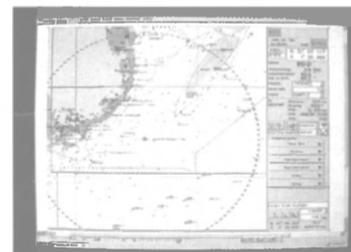
This futuristically designed radar unit features a large 29-inch high-definition color CRT display. It enables quick detection of small targets.

● JAN-3598 ECDIS Total Navigator

This advanced ECDIS system permits fully automatic navigation. It features a large color LCD and abundant functions unique to JRC, including radar video overlay, grounding prevention, NAVTEX data, route safety check, alarm displays and engine data display. The result is greater safety and economy.



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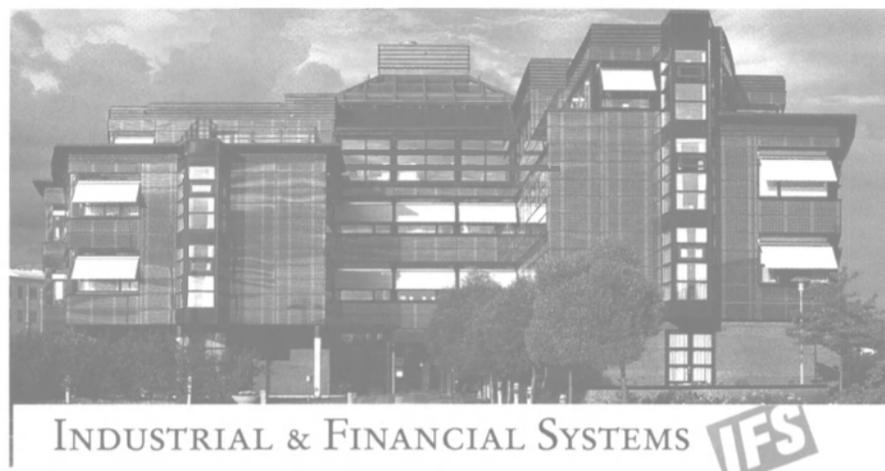
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IFS And DNV Join Forces On IT Project

IFS Norway AS and Det Norske Veritas (DNV) have agreed to combine their technology by developing an IT solution for the international maritime market. The solution will become the first of its kind on the global market and will be focused on ensuring stable and safe operations of Floating Production, Storage and Offloading (FPSO) vessels for oil production offshore.

The partners will present a prototype of an integrated solution combining the DNV's solutions for design and strength assessments of FPSOs with the market-leading ERP business applications suite, IFS Applications. The prototype will be presented in Spain at a conference relat-



ed to the offset program with Spain in connection with the Norwegian Government's procurement of frigates to the Royal Norwegian Navy from the Spanish shipbuilding corporation Izar.

DNV Software and IFS represent some of the leading-edge environments

within their markets. The solution they are about to jointly develop will cover all phases in the life cycle of a floating oil production vessel, i.e. the design of the vessel, the construction and the operation offshore. This is a new concept where two leading players join forces by

combining their expertise within hull construction and maintenance of such asset-intensive operations. The solution will provide completely new opportunities to make fast and sound decisions to minimize downtime in the oil production without compromising safety on board. During the next five years it is expected that approximately 60 FPSO vessels will be built on the worldwide market. DNV Software's FPSO Package will be utilized in a number of these projects for design and strength assessments. Combined with the IFS Applications, the new solution will enable the operators to maintain a higher level of maintenance and thereby reduce downtime in the offshore oil production from these vessels.

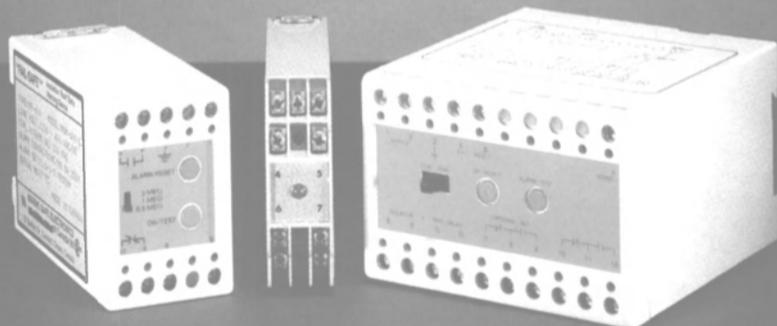
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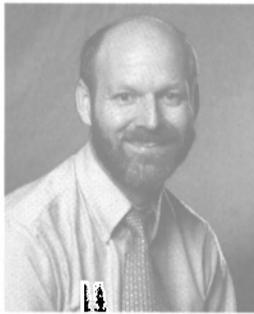


CLEAN SEAL

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EBDG Promotes King, Wolff

Elliott Bay Design Group (EBDG) promoted **Brian King** to vice president of engineering and **Douglas M. Wolff** to vice president of operations. King joined EBDG in 1988 as the chief marine engineer. In his new role, King will oversee and manage the firm's engineering and technical resources.



Brian King



Douglas M. Wolff

Wolff joined EBDG in 1992 as the firm's chief naval architect. With the added responsibility of vice president, Wolff will oversee the firm's staff of professionals and support personnel and will also head the firm's training program, which includes EBDG's in-house lecture series.

Globe Wireless Elects Coles, Whitworth

Globe Wireless' Board of Directors has elected **Frank Coles** as its President and COO.

Coles, who has served as the company's managing director for the last two years, is a master mariner and holds a Master's Degree in maritime law. Globe Wireless also announces the appointment of **Trevor Whitworth** as senior vice president of sales. In this new position, Whitworth will be responsible for all sales and customer service activities on a global basis.



Frank Coles



Trevor Whitworth

In addition, **Walter Kane** was promoted to vice president, sales for the Americas. Kane has had a career of over 20 years as a Radio Officer in the United States Merchant Marine and United States Coast Guard.

Cummins, Mercury Marine Form Joint Venture

Cummins Marine and Mercury Marine formed a 50/50 joint venture to supply integrated diesel propulsion systems to the worldwide recreational and commercial marine markets. The joint venture, Cummins MerCruiser Diesel Marine LLC, will be headquartered in Charleston, S.C.

Under the terms of the agreement, Cummins will supply diesel engines 15 liters and below, including certain electronic displays and other hardware.

Mercury Marine will supply the Mercury 1.7 liter, 2.8 liter, 4.2 liter and 7.3 liter diesel engines, drive units for sterndrive applications and their SmartCraft electronic integration hardware.

The joint venture aims to become the premier worldwide supplier of integrated diesel marine propulsion units.

Cummins will retain its current high-horsepower commercial marine and auxiliary power business, which will continue to be headquartered in Charleston, S.C. Mercury Marine will retain its traditional gas engine propulsion business.

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Mercury Marine Acquires Teignbridge Propellers

Mercury Marine has acquired Teignbridge Propellers Ltd., Newtown Abbott, U.K., producer of bronze and Nibral propellers for yachts, patrol boats and commercial vessels. In addition to its line of standard and custom propellers, Teignbridge also produces a complete underwater package of stern gear for inboard-powered vessels, which includes rudders, shafts, struts, seals, logs and bearings.

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Volvo Penta Signs \$2.8M Tug Engine Contract

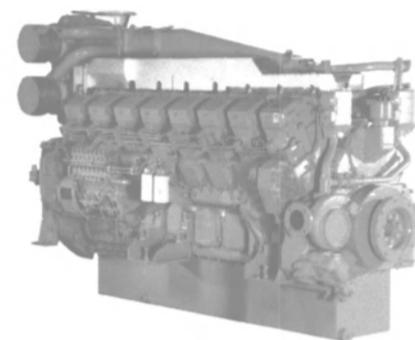
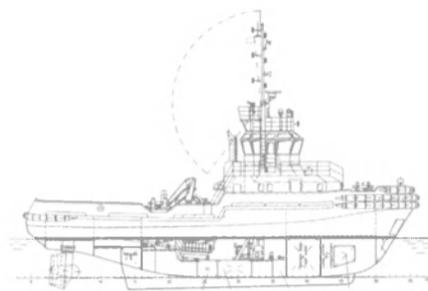
As a result of its extended product program, Volvo Penta has been chosen as the complete engine supplier for a new series of tugs in the Ukraine.

In all, this will involve deliveries of 15 diesel engines for three sister vessels which will be built in 2002.

Volvo Penta's order is worth approximately \$2.8 million from the Ukraine for the engines for a total of three multi-purpose tugs. These engines will be installed as follows: two 6.5-liter propulsion engines for each tug; two seven-liter engines for powering gen sets on board each boat; one six-liter engine for operating the fire pumps onboard each tug; making a total of 15

engines, six of which are the largest in Volvo Penta's large marine diesel program and nine of which are six- to seven-liter engines.

The tugs, which measure more than 98 ft. (30 m) long, will also be used as fire-fighting vessels. These boats will be stationed in Yuzhny, which is situated in the Odessa region in southern Ukraine and is one of the most important ports on the



Black Sea. The first vessels in the series with Volvo Penta engines is currently being built at one of Europe's largest shipyards, Chernomorsky Shipbuilding in Nikolayev in the Ukraine. The engines for the first vessel, which will be completed during the first half of 2002, will be delivered at the end of January. The other two vessels will be built before the end of 2002.

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Length, (o.a.)	120 ft. (36.5 m)
Length, (waterline)	116 ft. (35.3 m)
Breadth, (molded)	46 ft. (14 m)
Breadth, (design load)	37 ft. (11.2 m)
Depth, (molded amidships)	12 ft. (3.6 m)
Design draft	7 ft. (2.1 m)
GT	Less than 100
Horsepower	(@ 1,800 rpm), 450 bhp, each end
Fuel oil capacity	348 gallons
Automobile capacity	22
Passenger capacity	100

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Austal Wins Contract For Cruise Vessels

Austal Limited's subsidiary Austal Ships has secured a contract for two 226-ft. (69-m) 'boutique' cruise ships for operation in French Polynesia.

The new order, with a combined contract value of approximately \$27.8 million, increases Austal's total value of vessels under construction or on order to over \$202 million.

Due for delivery in early 2003, The 'boutique' cruise ships, which were ordered by Bora Bora Cruises of Tahiti, will be monohull design. Tu Moana and Tia Moana which mean 'strong on the ocean' and 'sure and stable on the ocean' will accommodate 78 passengers each and will provide luxury cruises between the islands of Huahine, Paiatea, Tahaa and Bora Bora at a cruising speed of 14 knots.

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EBDG Completes Design For Fisher Island

Seattle-based Elliott Bay Design Group (EBDG) has recently completed the Contract Design for a fourth passenger-vehicle ferry for Fisher Island, Fla. EBDG was contacted about an upgrade to the initial vessel design, which was completed by its predecessor firm, Nickum & Spaulding, in 1980. Two vessels were built in 1981, M/V Eagle and M/V Pelican — a third vessel, M/V Flamingo, was constructed in 1987.

The fourth vessel to join the Fisher Island fleet will vary from the original vessel design. According to EBDG Project Manager Will Nickum, design changes include an aluminum superstructure and bulwarks, enclosed spousons, revised engine room and pilot-house access, and an enlarged pilot-house. The vessel will feature a revised stack and mast configuration as well as relocated engine air intake.

With the design package complete, EBDG will act as Construction Liaison on behalf of the Owner. In December 2001, Fisher Island Community Association signed a contract with Eastern Shipbuilding Group of Panama City, Fla. to construct the new vessel.

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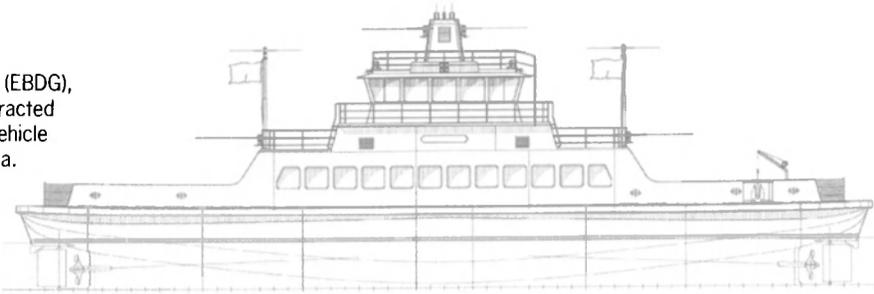
Norcontrol IT To Supply VTS In UAE



Norcontrol IT has won the contract to provide the Vessel Traffic Management and Information System (VTMIS) to Port Mussafah of the United Arab Emirates. Delivery is scheduled for July 2002 and includes a three year corrective maintenance package. Norcontrol IT will be supplying its world renowned VTMIS 5060 system to Port Mussafah. The delivery will include a dual screen VTS Operator Workstation, a single marine surveillance radar with dual transceivers for redundancy, HF and VHF radio communications and a hydrological and meteorological system. The delivery will also include a new VTS Database 6070 information system, which uses the latest in web-based application technology to deliver a simple and intuitive user interface.

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Elliott Bay Design Group (EBDG), Seattle, Wash. was contracted to design a passenger-vehicle ferry for Fisher Island, Fla.



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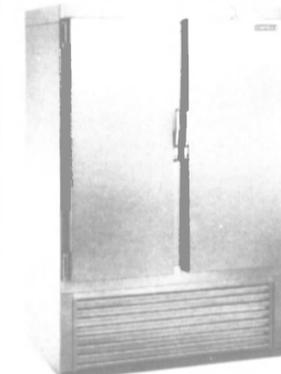
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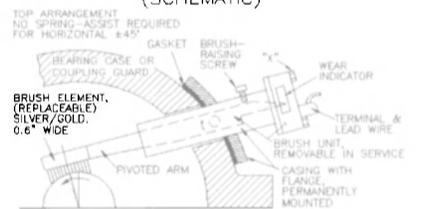
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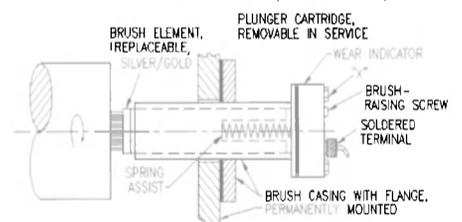
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Crescent Focuses on Tankers and Ferries

U.K. shipping and transport group Crescent PLC has focused its operations on short sea tanker and freight ferry operations. "Following our strategic plan to move out of owning tonnage in the short sea dry bulk sector, we are happy to have completed the sale of nine vessels over the last year," said **Kevin**

Hobbs, Crescent group operations director.

"That has cleared the way for us to focus on the two sectors where we can add value — a high-intensity coastal tanker fleet and freight ferry operations." Crescent group is comprised of three divisions, which operate throughout Europe: Crescent Tankships, Seatruck Ferries and Crescent Marine Services.

Matson Sells Two Combination Ships

Matson Navigation Company, Inc. has sold two combination RoRo/LoLo containerships to Sea Star Line, LLC (Sea Star) in Jacksonville, Fla. The vessels, which have been bareboat chartered to Sea Star since the company was formed in 1998, will continue to be deployed in the Puerto Rico trade. The sale to Sea

Star, which is owned jointly by SaltChuk Resources, Inc., Matson and Taino Star Investment, Inc., underscores the investors' long term commitment to the line's Puerto Rico service. Matson is a wholly owned subsidiary of Alexander & Baldwin, Inc. of Honolulu. The two ships, the SS El Yunque and El Morro, were both built by Sun Ship Building and Dry Dock Company and initially placed in the U.S. Atlantic Coast-Puerto Rico trade. Matson purchased the vessels in 1989 and 1990, respectively. Following the purchase, Matson modified both ships from strictly RoRo vessels to combination RoRo/LoLo containerships. When the vessels were chartered to Sea Star, further modifications were made to increase their "big box" container capacity.

MOL Names Carlton President of Mitsui

MOL, Ltd. has appointed **Paul Carlton** as president of the company's western hemisphere bulk agency, Mitsui O.S.K. Bulk Shipping (USA) Inc. As president, Carlton is responsible for the management of MOL's car carrier, RoRo, tanker and bulk cargo sectors operating throughout the Caribbean, North, Central and South America. Carlton will be based at Mitsui O.S.K. Bulk Shipping (USA) corporate headquarters located in Jersey City, N.J.

Carlton brings 22 years of bulk shipping experience to Mitsui O.S.K. Bulk Shipping (USA). Before joining MOL, he served as executive vice president of the Asia Pacific Region and deputy head to the president for Wallenius Wilhelmsen Lines Asia.

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MEP Develops Treatment For Shipboard Waste

Marine Environmental Partners (MEP), has taken a leading role in providing innovative technologies to combat pollution associated with the maritime shipping industry. Therefore, the company has developed two new treatment processes to deal with shipboard generated black (sewage) and grey (laundry, kitchen, and sink/shower), wastewater and a simple and highly effective process for eliminating biota in ship's ballast water. Designed with non-chemical and non-membrane components, the new systems utilize patented EIMS (electro-ionization magnetic separation) technology as its core, allowing MEP to provide solutions for a multitude of waste streams in compact, fully automated, and extremely low maintenance systems ideally suited for shipboard use. Shipboard demonstrations of both systems are set to take place during the first quarter of 2002.

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Underwater Bonding Seals the Deal



Diver/technician inside habitat after de-watering.



A diver inspects a seal.

Miami Diver has led the development of a unique universal steel habitat to efficiently carry out underwater repairs on almost any ship.

In July 1999, a leading cruise ship operator approached Miami Diver Inc. with a damaged lip type stern seal on one of its vessels. The 73,912-gt ship was reporting sea water ingress from the starboard side shaft seal, and the cruise operator was looking for options to prevent an untimely and expensive unscheduled dry-docking.

This was a unique situation in the underwater bonding of a lip-type shaft seal had reportedly never been accomplished before. Miami Diver immediately responded and called upon the network companies based in Vancouver, B.C. Canada and Europe and its subsidiary companies to collectively come up with a feasible option for replacement of the seal underwater. The biggest challenge in the project was that the cruise ship operator required the repairs to be accomplished without interrupting the vessel's sailing schedule.

The joint efforts resulted in the design and fabrication of a dry habitat to be installed around the starboard shaft to facilitate the replacement and bonding of damaged sealing

rings in the dry. The habitat was fabricated from steel in house and was tested for fit up during the vessels port calls in Miami, Fla. On August 2, 1999, Miami Diver in conjunction with the seal manufacturer installed the habitat and successfully replaced and bonded the damaged sealing rings; all work was completed and requested by the ship operator, without interrupting the vessel's schedule.

A second opportunity presented itself in September 2000 as another cruise vessel developed a problem with the pod drive. The 137,276-gt vessel presented a new challenge in that it was fitted with pod propulsion system. Again Miami Diver and its network companies joined forces to design and fabricate a steel habitat for the replacement of the damaged lip-type seal. On November 5, 2000 the habitat was installed and all four lip seals were successfully replaced and bonded in the habitat. The repairs were completed with no interruption of the vessel's schedule.

Perfect Fit

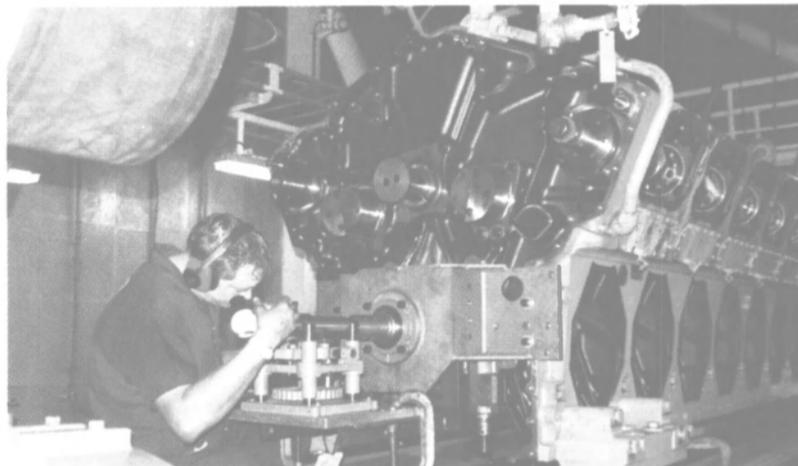
The benefit to the shipping industry for underwater repairs of this nature was evident. However, the use of a steel habitat did not seem to be a feasible option for the majority of ship owners due to the lead time and expenses required to fabricate a custom habitat for each vessel. The prompted Miami Diver and its network companies to move into research and development of a new universal system capable of fitting the majority of large vessels and portable enough to be mobilized world-wide on narrow body aircraft.

Miami Diver also began to pursue a relationship with B+V Industrietechnik to support the new project and develop strong ties with the leading seal manufacturer. Due to the two previously successful jobs with

B+V Industrietechnik, the relationship developed rapidly and Miami Diver signed a service agreement in December 2000 to become an authorized underwater seal repair facility for B+V Industrietechnik.

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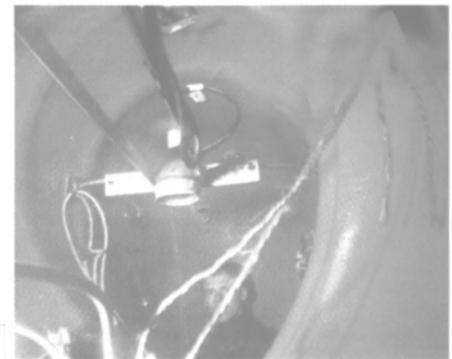
Ship Repair

After several meetings with the network, an agenda to design and develop a complete repair procedure and system was set forth to present to the shipping industry. The key areas for development were the habitat, bonding tools and an underwater carbon arc gouging system for removal of the rope guards and wet welding procedures for the replacement of the rope guards.

Miami Diver's European network member fabricated the special heating elements and sensors. To further the development of the bonding system Miami Diver established an exclusive working relationship with **John Gentry** of Triton Marine Services in the U.K. Gentry brought a great deal of knowledge and know how as his company works with all stern seal manufacturers.

Special jigs were manufactured by Triton Marine Services to work with the heaters and to function in a wet environment with diver/technician friendly features to make it more convenient during repairs inside the habitat. The jigs were manufactured to fit a wide range of liner sizes.

The new habitat was designed to be lightweight to permit easier and faster



Diver seal technician — bonding lip seal located above, while below the lighting system is the bonding jig.

installation along with greater mobility for faster mobilization using a wide variety of transportation options. The system for conventional shafts is designed for universal use on a full range of seal arrangement sizes. The small habitat fits seal arrangements from 480 to 670 mm - the large habitat fits arrangements from 670 to 1,000 mm - both are capable of fitting any stern configuration due to flexibility of the material. A dummy shaft and liner were also fabricated to test each new bag for fit and integrity at a depth of 30 ft. of seawater.

An underwater carbon arc system designed and developed by All-Sea Enterprises is used for the removal of welded rope guards. The carbon arc system allows for a much faster removal and easier reinstallation due to minimal prep work or fit up work required during reinstallation once repairs are complete.

Miami Diver conducted the wet welding training and certification for network personnel at its Florida facility, while in-house wet welding procedures were developed and qualified and a training and testing system and welder qualification were put in place with **Michael Pett** of Hydroweld U.K. using hydroweld FS welding electrodes. The tests were witnessed by six major Classification Societies and the results were a Class "A" wet welding certification.

During the development of the equipment, materials and procedures, Miami Diver and the other network companies sent personnel to B+V Industrietechnik facility in Germany for training and certification in overhaul of Simplex-Seals by bonding.

On September 2, 2001, the new system was installed and tested on the 137,276-gt cruise vessel fitted with a pod propulsion system. A habitat was specially designed for the azipod propulsion system for the test using the same methodology as the conventional shaft habitat.

The tests were conducted as a precautionary operations by the cruise ship operator to ensure the capabilities of the new habitat and to established a time frame for installation, bonding of new seals, and removal

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Bender Shipbuilding Gets Contract on Ticonderoga

Bender Shipbuilding & Repair Co., Inc. was awarded a 120-day contract for the drydocking of the USS Ticonderoga, the Navy's first Aegis Cruiser, presently homeported in Pascagoula, Miss. The vessel's overhaul is being managed by the Supervisor of Shipbuilding, Conversion in Pascagoula, Miss. for the Department of the Navy.

Repairs, which are scheduled to begin in February 2002, consist of rudder, shafting, valve, structural and electrical repairs as well as major preservation items that presently total approximately \$8 million. Bender has the option pricing in place for additional work that could bring the total package to almost \$16 million.

Trinity House Returns To A&P Shipcare

A&P Shipcare recently completed the refit of the Trinity House Light Vessel LV21 at the Group's Ramsgate facility.

The vessel, which arrived during early November for a hull blast and paint program, was the fourth vessel from Trinity House Light House Service to slip at A&P's Ramsgate facility since it opened in 2000.

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Electric Boat Gets \$7.6M Navy Contract

Electric Boat Corporation, a General Dynamics Company, Groton, Conn., is being awarded a \$7.6 million cost-plus-fixed-fee modification to previously awarded contract (N00024-96-C-2100) to exercise an option for On Board Repair Parts (OBRPs).

Work will be performed in Groton, Conn. (55 percent) and Newport News, Va. (45 percent), and is to be completed by June 2004. Contract funds will not expire at the end of the current fiscal year.

The Naval Sea Systems Command, Washington, D.C., is the contracting activity.

USS Gunston Hall Goes To Norfolk For Work

Norfolk Shipbuilding & Drydock Corp., Norfolk, Va., is being awarded an \$8.4 million fixed-price contract for the Phased Maintenance Availability of USS Gunston Hall (LSD 44).

Work includes miscellaneous structural, electrical, and mechanical repairs including ship alterations, and alterations equivalent to repairs.

Work will be performed in Norfolk, Va., and is expected to be completed by June 2002.

Grand Bahama Shipyard's Drydock Arrives

Grand Bahama Shipyard's Dock No. 2, which is the former Cascade General Dock No. 4, arrived safely at its new spot at the Freeport, Bahamas shipyard on December 11. The floating drydock, which measures 984 x 2,296 ft. (300 x 700 m) and is capable of lifting 85,000

tons, will be the largest floating dock on the Eastern seaboard of the U.S., accommodating cruise vessels up to 150,000 grt or VLCC tankers of up to 250,000 tdwt.

The 20,000 n.m. tow from Portland, Ore. to the Freeport, Bahamas shipyard encompassed 160 days. The dock traveled across the Pacific Ocean passing close to Hawaii, through the Philippines

an the East Indies, across the Indian Ocean and up the Red Sea, through the Suez Canal and then across the Mediterranean and the Atlantic.

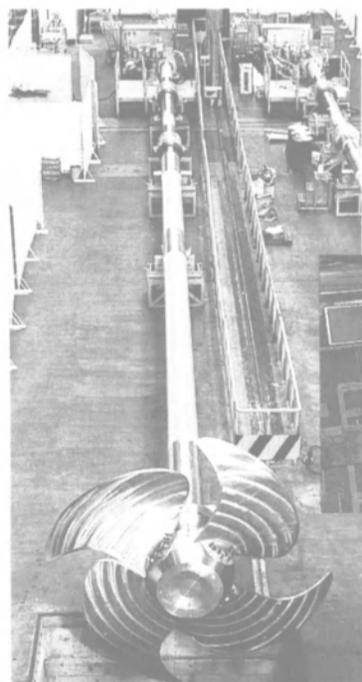
Preparations are currently underway at the shipyard for the dock, which is expected to be fully operational by the end of March 2002.

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Teekay Signs Contract With SeaSupplier

SeaSupplier Ltd., the marine e-procurement subsidiary of Stolt-Nielsen S.A. has signed a multi year e-procurement contract with Bahamas-based Teekay Shipping to connect Teekay procurement systems with its suppliers.

Under the agreement, SeaSupplier's SeaConnect solution will provide Teekay with a common e-procurement platform, which is geared to improve and standardize contract usage, rationalize product databases, and automate connectivity to suppliers worldwide.

SeaSupplier's open technology platform and adaptable middleware soft-

ware will enable Teekay's J.D. Edwards system to communicate efficiently with all suppliers, using multiple communication formats including EDI, EFACT, Flat files, XML and MTML.

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MHI Selects Intergraph eMARIAN Materials

Mitsubishi Heavy Industries Ltd. (MHI) of Japan has signed contracts to purchase eMARIAN materials management software and services from the Process, Power & Offshore division of Intergraph Corporation. The contracts cover software and services for installation, systems integration and consulting. Implementation of eMARIAN is underway in MHI's Yokohama Engineering & Construction Center (MCEC) and will be extended to construction sites around the world. The sale includes integration with the MCEC SAP R/3 system for cost control.

eMARIAN users include MHI's mechanical and equipment, instrumentation, piping, electrical, civil and structural engineering disciplines. The software comprises the entire eMARIAN suite of modules and encompasses management of engineered equipment, bulk materials, e-Procurement and e-Supply chain management as well as construction site materials and warehousing management.

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ABS-NS Establishes Direct E-Procurement

ABS Nautical Systems has established a direct-link e-procurement facility as an extension of the Purchasing & Inventory module of its integrated ABS-NS SafeNet fleet management system.

The new e-procurement capability arose from client feedback at one of the regular Nautical Systems' user conferences and has been developed in partnership with existing SafeNet users to ensure its practicality. One component of the SafeNet e-procurement facility is that all users of the system provide the names and contacts of their vendors. Nautical Systems provides each of these vendors with the required communication applet at no charge.

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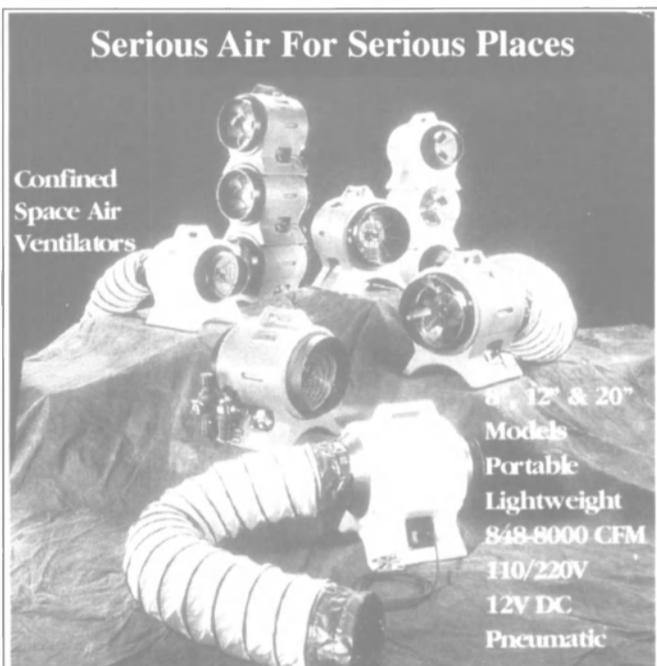
MarineProvider Takes Equity In OceanConnect

OceanConnect has attracted yet another new equity partner - MarineProvider ASA — the e-procurement solution for the electronic trading of ship's stores and spare parts.

The news comes shortly after announcements that Chemoil Corporation and DS Norden AS have acquired equity in OceanConnect, and OceanConnect's acquisition of the Clarksons Bunker Group.

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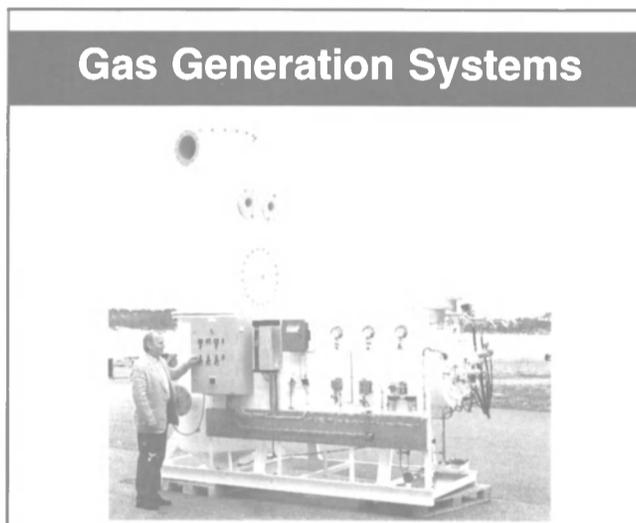
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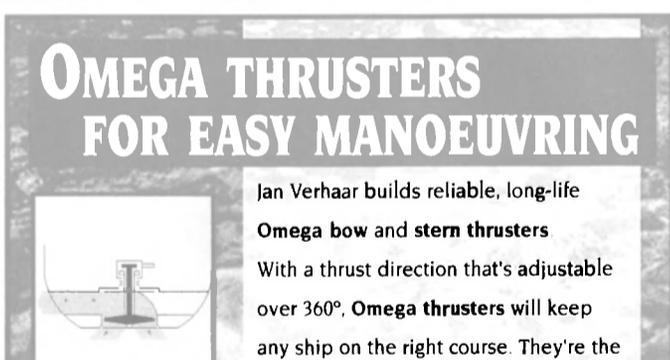


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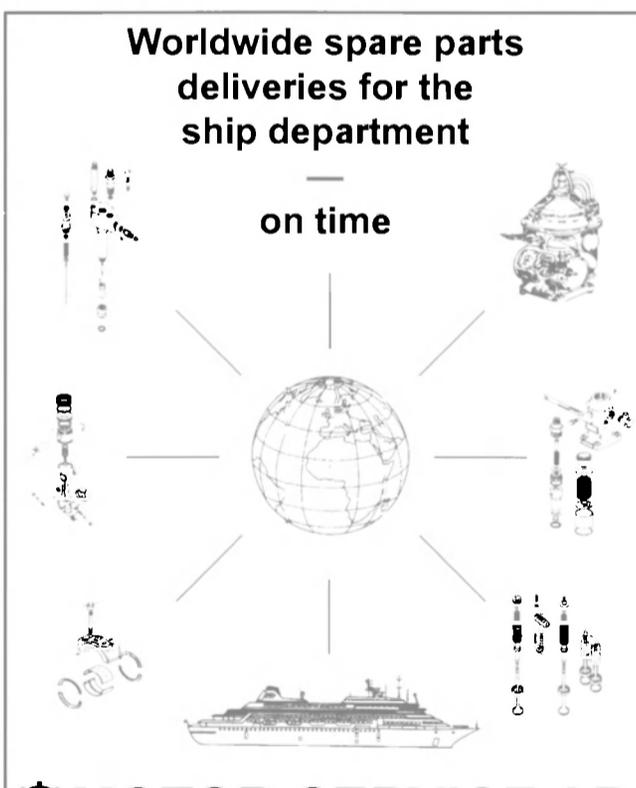
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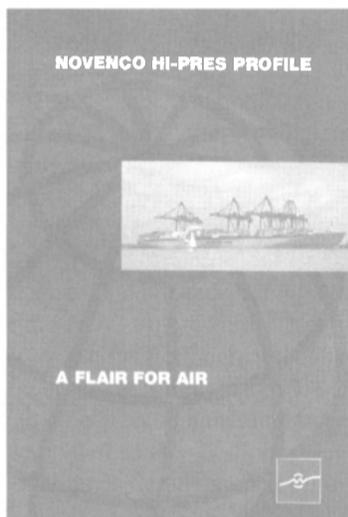
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By **Greg Trauthwein**

Adrick Marine, which provides custom air conditioning and refrigeration solutions to the marine industry, and is the largest supplier of AC and



Adrick Marine serves as the U.S. East Coast representative to distribute Novenco Hi-Pres marine equipment, which is a leading worldwide supplier of high pressure air conditioning systems and associated air side components.

refrigeration units to the U.S. Coast Guard, is, by conventional standards, small, generating about \$2 million per year. However the company has successfully carved its niche in "building the specially designed solutions that no one else wants to do," Vassallo said.

The company manufactures low pressure air conditioning units from .5 ton to 15 tons capacity, engineered air conditioning systems up to 600 tons capacity, and supplied custom engineered solutions for just about every shipboard use.

A 1961 graduate in Marine Engineering from Fort Schuyler, Vassallo started his career not with the intention of creating his own business, but to make a living. He started with M. Rosenblatt & Sons upon graduation, soon after moving onto Bailey Refrigeration, where he served as a chief engineer for 13 years. He then moved to Frigitemp in Brooklyn, ascending to the vice president rank. But, in the mid-70s, Frigitemp went bust, leaving Vassallo in search of a new direction - and an income.

Utilizing his experience, technical knowledge, shipboard experience and expansive list of industry contacts, Vassallo, with the urging of friends and colleagues, decided to strike out on his own, creating Adrick Marine in 1976.

Competing with the large, established, corporate suppliers of "catalog" marine refrigeration and air conditioning was, obviously, not a viable option. Instead, Adrick sought to establish itself as a supplier of custom marine solutions, relying on the marine industry's need for unique systems as it constantly seeks to trim weight and save space.

"When we go aboard a ship, we have practical shipboard experience," Vassallo said. "For example, we know how to design and position a unit to minimize maintenance."

Adrick, with the owner, designs the custom solutions, then buys the equipment and creates the unit. If the custom design is the soul of the project, then the heart is the company's own Electro Control Panel.



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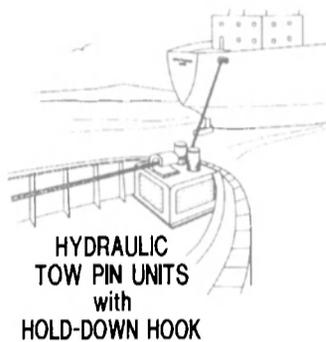
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Standing in testament to the Adrick solution is the diverse list of references, starting with the U.S. Coast Guard and including Israeli Navy ships and some of the world's most advanced workboats.

Expanding the Business

"The biggest challenge in building a company is planning for future business — that crystal ball is sometimes very foggy," Vassallo said. That lack of clari-

ty, which is shared by companies both large and small, has led Vassallo to diversify Adrick Marine within and outside of the core marine business. For example, the company has a rapidly growing land-side business producing sheet metal ductwork for buildings in Manhattan.

Adrick is seeking to extend this to shipboard applications as well. Just as significantly, the company signed a

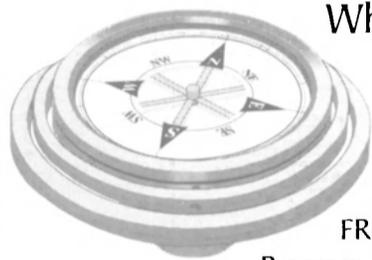
landmark deal to distribute Novenco Hi-Pres marine equipment — a top world supplier of high pressure air conditioning systems and associated air side components for installations in accommodation areas, engine rooms and machinery spaces — as its U.S. East Coast representative. In addition to its high-pressure air conditioning system, Adrick will present the Danish company's fire-fighting system as well. The FiFi system

has been developed to meet the requirements of SOLAS MSC/Circ. 913 for the local protection for fires within machinery spaces. The Novenco Local Application system is approved by major classification societies and the U.S. Coast Guard.

The territory is large, and encompasses the entire U.S. east coast extending west around the Great Lakes to Minnesota, and around the coast of Florida up to East of Apalachee Bay, including the East Coast of Canada.

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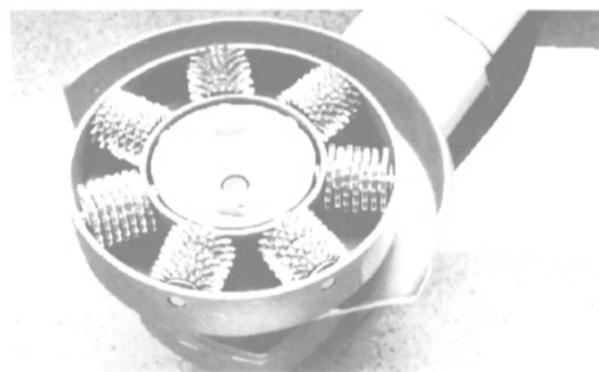


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MariTEL Appoints Smith As President and CEO

MariTEL, Inc. has named Dan Smith as President and CEO, effective February 1, 2002. Smith joins MariTEL from BellSouth, where he has been executive vice president of Latin America North for BellSouth International since 1998. Prior to his assignment at BellSouth International, Dan was vice president of sales and marketing for BellSouth Cellular and earlier, regional vice president of BellSouth Mobility. Dan has also been group vice president of American Cellular.

Wartsila Acquires John Crane-Lips

John Crane-Lips will become part of Wartsila following the signing of the sale and purchase agreement between Wartsila and John Crane-Lips' UK-based parent Smiths Group for approximately \$304 million. The acquisition of John Crane-Lips, which will operate within Wartsila under the name Wartsila Propulsion. Wartsila will gain the brand name Lips, as well as the Deep Sea Seals brand. Smiths Group will retain the name John Crane.

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Thrustmaster Expands Houston Facility

Thrustmaster of Texas has expanded its Houston manufacturing facility by over 65 percent. The expansion now gives Thrustmaster more than 50,000 sq. ft. of manufacturing space, in addition to more than 10,000 sq. ft. of administrative, design, and research space on their six-acre Northwest Houston location.

The expansion, which began with the official groundbreaking and pouring of slab in September, took five months to complete without any interruption in ongoing work. In addition to the new square footage and the new machinery, a 25-ton overhead crane was also added and the size of its spare parts warehouse was also expanded.

Crowley Promotes Miller To Director



Crowley Maritime Corporation has promoted **Mark Miller** to director of Corporate Communications with responsibility for internal

communications, media relations, advertising and marketing communications for the corporation and its subsidiaries, and business units operating around the world.

Miller joined Crowley in April 1995 as Manager of Public Relations and Advertising for the corporation's Jacksonville-based container shipping subsidiary, Crowley Liner Services. In April 2000, he was promoted to manager of Corporate Communications with similar job responsibilities but supporting all of Crowley's business units.

ReeferShip Ltd. Formed

LauritzenCool, Eastwind Transport and Armada Shipping announced the formation of ReeferShip Ltd., a new marketing company that will identify, pursue, and develop business for refrigerated ships controlled by Eco Shipping, Arctic Reefers, and Armada Shipping.

ReeferShip Ltd. is owned equally by its three principals. The company's combined fleet stands at more than 50 vessels with total capacity of about 20 million cu. ft.

Vessels in the fleet range in size from 185,000 to 668,000 cu. ft. Arctic Reefers and ECo Shipping will be kept intact in their present form as pools for large and handy-size refrigerated vessels, respectively.

Eastwind is contributing its reefer vessels of 400,000 cu. ft. and above to Arctic, LauritzenCool is placing its handy-size tonnage under Eco's management, and Armada is through a joint venture with Arctic placing tonnage in both the Arctic and ECo systems. In addition, Eastwind has taken a substantial shareholding in Arctic, while LauritzenCool has increased its ownership interest in ECo.

Finally, ReeferShip vessels from all three participating fleets will be used whenever possible to fill the tonnage requirements of Eastwind Transport and LauritzenCool.

ReeferShip will operate out of Copenhagen and New York. Armada's reefer team will relocate to Copenhagen. ReeferShip will also have access to all of Eastwind's and LauritzenCool's marketing and agency offices worldwide.

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A.R. Larsen To Offer Turnkey Interior Services

A. R. Larsen Company, Inc. of Redmond, Wash., a provider of galley equipment, design and custom fabrication in the Northwest, has expanded its capabilities to include complete standard and custom galley services to the marine industry.

Since 1985, A. R. Larsen has provided services for new and renovated galleys on commercial ships, fishing vessels, factory trawlers, oil rigs, cruise lines, passenger ferries and pleasure crafts around the Pacific Rim and beyond. For the past year, the company has been closely involved with the construction and renovation of complete galley interiors including joiner bulkheads and

doors, ceiling systems, furnishings and fixtures. A. R. Larsen is presently completing custom work and equipment for Northwest passenger ferries and factory trawlers, national cruise ship lines and sportfishing vessels, and negotiating additional projects worldwide.

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The Era of The Electronic Engine Is Here



by David Tinsley,
technical editor

Having already put down a marker for the industry by converting the main engine of one of its ships to full electronic control, Norwegian chemtanker specialist Odfjell has further endorsed the technology by nominating a two-stroke electronic engine from the outset for a newbuild project.

Experience gained with the installation in the 37,500-dwt Bow Cecil, run in wholesale electronic mode for about a year, has convinced Odfjell of the attributes and potential of such a system. It has therefore selected a purpose-designed, electronic version of the MC-C low-speed diesel from the MAN B&W stable for a 37,500-dwt parcel tanker contracted with Norwegian ship-



Norwegian chemtanker specialist, Odfjell, has chosen an electronic version of the MC-C low speed diesel engine from MAN B&W for its 37,500-dwt Bow Cecil.

builder Kleven Floro.

The fully integrated electronic control systems incorporated in the seven-cylinder S50ME-C plant of 10,415-kW (14,300-bhp) obviates the need for the traditional camshaft to actuate fuel injection and exhaust valve mechanisms.

Unlike a standard engine, fuel injection characteristics can be optimized at

many different load conditions, and maximum pressure can be kept constant over a wider load range, yielding benefits in improved consumption and emissions performance across the full operating profile. Ship maneuverability also gains from the lower rotational speed possibilities.

The raft of advantages is especially pertinent to the trading profile of a par-

cel tanker, with its typical multi-port call pattern and relatively high proportion of operating time in harbor waters and running at less than maximum continuous power loads.

The facility to switch to low emission modes, to meet tough local controls governing atmospheric pollution, not least as regards oxides of nitrogen (NOx) and smoke limits, is regarded by Odfjell as one of the strong points of the arrangements.

The 1998-built Bow Cecil had its MAN B&W 6L60MC engine converted from standard, camshaft-based operation to electronic control of key functions in November 2000. After an initial period of alternating between electronic and camshaft drive, the vessel has been operating principally in electronic mode since last March.

The 7S50ME-C prime mover selected for the newbuild chemtanker at Floro, due to enter service in the fall of 2003, will be manufactured at MAN B&W's Alpha Diesel factory in Frederikshavn, Denmark, thanks to recent years' investments in two-stroke production and test facilities at the works.

Freezership of New Order

Evoking the name of a seminal British reefer containership of the 1970s, while incorporating an Anglo-Dutch prefix of the 1990s, the recently delivered P&O Nedlloyd Remuera has put down a new milestone for the industry by virtue of its record concentration of power plugs for refrigerated boxes. Within an all-up

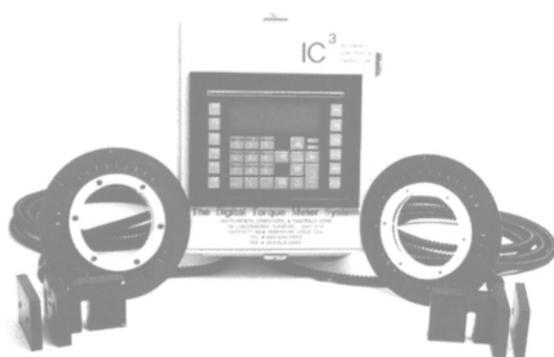
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Rolls-Royce Package Approach Wins Order



Just as the practice of single-sourcing complete packages of equipment and machinery, albeit long applied, has gathered tremendous pace over the past decade in the commercial marine sector, the uptake of functionally-integrated systems has had a signal bearing in driving ship technology forward.

Building on its own track record in the naval field, in particular, and on the long-standing policy of the absorbed Ulstein interests to supply 'coherent' systems to

offshore support ships, Rolls-Royce has landed an integrated ship systems deal spanning an innovative vessel designed to install wind turbines offshore.

Ordered by U.K. firm Mayflower Energy in recognition of an emerging market for ships to build up the many offshore windfarms planned by North European countries, the 426-ft. (130-m) Mayflower Resolution will transport and position parts for up to 10 wind turbines at a time. The design has been conceived to minimize the risks associated with year-round deployment in the North Sea, and features a jack-up capability to provide a stable offshore working platform.

Rolls-Royce has been selected to supply the integrated ship systems, including the entire diesel-electric propulsion plant and also the bridge outfit, including navigation, communications, automation and dynamic positioning.

Although the broad portfolio of Rolls-Royce products will be accessed for the contract, much equipment is being sourced from other manufacturers.

In fact, the U.K.-owned group considers that the order "fits well with the Rolls-Royce strategy of taking increased responsibility for integrating complete ship systems, building on years of supplying comprehensive equipment packages for offshore support vessels."

Mayflower Resolution, which will be constructed at the Shanhaiguan Shipyard in northern China, will be propelled by four Ulstein Aquamaster azimuth thrusters fitted in nozzles, augmented in maneuvering and dynamic positioning mode by three Kamewa Ulstein controllable-pitch tunnel thrusters. Power for propulsion and shipboard services will be primarily met by four gensets, made up of 1,824-kW Mitsubishi high-speed diesels and Newage Stamford alternators.

Mayflower Energy is currently marketing the vessel both to wind energy companies and to the offshore oil and gas industry, and is confident of having contracts in place when the newbuild is ready for operation in spring 2003.

container capacity of 4,112-TEU, the German-owned vessel offers 1,300 slots for 20-ft. and 40-ft. high-cube reefer units of the integral type, claimed to render her the largest reefer cargo carrier worldwide.

She denotes the start of a major reinvestment in the trade out of Australasia.

Although overall vessel size seems modest by comparison with the new generation of 6,000-8,000-TEU boxships phased into other liner trades, P&O Nedlloyd Remuera signifies a substantial advance in shipment capacity relative to the 2,700-TEU ships that have hitherto maintained the company's eastabout traffic from New Zealand to Northern Europe.

Moreover, the high level of both reefer technology and reefer slots encapsulated in the new design has considerable implications for service level and route productivity, providing the basis for further development of the perishable cargo business. A potent Sulzer diesel prime mover of the 9RTA96C model, rated at approximately 70,000-bhp, should ensure a service speed of 23.5-knots, with sufficient reserve to make 25.2-knots if required.

Dubbed the Albatros

S class, and built by Samsung Heavy Industries, P&O Nedlloyd Remuera leads a series of seven ships, all of which are committed to P&O Nedlloyd on initial eight-year charters from Hamburg-based contractual owner Claus-Peter Offen. They will replace 10 blown-air, insulated reefer container-carrying ships used by the line in the various trades involved.

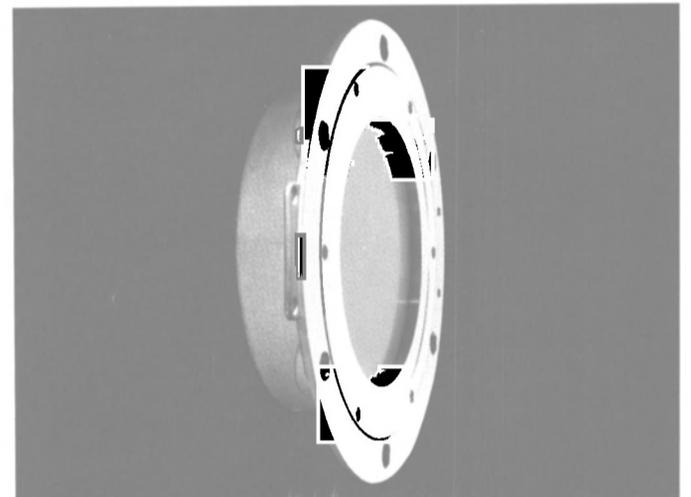
Partner operator CP Ships is due to add a further three vessels of similar design, booked with the Daewoo yard, making for a prospective fleet of 10 compatible ships, most of which should be in commission by the year's end.

The immediate intention is to ensure dependable, fixed-day weekly sailings for exporters and importers on the Australia/New Zealand, Europe and U.S. trade route.

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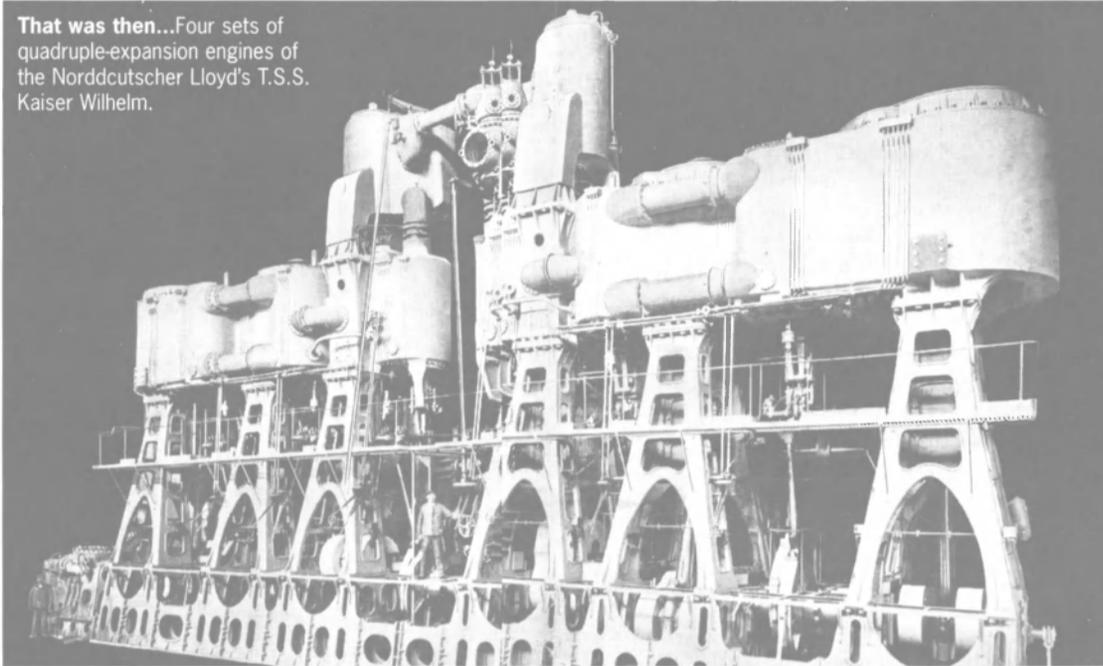


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Innovation in the Engine Space

Turn of the century photographs of dirty, hot, cramped machine spaces filled with boilers, engines, gratings and bulkheads begin to tell the story of the state of steam power just after the birth of the propeller. Oil squirt cans, dancing connecting rods, and sweating coal passers and firemen characterized the engine rooms of the late 1800s when paddle wheels were gradually being replaced with the screw.

Pioneers of screw propulsion experimented with an assortment of propeller designs before commercial application of the concept began. The first screw-driven vessel in the U.S. Navy was the Princeton, built in 1843 by John Erickson. Even though the prop had many advantages over the paddle wheel, the fact that during the 1840s and 50s most ships were still made of wood posed significant challenges in terms of power, thrust, and managing the final drive to the propeller shaft.

In terms of engine design and construction, screw technology of the 1850s was much the same as paddle propulsion. Engineers tried a number of existing prime movers including beam, oscillating, and horizontal engines before finally deciding that the vertical direct-acting engine was the best solution. One of the first installations of a beam engine turned sideways was by shipbuilder Todd & MacGregor who laid down a 1,600-ton iron steamer in

1849. The ship's overhead beam engine had two 66 in. bore by 5 ft. stroke cylinders, each connected to its own beam by means of a connecting rod.

By 1862, the two-cylinder geared oscillating engine was adopted for the Cunard screw steamer China. The cylinders were 80 in. diameter and the stroke 5 ft. 6 in. The gear wheels, more widely used than chain drives, contained four rows of wooden teeth, these being less noisy, easier to cut and less of a problem to lubricate than metal teeth.

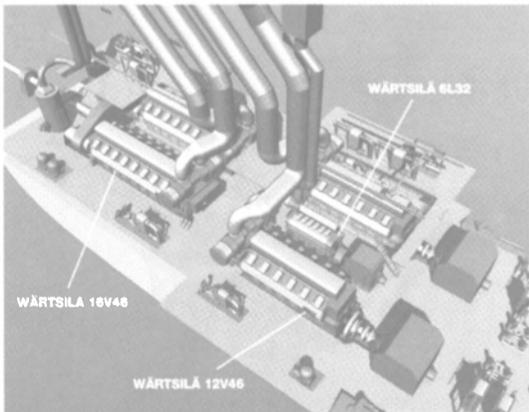
Horizontal engines were the first truly successful plants for screw-driven vessels. Initially, readily available horizontal engines used for naval steamers were fitted into merchant ships. However the limited width of many merchant ships presented problems with fitting direct-drive horizontal engines.

The solution, according to many builders, was a vertical arrangement. By the mid-1800s, the vertical inverted direct-acting condensing engine became the main engine used on nearly all screw-driven vessels. Cylinders of an inverted engine were mounted on supports bolted to the bedplate, the piston rod of each cylinder passing through its lower cylinder cover and connecting with a crosshead running in guides attached to the cylinder supports. When owners realized that the inverted cylinder engine saved on engine-room floor space, allowing for more cargo, cabins or coal, inverted cylinders arranged vertically above the crankshaft became the norm for screw propulsion.

Compound and Triple Expansion Engines

Until this point all steam expansion took place in one cylinder. But with ongoing improvements in compound engines, the days of the simple expansion engine were numbered. By the 1870s compound engines were considered reliable, and the fuel saving advantages of compound expansion were clear. The first of these engines operated at about 60 psi while later compounds would use pressures of 80 to 100 psi. During the early years,

(continued on page 43)



This is now...The RoPax vessel, (as featured on page 47 of the January 2002 edition of MR/EN) houses Wärtsilä EnviroEngines equipped with Common Rail and compact SCR units.

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Landmark LNG Carrier Launched by IZAR



By Greg Trauthwein

To great fanfare, Inigo Tapias, the new 138,000 cu. m. liquefied natural gas (LNG) carrier was launched on January 29 by IZAR's Sestao yard in Bilbao. The ship — standing in testament to the 1,213 workers at Sestao who physically made the ship a reality as well as the underlying strength of the IZAR company — is a highly significant one for many reasons, both technical and business. The 933-ft. (284.4-m), 19.5 knot ship embodies the hopes of a shipbuilding nation that is seeking to re-establish its presence in the LNG niche that it has not occupied for more than three decades, as the production of gas ships generally lays in the hands of Far East builders today.

The ship is unique in many respects - not the least in that it was launched into the water, sliding down its building way in the traditional manner in the presence of thousands of guests, both local residents and VIPs from the shipping world. It is the first of the series of five (two to be built at Sestao, two to be built at Puerto Real, and the fifth still undecided) that takes advantage of the millions invested in updating the shipbuilding technology and capacity at Sestao. In the last two years, the shipyard in Sestao has received: new flow of fabrication; new curve-blocks lines; new light-blocks lines; new sub-assembly curve blocks lines; additional lifting capacity; and new warehouse building construction. IZAR, according to company officials, wants to differentiate itself with technology, as it is the only way to be and stay ahead."

"Decade of Gas"

To say that competition for a slice of the gas transportation market has heated up is a vast understatement. With the projection for increasing amounts of gas versus oil projects rising in the near and long-term, companies are jockeying for position to build and operate these high value ships. IZAR officials, in planning the deployment of the vast armada of shipbuilding facilities and capabilities available around Spain upon the consolidation of Astilleros Espanoles and Bazan into the current company, identified the coming future as "the decade of gas."

The IZAR LNG ship is unique in many respects, but its

signature is its longer, more slender hull, as compared to other vessels of this type and capacity. With a length of 933 ft. (284.3 m) and a breadth of 139 ft. (42.3 m), the vessel is designed to be more speed efficient compared to vessels from other makers, giving it a slightly higher speed with the need for less propulsion power. This, of course, translates to dollars saved.

IZAR, upon determining that the gas market would be central to its future shipbuilding plan, licensed the right to build all three major types of LNG gas transport systems; aluminum spheres, prismatic tanks, and membrane. The Membrane NO 96 — GTT system was chosen, in part because it is the most common of all systems, with reliability heavily favored by the shipowner. However, an added benefit was the fact that it is the membrane system that best allows the longer, more slender hull delivered by IZAR. Regardless of the method, the process of constructing these mammoth vessels' tanks is a time-consuming venture, as it will take a full 17 months for the vessel to be complete. Designed for a 40-year fatigue life (there is no high-tensile steel used in construction), the ship is truly the embodiment of international shipbuilding prowess, as IZAR forged deals and relationships around the globe to help bring the ships to fruition. The shipyard has forged ties with the following companies for these purposes:

Name MHI (Mitsubishi Heavy Industries)
Technology Propulsion Equipment supplier and engineering technical assistance for propulsion system.

Name GTT (Gaz Transport & Technigaz)
Technology License to use Membrane NO 96 system and engineering technical assistance for Cargo Containment System (CCS) and Cargo Handling.

Name STII
Technology Subcontractor for mounting and installing Cargo Containment System (CCS).

Name KONGSBERG-SIMRAD
Technology Subcontractor for Automation and engineering technical assistance.



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LNG Carrier Inigo Tapias was launched at IZAR Sestao shipyard on January 29, 2002.



While pricing information was not available, IZAR assures that, in looking at the complete lifecycle of the ship, pricing is competitive on the international marketplace.

Inigo Tapias and its four sister ships were built to be compatible with these 12 ports of call, as required by RYPF, the charterer: Bilbao, Barcelona, Huelva, Cartagena, Boston, Penueles (Puerto Rico), Bonny (Nigeria), Das Island (UAE), Point Fortin (Trinidad & Tobago), Bethouia (Algeria), North West Shelf (Australia), Ras Laffan (Qatar), Qalhat (Oman). In total, for the five ship series, there are two charterers, RYPF and U. Fenosa; and three shipowners, Naviera F. Tapias, Elcano and Knutsen/Marpetrol.

In total, for the five ship series, there are two charterers, RYPF and U. Fenosa; and three shipowners, Naviera F. Tapias, Elcano and Knutsen/Marpetrol. Following is the delivery schedule:

Ship#	Charterer	Yard	Delivery
1	RYPF	Sestao	Aug. 2003
2	RYPF	Puerto Real	Nov. 2003
3	RYPF	Sestao	Feb. 2004
4	Fenosa	Puerto Real	July 2004
5	RYPF	undecided	Dec. 2004

The yard currently has four additional "slots" open for ships of this size and type for deliveries in December 2004, July 2005, October 2005 and March 2006, and is aggressively trying to fill them.

Though it has been 32 years since Spain has built an LNG carrier, it is interesting to note that the last vessel delivered, Laieta, is still providing reliable service to RYPF on its Algiers to Barcelona route.

Inigo Tapias Main Particulars

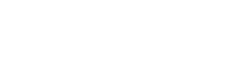
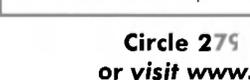
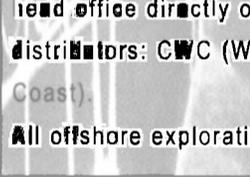
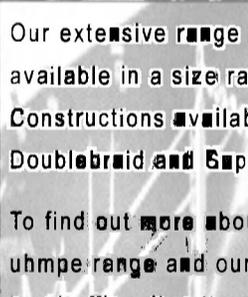
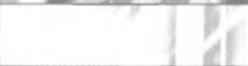
Length, o.a.	933 ft. (284.4 m)
Length, b.p.	889 ft. (271 m)
Breadth	139.4 ft. (42.5 m)
Depth to main deck	83.3 ft. (25.4 m)
Depth to trunk deck	105.6 ft. (32.2 m)
Draft	37.4 ft. (11.4 m)
Air draft	179.3 ft. (54.65 m)
Ballast	49,900 cu. m.
Fuel	7,900 cu. m.
Lube oil	100 cu. m.
D.O.	470 cu. m.

F.W.	1,000 cu. m.
Cargo	138,000 cu. m.
Deadweight	68,200 tons
Speed	19.5 knots
Sea trial speed	90% MCR = 21 knots
	(Ballast conditions)
Fatigue life	40 years W-W
Discharge time	12 hours
Cargo containment system	Membrane NO 96 - GTT
Complement	40 persons
Propulsion	Steam Turbine
	28,000 kW @ 83 rpm

Reduction gear	Double reduction tandem type
Main boilers	2 x 65 tm/h @ 61.8 kg/cu. cm.
Propeller	Fixed, 5 blade, 8.7 m diameter
Turbine	Kawasaki-Izar
Boilers	Mitsubishi
Turbo Generators	Mitsubishi
Diesel Generators	MAN-Wartsila
Auxiliary charge machinery	Cryostr
Charge pumps	Ebara
Feed pumps	Shinko
Automation	Konsberg-Simrad
Classification	Lloyd's Register

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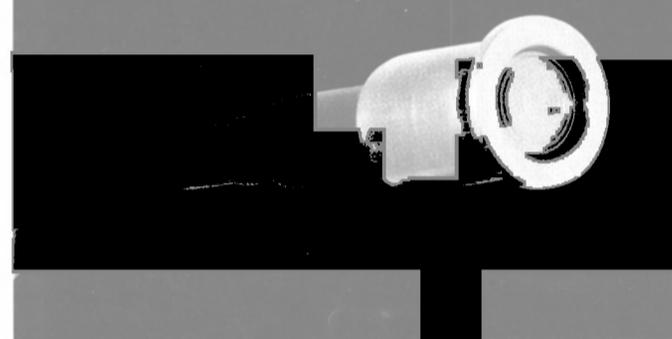
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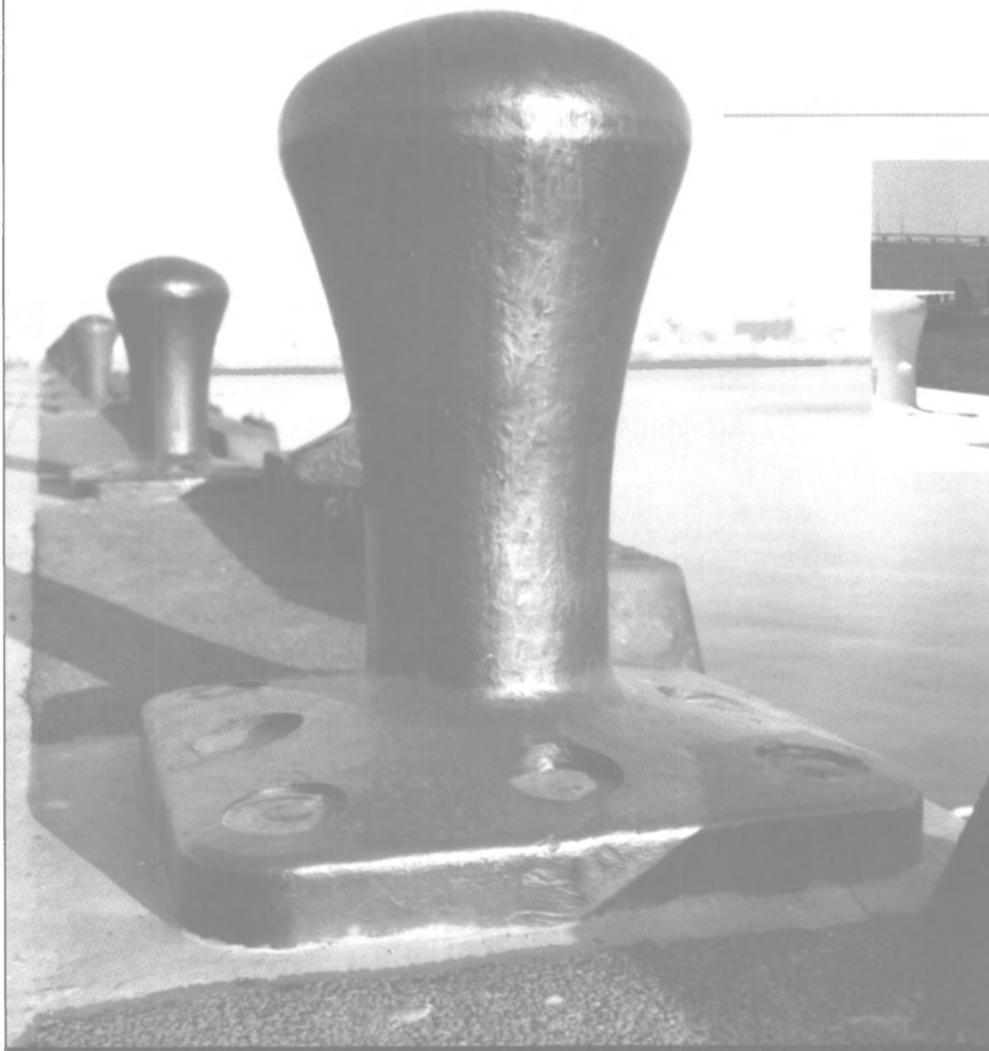
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BV backs S&T Ecomax Tanker Design

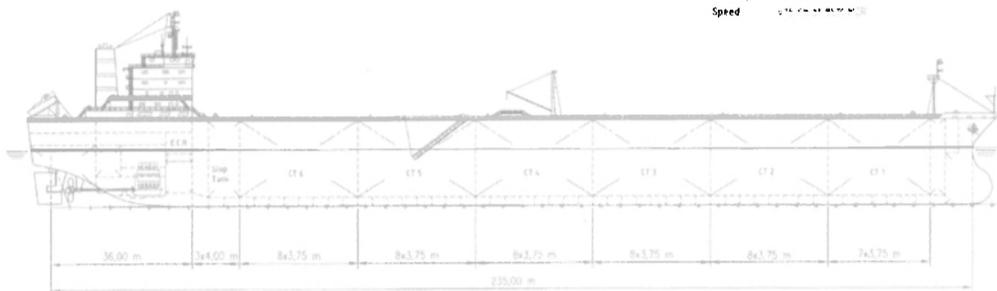
SCALE
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CRUDE OIL TANKER - 60,500 DWT

Profile

Main Particulars

LOA . 248.00 m
LBP . 235.00 m
B . 42.00 m
Depth . 23.20 m
Draft . 14.90 m
Cargo capacity 12300 m³
Main Engine 16,800 kW (per shaft)
Speed 16.5 knots



Innovation on the tanker front comes from many venues, and one of the latest — the Ecomax tanker design — is offered from the minds and experience of a pair of French companies, classification society Bureau Veritas and shipowner Services & Transport. The new Aframax tanker design is intended to address all the major causes of large oil spills, and features two independent engine rooms, power supply systems and steering gear, increased hull scantlings, reduced high tensile steel content, duplicated navigation equipment with off-track monitoring and full inerting of all ballast spaces.

"While smaller oil spills are getting less frequent, the occurrence of large spills due to tanker accidents is remaining constant," says **Philippe Anslot**, technical director of Services & Transport. "When we looked at the underlying causes of those spills we saw that the four main factors were machinery failure, navigation error, fire and explosion and hull damage. So we set out to design a tanker that would be much less likely to have an accident due to any of those factors. The Ecotanker is the result."

The Ecotanker design is based initially on an Aframax vessel, but studies have also been done for larger and smaller vessels. Length is slightly increased over conventional aframaxes, but other dimensions remain much the same.

The possibility of machinery and systems failure is addressed by duplicating the engine rooms, stern tubes, propellers, steering gears and rudders. In the event of breakdown of one power plant or system, the vessel will still be able to operate in complete safety, and make 12.5 knots as opposed

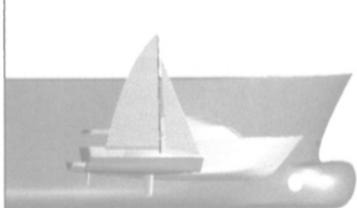
to 16.5 knots with both slow speed diesels functioning. Navigational failures are tackled by building in a high level of redundancy to the equipment, applying ergonomic techniques to the bridge layout and design, and by the installation of a newly-developed Automatic Navigation and Tracking System, which will warn of any off-track deviation. Fire and explosion risk is reduced by efficient and permanent inerting of all ballast and double hull spaces, using the Helsingborg-developed Vent 2-D system, and by installation of double gas sampling systems in the ballast tanks adjacent to cargo spaces.

Hull failure is addressed through the reduction of the use of high tensile steel to 32 percent from a more typical 48 percent, a move that combined with increased attention to fatigue details, increased scantlings particular at main deck level, and coating all ballast tanks and sensitive areas of cargo tanks, is meant to make a more robust ship, capable of providing a lifetime of safe navigation.

Jean François Segretain, head of BV's development department, says, "Our new BV Rules 2000 are unique in giving tankers increased deck scantlings to take account of ultimate hull girder strength. Combined with the attention to fatigue and corrosion, and the detailed attention to making survey and inspection easier, built into this design, we have come up with a 40 year world-wide ship, much stronger than those being built today." Overall build cost is estimated to be 25 percent in excess of a standard Aframax tanker.

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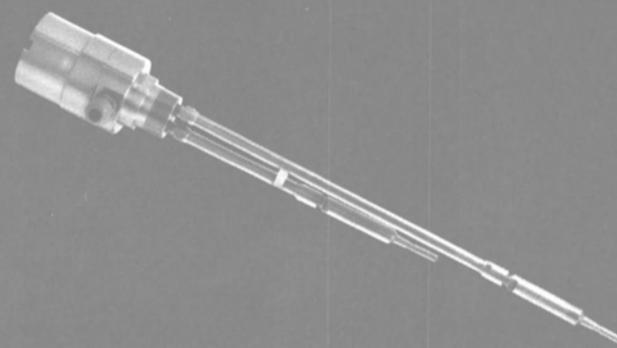


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March, 2002

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The Sea Switch Two uses a fully static system that is based on the propagation of an acoustic wave into a metallic rod. A piezo-electric sensing element produces a wave along the rod. As the liquid reaches the sensing element the oscillation stops and the alarm is activated.

The Sea Switch Two sensor detects high, high-high, or low level in any liquid with an alarm output given by a dry contact or current loop change 6-18 mA.

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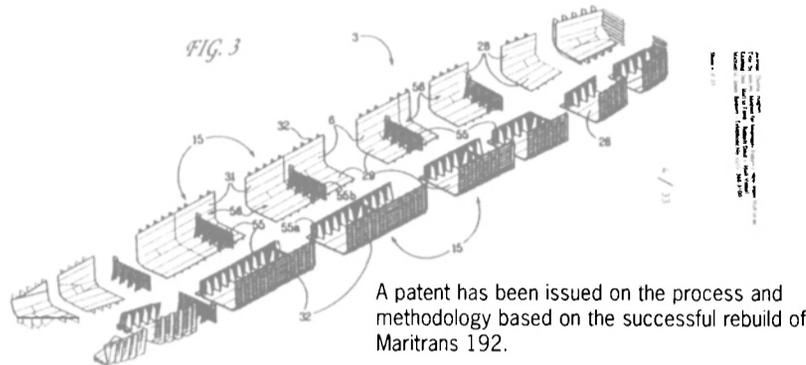
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Maritrans Continues Double Hull Program

Despite a recent legal setback in which Maritrans was denied its motion to classify the mandatory double-hulling of tankers as a "taking" of its single hull vessels, Maritrans continues to be one of the more progressive U.S. owners in ensuring that its fleet of vessels will be up to code to meet OPA 90 demands. It was December 1998 that *Maritime Reporter & Engineering News* initially recognized the superior Maritrans solutions, naming Maritrans 192 as a Great Ship of the year. This was unique in that Maritrans 192 was not a new ship at all, rather an innovative double hulling of an existing single hull barge, an internal double hull rebuild which was patented in 1999. To date, Maritrans reports that Maritrans 192 and Maritrans 244 are rebuilt and operating flawlessly, while Maritrans 252 recently joined the fleet.

"We are already assembling the innerbottom plates for Maritrans 250, which was contracted last summer," said **Greg Robinson**. "All of our rebuild work has been placed with Tampa Bay Shipyard."



French Snag LNG Order

In February Gaz de France ordered a 74,000 cu. m. LNG carrier from Chantiers de l'Atlantique, with an option for a second vessel. The French have maintained a strong hold on this high-tech, high-value ship type despite the general migration of gas ship orders to the Far East.

In particular, Bureau Veritas helped develop the concepts for the vessels, and developed unique new rules to allow the yard and owners to break new technological frontiers.

The ships have two key innovations. The traditional steam turbine plant will

be replaced by a low-pressure dual fuel diesel electric system, and the cargo gas will be carried in the new GTT CS1 membrane system.

BV developed the safety concept of the low-pressure dual fuel diesel/gas engine, and has issued new rules for such engines. These are unique, and set new standards for this type of machinery plant. BV's consultancy division, Tecnicas, worked with GTT on the complex calculations and modeling needed to develop the cost-effective CS1 containment system. CS1 was granted BV concept approval earlier this month.

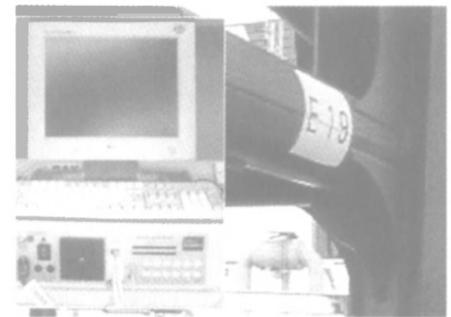
The dual fuel diesel electric propul-

sion system is designed to offer advantages.

For one, it is designed as a more compact installation, allowing cargo space to be maximized in the hull. In addition, it is designed to reduce gas consumption compared to the conventional turbine installations. The CS1 containment system reportedly combines the best features of the proven Mark III and NO96 membrane systems. It offers increased strength, faster fabrication, and a cost reduction of 15 percent compared to existing systems.

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LR: Hearing is Believing



Lloyd's Register has developed jointly an acoustic emission monitor providing a unique approach to crack detection and monitoring.

When cracks in a structure grow, they produce ultrasonic stress waves, known as acoustic emissions (AE). Detection technology, based on AE, has been known for many years, but to date has not gained widespread industry acceptance. Recent technological advances, however, coupled with constant equipment evolution, helped to ensure that a level of maturity has now been reached where it can be used reliably for structural assessment and monitoring purposes, particularly in the context of propagating fatigue cracks. LR, in association with Airbus and Ultra Electronics Ltd., Ocean Systems, developed a new generation AE-based equipment.

Known as BALRUE, it is touted as a novel AE monitoring system, designed with the specific objectives of first locating, and then determining the level of activity associated with fatigue cracks. The system is flexible, allowing for continuous or intermittent monitoring depending on the conditions.

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LNG: Partial Loading Ability Useful

Samsung Heavy Industries' new 138,000-cu. m. Technigaz Mk III membrane LNG design has been approved for partial loading by the American Bureau of Shipping (ABS), according to ABS' most recent edition of *Surveyor*. The ability to run these high-value ships with partial load — and to effectively maintain stability of ship and tank given the sloshing — is viewed as particularly critical as a glut of new LNG carriers on order could lead to a spot market for the ships. The new design has also been approved for a 40-year fatigue life by ABS.

The new LNG carriers being built in Spain at IZAR, the first of which was launched in late January and profiled on page 28, are also able to be operated in partial load mode.

These 138,000 cu. m. capacity vessels utilize the membrane NO 96-GTT cargo containment system, and are classified by Lloyd's Register.

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The Marine Safety Committee approved amendments to paragraph 1.2.4 of the Revised standards for design, testing and locating of devices to prevent the passage of flame into cargo tanks in tankers (MSC/Circ.677), as follows:
"1.2.4 Devices should be tested and located in accordance with these standards. In addition to these standards, pressure/vacuum valves should comply with ISO standard 15364:2000 "Ships and marine technology - Pressure/vacuum valves for cargo tanks"."

The PV Valve installed on or after 1. July 2002 Should be meet the requirement of ISO 15364.

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- No accumulation of vapor & liquid
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Benefits of T2000-TFC-01

- High accuracy & Responsibility
- Protect operator
- Prevent Environmental pollution
- Easy construction
- Easy operation & maintenance

Type approved by : EC, USCG, ABS & the Korea Administration

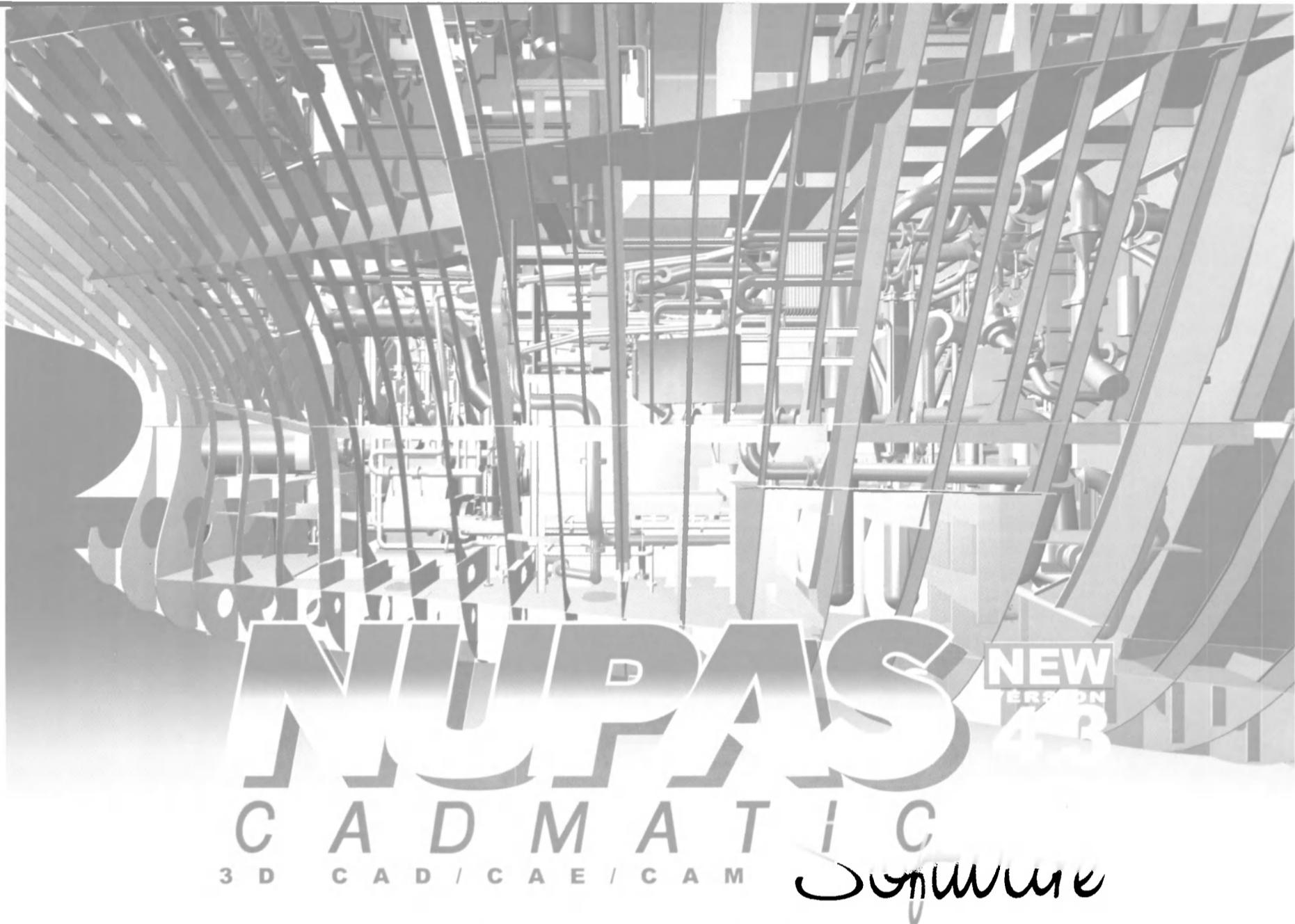


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NACE Keeps the Corrosion Out of Coatings

NACE International, The Corrosion Society, is a professional technical society dedicated to the prevention and control of corrosion. The organization offers technical training and certification programs, sponsors conferences, and produces industry standards and reports, publications and software. Established in 1943, NACE has more than 15,000 members worldwide, provides education, and communicates information to protect people, assets, and the environment from the effects of corrosion.

Over the last three years NACE has been working closely with the Federal Highway Administration and CC Technologies to complete the federal funded Corrosion Costs and Preventive Strategies in the United States. The Study, which will be available to the public in May 2002, will focus not only on the cost of corrosion, but also go into the details of the benefits of corrosion control and prevention. This is an important component of the Study and will be a key tool for industry and government. With the total cost of corrosion to the U.S. amounting to \$276 billion per year, the preliminary findings of the Study show that for the marine sector the annual cost of corrosion is over \$2.7 billion — addressing the costs associated with waterways, ports, and ships. It should be noted that this is a low estimate since the corrosion costs of harbor and other marine structures are not included. The key method for controlling these costs is the utilization of coatings.

As a leading resource for corrosion prevention NACE has an expanded library of publications related to coatings, and more specifically marine coatings, and an more than 70 standards/reports related to coatings.

On-the-Job Training is Key

Coatings technology during the last 10 years has had



a dramatic increase. The industry has gone from relying on multicoated thin-film technology to single or dual coat thick film technology. Along with these changes has come a greater requirement of surface cleanliness, shorter recoat times, and greater control of the curing process.

Despite the pressures of adopting these new coating technologies, the general consensus has had a positive impact. One of which was a greater need for training to combat coating failure. For more than 20 years NACE has provided quality training in the coatings industry with its Coating Inspector Program.

Incorrect application is a leading cause of coating failures; as a result, the use of a third-party coating inspector is vital to any coatings job. The comprehensive NACE Coating Inspector Program prepares coatings professionals for the demanding role of being a third party coating inspector as well as being a part of an overall job team.

Inspectors play an integral role on a job site by verifying that correct materials are applied according to the owner's specifications. Coating inspectors check for proper surface preparation and ambient conditions at the paint application site. They also make sure that the materials have been properly applied by taking measurements and conducting tests on the finished coatings works. Detailed documentation and effective communication skills through a project are the keys to an inspector's success.

Those who work in the protective coatings industry find it helpful to know what trained coating inspectors know — and what they are looking for on a job site. A solid understanding of inspection fundamentals will help contractors, blasters, paint applicators, fabricators, and specification writers do better work as part of a coatings application project.

Facility owners, maintenance personnel, and technical sales reps will also benefit by understanding the inspector's point of view.

NACE offers CIP Session 1, which is an inten-

sive presentation of the basic technology of coating application and inspection over a full 60 hours of personal instruction and practice.

This course provides both the technical and practical fundamentals for coating inspection work on structural steel projects.

This course involves lectures, demonstrations, and hands-on training with equipment and instruments in an actual working shop. Multiple qualified instructors present the material and the class is concluded with both written and practical examinations.

Learn "how to" information that can be applied immediately to your job:

- Intensive and personalized training;
- Gain the knowledge and personal experience of the industry experts who developed and teach the program;
- Enhance your opportunities and performance in a corporate setting or as an independent contractor;
- Network with colleagues in your industry;
- Learn how to effectively work with all levels of management in a non-competitive setting.

This session is designed for coating inspector trainees but will also provide project engineers, quality assurance managers, contractor, painters, technical sales representatives, blasters, paint applicators, maintenance personnel, and other interested persons with a basic understanding of coatings application and inspection. There are no prerequisites to attend this class.

An additional field lab in the classroom will familiarize students with instruments and equipment and focus on instrument calibration, environmental testing, and the proper use of visual standards.

Students work in teams at the field lab and on a variety of in-class problem-solving exercises. A sub arctic exercise opens up discussion about how to deal with difficult problems and balance group interests, and how these skills translate to the inspection job site.

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Antifouling Paint Helps USCG Sink Maintenance Costs

The United States Coast Guard (USCG) has reduced maintenance costs by minimizing the time spent on ship bottom refurbishing, with the help of E Paint Company of East Falmouth, Mass.

E Paint SN-1 coating provides USCG vessels with well-balanced control over a wide array of common soft and hard fouling species. Vessels coated with E Paint SN-1 solventborne antifouling

paint can operate for up to two years before they must be hauled, pressure-washed and repainted. This is longer than is possible with virtually all approved non-metallic biocide antifoul-

ing paint. Extending the interval between maintenance significantly reduces vessel downtime.

This combination of efficacy and minimal threat to the environment is achieved by a dual-action biocidal system that combines E Paint's patented photoactive technology and a booster biocide. The system keeps ship bottoms smooth and clean without leaching harsh toxicants, which persist in the environment.

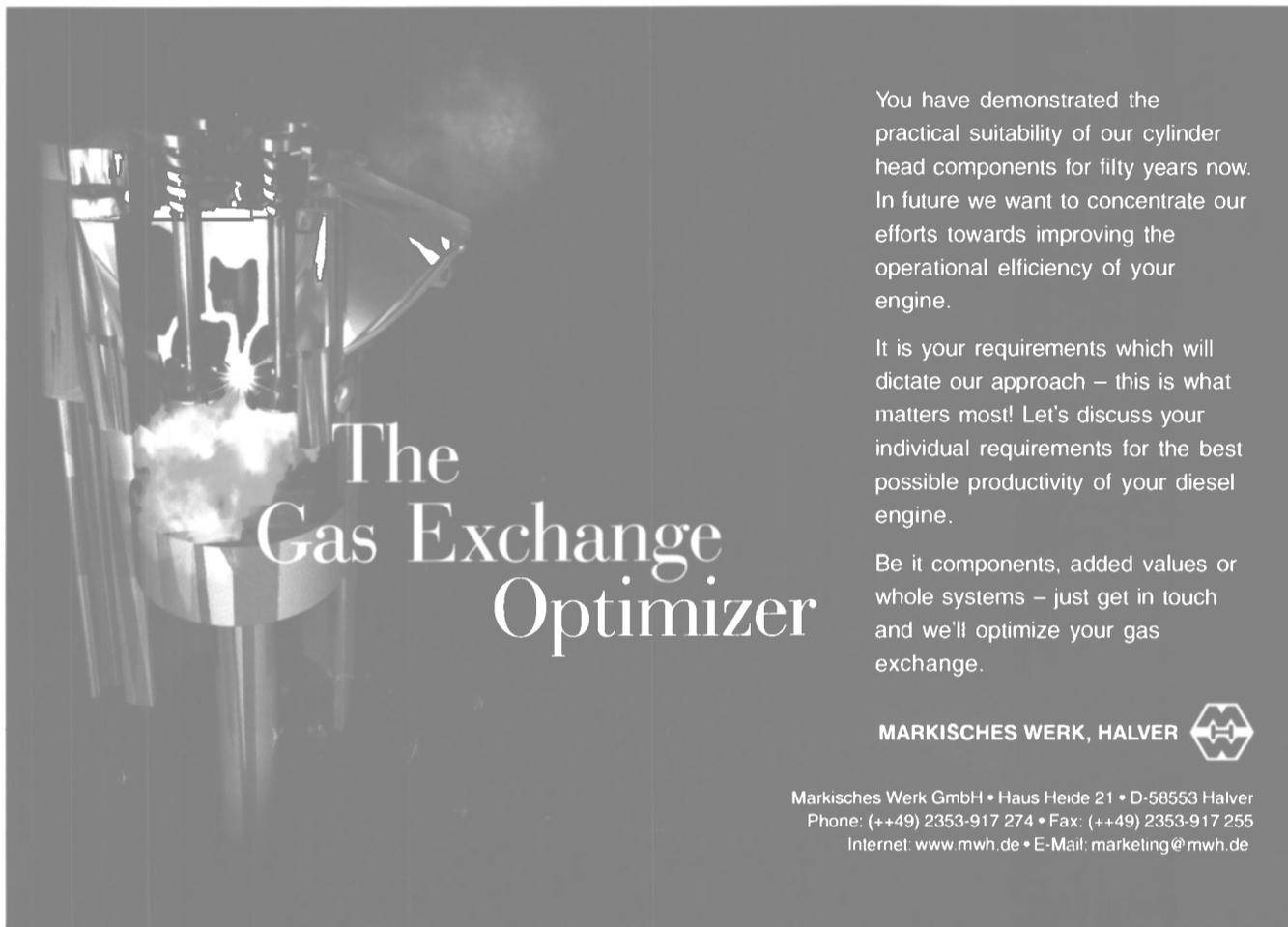
"Sunlight and water are photochemically combined by our paint to produce hydrogen peroxide, a potent antiseptic, on the paint's surface," said **Christine Greene**, Sales and Marketing Director at E Paint Company. "The hydrogen peroxide constantly bleaches the hull, discouraging the accumulation of fouling organisms. While discouraging the settling of a wide variety of fouling organisms, hydrogen peroxide has the additional benefit of decomposing into oxygen and water. The booster biocide works in combination with the photoactive surface and is required in warm water environments, which are particularly congenial to the growth of foulants. To qualify for this role, a biocide must be very effective against both hard and soft fouling species, especially algae, and should not present any undue hazard to the aquatic environment."

To meet these requirements, E Paint Company chose SEA-NINE 211, an isothiazolone biocide specifically developed by Rohm and Haas Company for use in heavy-duty antifouling paints. SEA-NINE 211 biocide controls such fouling organisms as algae, bacterial slime, barnacles, tunicates, tubeworms, bryozoa and diatoms. Equally significant, SEA-NINE 211 biocide provides excellent performance while posing a minimal long-term environmental threat. SEA-NINE 211 compound degrades very rapidly in seawater, binds to sediment instead of remaining in the water, and does not accumulate in the tissues of marine animals. Because of the environmentally-positive performance features of SEA-NINE 211

E Paint SN-1 antifouling paint has been applied to the aluminum hull of the Safe/Sea Savior, a new state-of-the-art, 33-ft. (10-m) rescue/tow boat.



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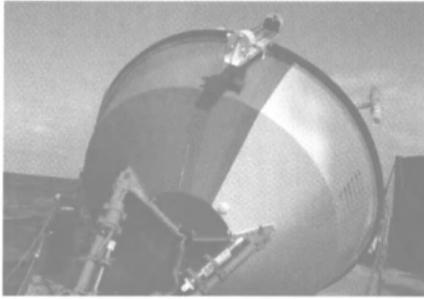
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E-Paint Co.'s SN-1 antifouling paint has controlled biofouling organisms on many aluminum-hulled vessels of the USCG.

marine paint antifouling agent, Rohm and Haas was the recipient of the first United States Presidential Green Chemistry Challenge Award in the category of Designing Safer Chemical Products.

E Paint SN-1 coating was formulated specifically for the USCG to be environmentally compliant without sacrificing effectiveness. Exhibiting low VOC content, positive effectiveness and environmental effectiveness has led to E Paint SN-1 to becoming the only US EPA-approved, biocide-containing paint authorized for use on all aluminum-hulled US Coast Guard vessels.

"Especially designed for use in rough weather, the Coast Guard's motorized lifeboats are precisely balanced to right themselves if capsized. If the buildup of fouling organisms is not controlled, it can adversely impact the balance, and thus, the self-righting properties of these boats, a definite safety hazard," said Greene.

Other agencies, such as the Woods Hole Oceanographic Institution, Channel Island National Park Service, U.S. Army Corps of Engineers and National Oceanographic Atmospheric Administration to not only use E Paint SN-1 on their aluminum vessels, but also on buoys and underwater equipment exposed to biofouling. In gaining Coast Guard business, E Paint SN-1 paint supplanted coatings made with tributyl tin oxide. E Paint SN-1 antifouling coatings are currently EPA-registered for use by the U.S. Department of Defense, U.S. Coast Guard, U.S. Army Corps of Engineers, U.S. EPA Research Vessels, National Park Service Vessels and

Oceanographic Research Vessels.

What's Next?

E Paint Company, with support from the National Science Foundation, has developed several new materials to improve the efficiency of peroxide production. One of these materials, a proprietary porphyrin, is similar to chloro-

phyll used by plants for photosynthesis. Improvements in the coatings formula allow for longer life and a smoother surface. Another promising new product under development is a waterborne barrier coat paint characterized by ease of application and excellent protection of the substrate. The future is in water-

borne coatings. They will replace the high VOC solventborne barrier coats, primers and antifouling paints. Current water-based coatings have been plagued with difficulties ranging from adhesive failure to cracking.

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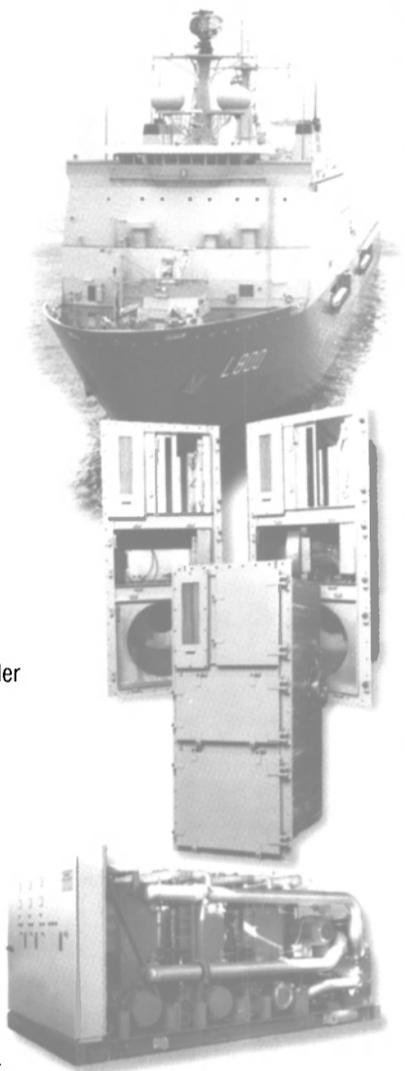
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NSRP Projects Show Impressive Results

NSRP ASE sponsors a variety of R&D projects that address lean initiatives — some focusing on new construction and others on repair. One notable lean repair project that has demonstrated rapid pay-back and implementation involves the surface preparation process.

Traditionally, about 25 percent of ship repair work has focused on surface preparation processes, and roughly 67 percent of surface preparation work involves non-value-added activities, according to industrial engineering time studies from Atlantic Marine. Through an NSRP-sponsored Ultra-High Pressure Water Blasting (UHPWB) project, Atlantic Marine is achieving substantial process improvements and related savings in time and money.

Interim statistics show a 22-28 percent reduction in total life cycle costs using Ultra-High Pressure Water Blasting on a recent destroyer project over the project's baseline — a destroyer earlier this year. Specific metrics include:

- Overall process productivity — improved by more than 38 percent
- Blasting gun on-time — doubled from 24 percent to 47 percent
- Setup time — cut in half
- Wait time — dropped from 42 percent to 19 percent
- Labor per sq. ft. — 38 percent reduction
- Environmental disposal cost/gallon — 94 percent reduction (expected in near term).

A November demonstration in Jacksonville showcased results to date of the project to U.S. shipyards as a means of quickly transferring this knowledge throughout the U.S. industry. The shipyard compared statistics from similar water blasting jobs on two sister warships, the USS Spruance (DD-963) and the USS Obannon (DD-987). The Spruance underwent interim dry-docking availability a year ago when the project was just getting underway, which resulted in some substantial man-hour overruns for the surface prep process.

"This project has had a significant



impact on increasing our competitive position in the surface preparation process of military and commercial ship repair," said **Ed Fleming**, president of Atlantic Dry Dock Corp. in Jacksonville. "It has allowed Atlantic Dry Dock to compete with the more efficient dry blasting operations while reaping the environmental benefits of water blasting."

Contributing to the overall success of the hull blasting and painting effort on Obannon was the "lean" detailed plan the workers followed to prepare, blast and paint continuously from bow to stern with minimal delays and interruptions.

Given the significance of surface preparation and coating in many interim docking schedules, these time reductions have the potential to directly reduce time in dock and thus return the warship asset to the deployment-ready status more quickly.

Ergonomic improvements include a "Gun Rack" to support the blasting gun that takes the stress off the worker, and a "Crawler" that supports the worker in reclined positions and can be adjusted in many different angles. As part of the UHPWB project, Atlantic Marine is also tackling the environmental protection costs associated with surface preparation. To reduce the cost of disposing of contaminated blasting water, the team assessed options and selected the Electro-Pulse System to remove "metals" which remain after primary cascade sedimentation has been accomplished.

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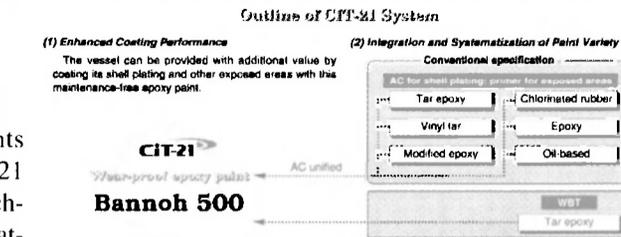
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Chugoku Marine Paints Develops New Hull Coating

Chugoku Marine Paints has created CIT-21 (Chugoku Innovated Technology 21), a new hull coating system intended for rationalization of and labor saving as it concerns hull painting work and alleviation of the load placed on the environment.

Since different parts of a hull require different coat performances, such as specific paints and coat specifications, a great variety of paint types are therefore used. Requirements include the resistance of the hull bottom to fouling, anti-corrosiveness of holds and ballast tanks, and weatherproofness of the superstructure and decks. The paints used can be classified by material into alkyd resin, chlorinated rubber, vinyl resin, epoxy resin and tar epoxy paints, and by function into the primer — brown coat and top coat.

By far the most significant feature of CIT-21 is that all areas — including shell plating, decks, superstructure, holds and ballast tanks — can be collectively coated with a wear-resistant all-purpose epoxy primer known as Bannoh 500. This system, which is reportedly the first of its kind worldwide, uses a retouching system featuring a simplified coating arrangement. Its environmentally friendly features include tar-free highly anti-corrosive coating, non-use of solvents and tin-free anti-fouling coat.



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TurtleSkin WaterArmor Receives U.S. Patent

Warkwick Mills' TurtleSkin WaterArmor personal protective equipment (PPE) for waterjet operators has been tested and approved for CE Marking certification at pressures as high as 40,000 psi. Tested in Detroit, Mich., the safety suit also received a patent for its innovative design, which allows flexing at all joints. Designed to offer superior protection while offering exceptional flexibility and comfort, TurtleSkin WaterArmor is comprised of a layered system of patented TurtleSkin fabric — a fabric that has the tightest weave ever achieved in Kevlar fiber.

Widespread throughout the U.S., the suit is also being introduced throughout Europe now that it has approval for CE Marking. In fact, the suit has already prevented an accident that would have otherwise caused disastrous results.

The mishap, which involved a waterjet operator, occurred in Detroit, Mich. when the operator was using a rotating lance at a pressure of 36,000 psi. The operator accidentally swiped his foot with the waterjet spray while wearing WaterArmor gaiters. Not only was there no penetration to the operator's booth underneath, but the protection was such that the operator did not even realize had been hit until inspecting his gaiter.



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UPC's THR Polyurea Spray Coatings Find New Marine Applications

THR Polyurea spray coatings are becoming an important resource and solution to many industrial and non-industrial applications. Environmental concerns and increased legislation pushing to reduce volatile organic compounds (VOC) is a major reason the use of polyurea spray coatings are being considered over traditional coatings. THR Polyurea spray coatings are 100% solid and contain no VOC.

THR Polyurea spray coatings have a fast, predictable and consistent reaction that requires no catalyst. Because of the fast set capabilities of polyurea spray coatings facility down time can be reduced and put back into service relatively quickly. In addition to minimizing down time the advantages include relative insensitivity to moisture humidity and temperature during application and no limitation on build up thickness. High physical properties with typical values are as follows: Tensile (2000-3000 psi), Tear strength (300- 400 lbs/inch) Elongation (250-600%). Fast and slow cure THR polyurea spray products are available with tack free times ranging from 6 seconds to 8 minutes.

Urethane Products Corporation Incorporated in 1976 formulates, manufactures and sells a full line of THR polyurea spray coatings that have been designed for use in demanding environments. THR polyurea spray coatings were originally developed coatings for Urethane Products marine division, which produces marine products that include their Marine Guard™, Marine Cushion™ foam filled fenders and composite marine buoys. Standard off the shelf systems widely used in the industry could not meet the rigorous requirements that were demanded by these products requiring Urethane Product to develop a polyurea spray coating that could meet these requirements. The requirements included a coating that could withstand and maintain high physical properties over long periods in a salt-water marine environment. Additionally the coating had to provide excellent hydrolytic stability, high impacts and abrasion protection along with exceptional elongation and flex capability. In 1997 Urethane Products Corporation took their

technology and success with their THR polyurea spray coatings for their marine fendering products and developed a full line of coatings to meet the needs of various application requirements and environmental conditions.

Available THR Polyurea Spray Systems

•Hybrid systems

Provide a great option in applications where high physical properties are not required and price is a consideration. These systems are a blend of polyurea and polyurethane. Hybrid systems provide good physical properties and provide opportunity in cost sensitive applications.

•Aromatic polyurea systems

They can be based mainly upon MDI and TDI being the isocyanate hard block segment and polyether amine being the soft with primary or secondary amines as the chain extenders.

•Aliphatic polyurea systems (UV color stable)

They are based upon IPDI or TMXDI mainly as the isocyanate hard block segment and polyether amine being the soft block. For chain extenders secondary amines has been used.

Technical Capability

THR polyurea spray coatings have been extensively tested to verify their performance. Tests are performed by independent certified laboratories to ensure reliable accurate and verifiable information. Material testing, verification and inspection are in accordance with the standards and practices of: ASTM, NATA, SSPC and FDA. Additionally Urethane Products maintains a state of the art laboratory used to develop, test and formulate products to meet their customers needs.

Application Method

THR polyurea spray coatings must be applied to the substrate using a plural component heated spray pump

with a minimum of 2000 psi at the spray tip. The material needs to be pre-heated and maintained at 150°-165°F. Recommended application temperature range is between 40°-110°F.

Field Applications

THR spray polyurea coatings are used in projects ranging from coating steel dock pilings, chemical containment areas, micro digester tanks and other industrial and non-industrial applications.

Recent Projects

THR 6001M 100% Polyurea Coating was the coating of choice because traditional microbial resistant coatings were not cost effective due to material cost and application difficulty.

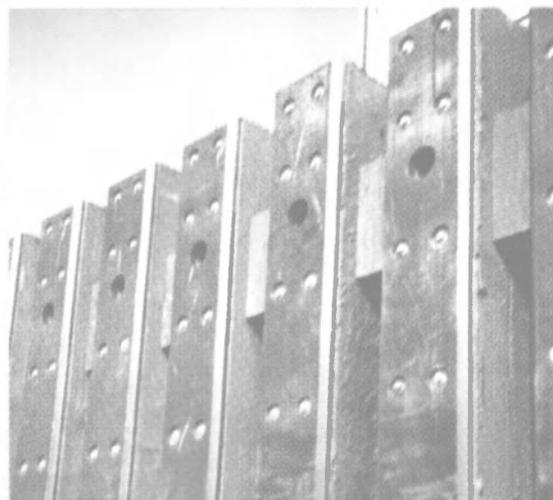
Other Urethane Elastomer Coatings would be unable to survive long term in this environment due to the exposure of the oxygen molecule in their Polyurea Urethane coatings. The microorganisms in these tanks quickly deteriorate the oxygen molecule and destroy traditional Polyurea Urethane coatings. THR 6001M is a proprietary formula and process that eliminates the oxygen molecule in the 100% polyurea system and provides a long-term solution for this application.

Challenges

The use of polyurea is still in the growth stage. Although there are many success stories, polyurea is moving into new areas and replacing traditional material such as epoxy, polyurethane, acrylics, paint and many others. Advances in technology in both the chemistry and equipment have created new opportunities for polyurea that were previously not considered.

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THR 9200M Polyurea Spray Coating



THR 9200M Polyurea coating was chosen by Washington State Ferries and the State fisheries department in a test project to encapsulate creosote treated timber piles. The objective was to encapsulate the timber and prevent the leaching of creosote into the water. The coating had to provide high impact and abrasion capability along with excellent adhesion and permeability ratings. This and related applications could provide a valuable solution for environmentally sensitive areas.

Derecktor Wins AMHS Fast Ferry Deal

Derecktor Shipyards has emerged victorious in the battle to build a pair of high speed ferries for the Alaska Marine Highway Systems.

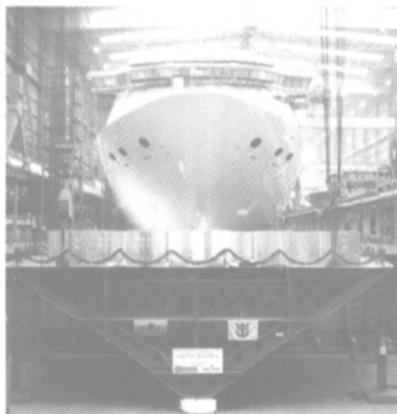
Late last month, **Paul Derecktor**, Alaska Governor **Tony Knowles**, State Department of Transportation Commissioner **Joe Perkins** and several Alaska State Officials attended the signing of the contract at the Alaska State Capitol in Juneau.

Derecktor Shipyards teamed with Nigel Gee and Associates (NGA) Ltd. of Southampton, England and will use one of their original designs, developed expressly for the Alaska project.

The new boats are designed to be safe, high-speed RoRo passenger ferries that minimize costs and can interface with existing AMHS docks and pier side facilities. The vessels will be designed to carry 250 passengers on the main deck

Serenade of the Seas To Be Delivered in Autumn 2003

The first 66 blocks of the 90,090-gt new cruise vessel Serenade of the Seas being built for Royal Caribbean,



were lifted into position in the covered building dock at Meyer Werft Shipyard in Papenburg, Germany. Flanked by the yard's board member, **Bernard Meyer**, project manager **Jarmo Lassko** and RCCL's senior vice president Marine Operations **Harri Kulovaara**, the ceremonial "lucky coin" was laid before the first block of the new vessel was lowered down onto the keel blocks by the yard's 600-ton crane.

Like its sister ships Radiance and Brilliance of the Seas, the 961-ft. (293-m) Serenade will be fitted with two podded podded drives. The propellers will be directly driven by electric motors installed in a pod under the ship's hull.

Two environmentally friendly and smokeless gas turbines will provide the vessel with electric power for propulsion.

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and 35 large vehicles, of the type mostly used in Alaska, on the cargo deck at a continuous-rating service speed of 35 knots and with great comfort up to sea state 6.

This project, funded by the Federal Government will allow the State of Alaska to link Sitka to Juneau with fast modern boats, capable of a comfortable one-day round trip, and improve service

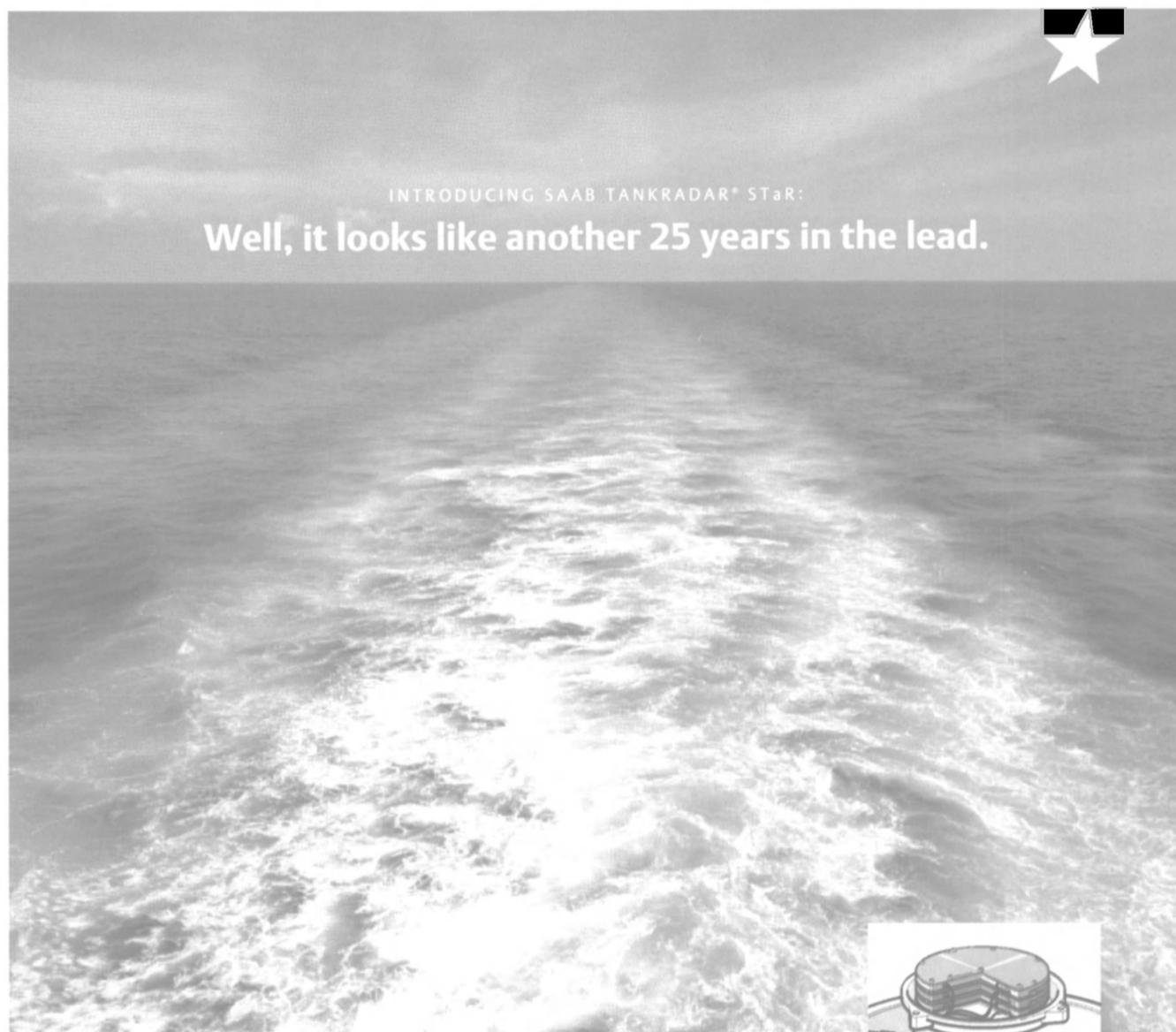
to communities in Prince William Sound. The first vessel is scheduled to enter service between Juno and Sitka at the beginning of 2004, while the second vessel should follow a year later.

"These ferries will improve transportation in coastal Alaska and will help the Alaska Marine Highway System improve its bottom line," DOT Commissioner Perkins said. "This is the begin-

ning of a whole new era in marine transportation in Alaska."

The Alaska Marine Highway System has been operating year-round since 1963, with regularly scheduled passenger and vehicle service to 32 communities in Alaska. It carries over 300,000 passengers every year.

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PRI Fuel Treatment Helps Meet Emissions Challenges



Power Research Inc. (PRI) is a manufacturer of industrial grade fuel treatments designed to treat heavy fuel oil, diesel and gasoline. Founded in 1985, PRI chemistries incorporate proprietary thermal stability technologies that permit cleaner combustion, reduced emissions, and prevention of deposits on engine components and boiler tubes.

PRI offers PRI-R, a heavy fuel oil treatment that overcomes operability issues associated with carbon, vanadium, sulfur and sludge. First, PRI-R is a maintenance product. PRI-R has been proven to prevent carbon and vanadate deposits results in extended time between component overhauls, hence providing added value and reliability to our vessel owners, increasing bottom line profitability. PRI-R has also been tested independently and found to reduce smoke opacity, NOx and SO2.

A 1992 evaluation of PRI-R on an RTA Sulzer (380 cST fuel oil) provided NOx reductions exceeding 21 percent, with SO2 reductions topping 10 percent. Fleet managers who have incorporated the product have reported advantages ranging from double exhaust valve service time between overhauls on medium and slow speed engines, to turbo blades that remain deposit free and waste-heat boilers that are free from soot build-up.

Power Research Inc. also offers PRI-SOLV, a highly concentrated sludge control treatment that has been found to reduce heavy fuel oil

sludge by more than 50 percent.

PRI-R and PRI-SOLV are used in a wide variety of propulsion applications, including steam turbines, low- and medium-speed diesels, aboard tanker and bulker fleets, container and RoRo vessels and cruise ships.

Another product, PRI-D, is an industrial-grade diesel MDO and MGO treatment. Proven to reduce smoke opacity emissions from diesel engines as much as 50 percent, PRI-D enjoys widespread application in both commercial and recreational marine. PRI-D is marketed as a fuel stability chemistry, to preserve fuel freshness, while capable of restoring the most severely degraded fuels to refinery freshness. PRI-D also dissolves slime and sludge resulting from algae growth, and prevents hard carbon deposition on all engine types, hence extending engine component overhaul times. PRI-D has endorsements by engine manufacturers, has been extensively tested for safety and effectiveness under Nuclear Regulatory Commission (NRC) guidelines for use in standby diesel powered generators at nuclear power facilities.

PRI-D is the choice of many wholesale fuel distributors for bulk fuel treatment in upgrading diesel fuel to the premium category. Power Research Inc.'s commercial marine clients include tug and ferry fleets, commercial and sport fishing vessels, excursion passenger vessels, work boats, harbor barges, oceanographic vessels, among many others.

PRI-G is a gasoline fuel treatment — again designed to permit the cleaner combustion of all gasoline types.

As fuel prices rise, the company has seen more operators change from 180 cST bunkers to 380 cST bunkers, hence affecting operating reliability of medium speed diesels in certain

areas. Additionally, there is heightened interest in emissions control mechanisms, with marine diesel engine manufacturers exploring new design options.

There will be limits as to the degree these design changes can positively affect emissions reductions, and we believe that fuel quality enhancement through proper treatment will play an increasing role in these emissions control efforts.

A Burgeoning Market

Owner interest in fuel treatment has grown in recent years. This reflects trends in certain ports toward degraded fuel quality, and increased interest in propulsion system reliability, particularly in overcoming charter hire loss. Power Research Inc. expects continued brisk growth over the next several years, owing to continued trends in fuel quality degradation in certain areas, and heightened owner interest in

exploring new ways to improve operating reliability while cutting maintenance costs.

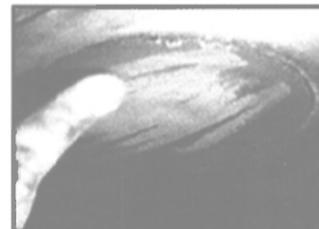
Emissions reductions will play a much larger role, and our extensive work in this area and documentation through independent evaluations provides excellent positioning for PRI-R as the emissions control solution. Key to our expansion is our proprietary technology — already proven to reduce smoke opacity, NOx and SO2.

Power Research Inc. has positioned itself to prosper by working closely with shipboard and onshore personnel. As a manufacturing and research organization, Power Research Inc. has extreme flexibility in formulating and tailoring the product line to meet specific needs.

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(continued from page 27)

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crankshaft strength limited engine power. Not until the introduction of higher quality steel were high output powers possible.

Use of the compound was followed by the triple expansion steam engine, considered reliable by the 1880s. In these engines, which needed a minimum of 120 psi to operate, the steam was exhausted from the high-pressure cylinder to the intermediate cylinder, then to a low-pressure cylinder. A triple expansion engine could operate at around 200 psi with a condenser vacuum of 26 inches of mercury.

The cranks were placed at 120° to give more uniform torque to the shaft. To operate with a higher pressure and offer smoother power, quadruple expansion engines were built as well. However, triple expansion technology dominated until the advent of the steam turbine.

Steam Turbine

Invented in the 18th century, the rotary engine was not practical until 1884 when Sir Charles Parsons invented a turbine to operate an electrical generator. The first turbine-powered vessel was the HMS Turbinia in 1897. This direct-drive engine operated at a relatively slow speed. The main problem with turbines was their high rotation speed — which required use of a reduction gear — and the fact that they were not reversible.

Yet, because of their favorable size-to-power ratio, steam turbines had been adopted for use in many large express passenger liners by the early 1900s. Canadian Pacific's 21,517-gross ton trans-Pacific liner Empress of Canada, which entered service in 1922, typified the period. Her propulsion plant consisted of two sets of Brown-Curtis turbines employing double reduction gearing, each set consisting of four separate turbines in series. During the war the turbine reigned supreme, driving First World War ships from large battleships to destroyers.

During the 1930s, manufacturers were preparing for war production. The main industrial wartime strategies were achieving standardization and developing increased manufacturing capacity and efficiency. Technology temporarily regressed in favor of producibility.

Because of an acute shortage of turbine, gear, and large diesel engine manufacturing capability, the approximately 3,000 ships built during WWII were powered with triple-expansion reciprocating steam engines. The 2,700 Liberty ships supplied by the Allies served the war effort in an exemplary fashion. Despite a significantly behind-the-times fuel rate of about 1.2 lb/ihp-hr, the ships' plants were capable of being operated by relatively inexperienced personnel.

ANCHORS CHAINS

To encourage exploitation of better fuel rates and alleviate the anticipated shortage of steam turbines and gears, a few experimental diesel installations took place just before and after the start of WWII. The direct-drive, British-patented, opposed-piston Doxford diesel engines were built in 3-, 4-, and 5-cylinder versions with 6,000 and 7,500 bhp continuous ratings. These became the popular, American-made, large diesel engines, built by the Sun Shipbuilding and Drydock Company of Pennsylvania.

Postwar Progress

After WWII, the unending quest for reduced weight and machinery space continued. By the late 1940s most steam merchant ships were turbine powered. Striving for heat and space efficiency inevitably led to pressure-fired boilers, or supercharged steam generators. In such boilers air from a turbine-driven compressor, powered by furnace exhaust gas was fed to the furnace at about 65 psi/490°F.

In the early 1960s U.S. operators of ocean-going vessels began to move toward increased speed and cargo system improvements. Grace lines' four Santa Magdalena-class (with a 20.5 knot speed) became the modern cargo carriers of the day. Both plants, which were of about 18,000 shp maximum, had two oil-fired D-type water tube boilers supplying 600 lb steam to a single set of cross compound steam turbines driving double reduction gears and a single propeller. This design represented a conservative standard for U.S. power plants for the next decade. Relief from wartime restrictions led to more experimentation. More than 1,000 nearly new Liberty ships were targeted as working test beds and outfitted with a steam turbine, a free piston gas turbine, a regenerative gas turbine, or a diesel engine. The most notable of the Liberties was the John Sergeant converted in 1956 with a 6,000 shp open-cycle regenerative gas turbine, double-reduction gears, and a controllable, reversible-pitch propeller.

Gas Turbine

When the U.S. Navy made the transition to light dis-

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shift paved the way for a transition to more diesel- and gas turbine-powered combatants. By effectively equalizing the cost of the basic propulsion fuel, the cost advantage of the steam plant was lost and a logistical advantage for gas turbine power was born.

The gas turbine was touted as a compact, fuel-efficient plant that offered high power per unit weight. While the concept predates the 20th century, it was not until after WWII that gas turbines began to find wide acceptance and application in power generation and propulsion. The first U.S. gas turbine-propelled merchant ship was the above-mentioned John Sergeant. Its low compression ratio, heavy-duty, industrial-type gas turbine's fuel consumption rate was a respectable 0.52 lb/shp-hr. By 1965 the Navy had installed many gas turbines for electric and auxiliary power, but only 78 for propulsion. One major step was the Navy's combined-diesel-or-gas propulsion plant for patrol motor gunboats, using diesel engines for cruising and a GE LM1500 gas turbine of 14,000 hp for high-speed operations.

Diesel Engine Drives

Throughout the 1920s and 1930s the diesel engine found increasing favor with many ship owners because it was more economic to operate. Scandinavian ship

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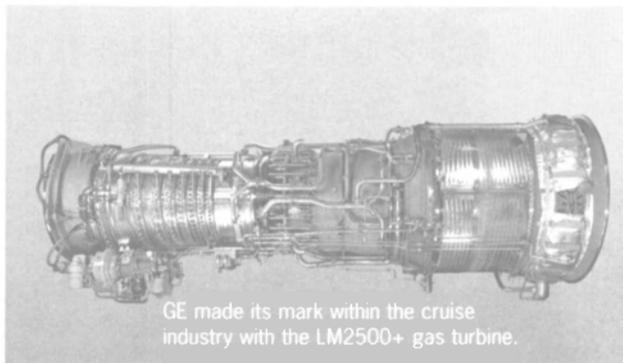
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GE made its mark within the cruise industry with the LM2500+ gas turbine.

owners turned almost exclusively to diesel. Only in terms of the large express liner could steam be classed as more economic than diesel in the late 1930s.

In the years preceding WWII, most diesels installed in the U.S. were direct drive reversing engines. Rapid expansion of demand for engines in the 50s and 60s led to a wide range of engines for propulsion varied from about 100 to about 5,000 bhp. Single reduction gear sets fitted with controllable reversing propellers or reversing reduction gears were available in a variety of sizes and the installation and capital costs of this arrangement were considerably lower than those of a steam plant.

Postwar diesel engine development proceeded in two almost diametrically opposed directions. For naval applications, engines were small, high-speed, and light-weight. Yet in merchant ships the trend was toward large, slow-speed engines of high power and high efficiency that burned costly fuels and maintained lower rpm to match lower propeller speeds. Diesel propulsion became more and more dominant in merchant ships even before the oil shortage in the 1970s overshadowed all other considerations in selecting machinery.

Marine Power Plants Today

In the late 80s and early 90s engineers began to recognize the attributes of gas turbine power that would make it acceptable for commercial use. To preserve the maximum amount of ship space for generating revenue, owners sought compact and lightweight power solutions. The first main

commercial use for gas turbines was in fast ferries. Today, space concerns and environmental interests have led some cruise lines to take another look at gas turbine technology.

Citing a goal to produce "the most environmentally sensitive cruise ships in the world," **Demetrios Kaparis** broke new ground in 2000 with his decision to implement gas turbine power — a technology he considers to be the "future of marine power plants" — on Celebrity's Millennium. While fuel costs are greater because of the use of distillates, some cruise lines have discovered an economic advantage to gas turbine-based plants, according to **Dave Luck**, manager of marine applications and ship integration at GE. "Having more cabins in the ship can more than offset the higher fuel cost," said Luck. In addition, pending environmental regulations and increased concern about exhaust emissions in some of the regions cruise ships serve have further influenced the decision to choose gas turbines.

Increasing environmental concern has also garnered new attention to earlier experiments with liquified natural gas (LNG) carriers. By next year, if all goes according to plan, Statoil will become the first operator on the Norwegian continental shelf to feature LNG powered propulsion on its vessels. While the construction cost of each vessel increased by \$6 million, the company chose LNG technology because it would greatly reduce emissions.

Sources: Steam at Sea, by Dennis Griffiths, Conway Maritime Press, 1997.

Smoke Ash and Steam: Steam Engines on the West Coast of North America, by Robin E. Sheret, Western Isle & Cruise Drive Co. Ltd. 1997.

A Half Century of Maritime Technology 1943-1993, Ed. by Harry Benford and William A. Fox; Powering Section written by David O'Neil, the Society of Naval Architects and Marine Engineers, 1993.

A freelance journalist for Newsweek, Rolling Stone, and Newsday, among other publications, Jessica DuLong is also assistant chief engineer on retired New York City fireboat John J. Harvey.

Gas Turbines Continue Making Commercial Inroads

GE Marine Engines has been supplying integrated propulsion systems for a variety of commercial and military marine customers for more than 25 years. GE's complete line of aeroderivative gas turbines includes the LM500 (6,000 hp), LM1600 (20,000 hp), the LM2500 (33,600 hp), the LM2500+ (40,500 hp) and the LM6000 (57,330 hp).

For instance, the first gas turbine-powered fast ferry in Greece entered service in the summer of 2001. This Corsaire 14000-class monohull is powered by two GE LM2500+ gas turbines in a combined diesel and gas turbine (CODAG) arrangement with two diesel engines.

The ship was built for operator Maritime Company of Levos (NEL), Piraeus, Greece, by Alstom Leroux Naval Shipyard in France.

The MDV 3000 program uses GE LM2500 gas turbines on the Capricorn, Scorpio, Aries and Taurus fast ferries. These vessels operate in the summer months on the Civitavecchia-to-Sardinia Island and Genoa-to-Sardinia Island routes in Italy.

The MDV 3000 are the world's largest fast ferries, and were built by Fincantieri, Genoa, Italy for Tirrenia Lines. With total power output at more than 70 MW per vessel, the ferries are capable of reaching speeds in excess of 40 knots, and can carry 1,800 passengers and 460 vehicles.

Another operation has 12 LM aeroderivative gas turbines in service on the three Highspeed Sea Service (HSS) fast ferries — Stena Explorer, Stena Voyager and Stena Discovery — since April 1996, July 1996 and June 1997, respectively. Owner Stena Line AB, Gothenburg, Sweden, operates the HSS ferries on the Irish Sea between the United Kingdom and The Netherlands.

Each semi-swath fast ferry has two LM1600 and two LM2500 gas turbines in a COBAG configuration. Combined the LM1600 and LM2500 gas turbines aboard the three vessels have logged more than 165,800 hours in service.

Built by Finnyards in Rauma, Finland, the HSS fast ferries measure 413 x 131 ft. (126 x 40 m). Each vessel can achieve speeds of more than 40 knots and have the capacity for 1,500 passengers, 375 cars, or 50 trucks and 100 cars. For instance, GE recently announced that Cunard Line selected two LM2500+ gas turbines in a CODAG configuration with four diesels for Queen Mary 2. This transatlantic liner will be the world's largest passenger vessel upon completion in 2003.

To date, GE has supplied COGES propulsion systems for Celebrity Cruises' three Millennium class vessels, as well as Royal Caribbean's Radiance of the Seas.

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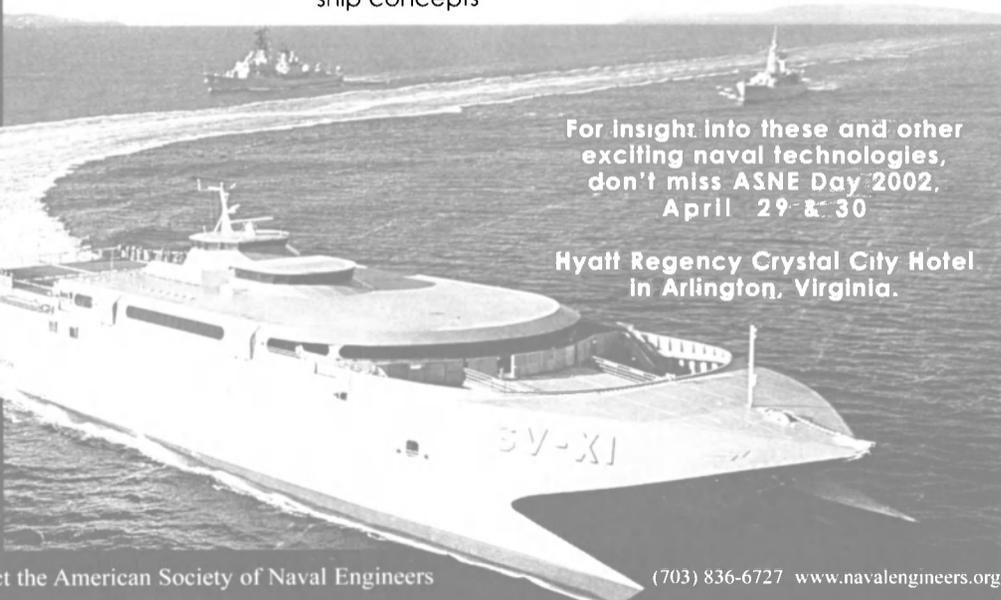
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Wartsila Buys Engine Reconditioning Business

Wartsila acquired the engine reconditioning business from Metalock (Singapore) Ltd. for about \$5.4 million. The acquisition will consist of the marine engine repair and recondition business and the workshop, a business that generates a cumulative sales volume of about \$8.8 million.

"This acquisition will further strengthen Wartsila as a total service provider. We have an opportunity to increase our market share especially in the low speed engines", said **Tage Blomberg**, group vice president and head of the Service Division. With its workshop located in Singapore, the focus of the acquired business, which will be named Ciserv is on marine engine reconditioning.

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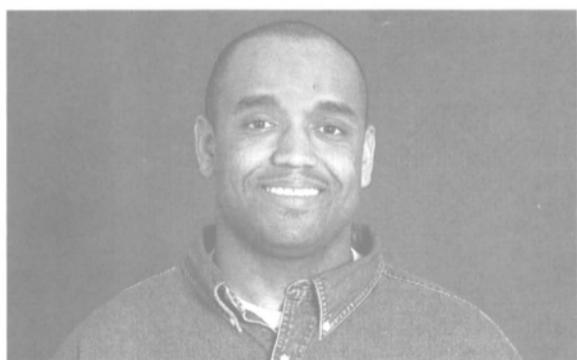
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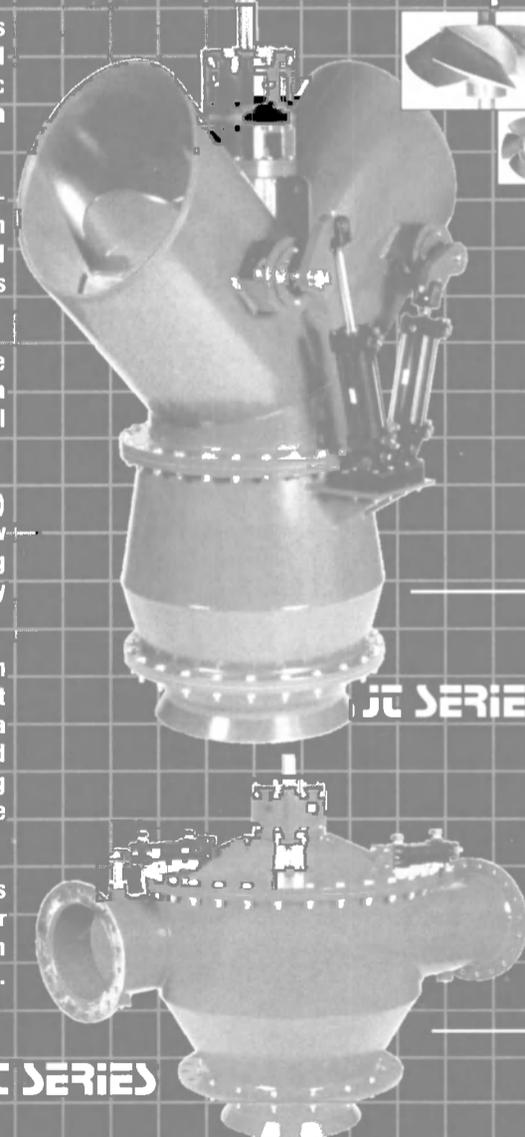
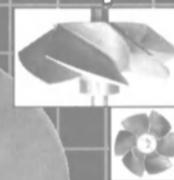
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Fleet F77 Extends Inmarsat's Offerings

Inmarsat, the original mobile satcom provider for the maritime industry, has been riding the crest of a wave recently, with users at an all-time high, overall 99.9 per cent satellite reliability and the launch of its Fleet F77, Mobile ISDN and Mobile Packet Data services for the maritime community. Ruth Ling reports on what's new and what lies on the horizon.

Twenty years ago, a revolution hit the maritime industry. Satellite communications became available to ships at sea.

Back in 1982, when Inmarsat began offering onboard satellite communications, its first and only system was Inmarsat A, which offered voice, facsimile, telex and data services. After nine years of successful service and expansion into most maritime sectors, Inmarsat began offering Inmarsat C.

Initially, maritime users gained access to this packet data service via the telex network. Later, various Inmarsat service providers offered data messaging without the need to format messages as telexes. This enhancement offered users around the world access to Inmarsat C messaging using only an off-the-shelf PC and basic modem.

With the global proliferation of Internet e-mail for business and private communications, various Inmarsat service providers took steps to upgrade their Inmarsat C service by offering connectivity via the Internet.

At the same time, thousands of SOLAS-compliant merchant vessels of 300 grt or more began installing Inmarsat C as a requirement of the GMDSS. Now, with Internet service in place, the operators of these vessels and other Inmarsat C-equipped vessels can easily send and receive Internet e-mail messages with owners, operators, agents, vendors, and their families and friends.

Inmarsat now has more than 22 years of experience in designing, implementing and operating satellite networks. Its portfolio of satellite solutions includes voice, fax, e-mail, Internet and intranet access and other data services at speeds of up to 64 kbits/sec., and permits such applications as remote telemetry and telemedicine. And, as any seafarer knows, Inmarsat

provides the communications element of the Global Maritime Distress and Safety System (GMDSS).

A subsidiary of Inmarsat Ventures plc, Inmarsat Ltd owns and operates a global network of nine satellites in geostationary orbit 36,000 km above the Equator. Its solutions are delivered through a network of approximately 200 distributors and other service providers operating in more than 150 countries to end users in the maritime, land and aeronautical sectors.

But the company knows there are other satellite communication providers snapping at its heels — newer, smaller, but just as determined to be a leader in this burgeoning and exciting industry. So Inmarsat isn't resting on its laurels; it is continuously developing new products, services and initiatives, often in conjunction with partner companies.

Pre-Emption Guarantees Priority For Safety

The company's latest product is Fleet F77, a new maritime service, which was announced at Europort 2001 in November. It is unique in that it has two communications options, one which enables a shipping company to pay only for the actual volume of data sent and received, the other to be charged for the amount of time spent online, as has always been the case previously.

It is currently the only satcom solution to meet the International Maritime Organization's latest criteria for new services within the GMDSS safety standard, enabling high priority distress, urgency and safety calls to override lower priority communications.

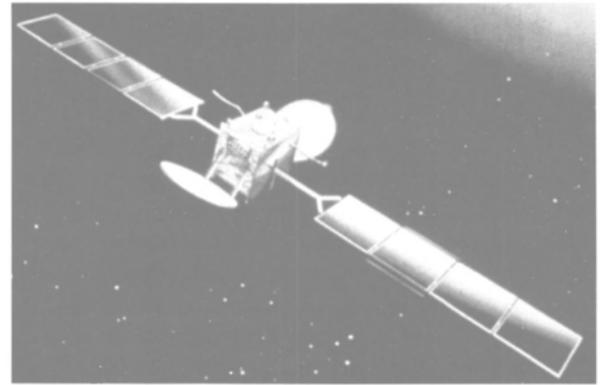
Rescue authorities calling a vessel equipped with Fleet F77 will always be able to contact a ship, even if the voice or data channel is in continuous use at a lower priority. Not only will pre-emption work seamlessly, but it will always work in a hierarchical manner: a distress call will pre-empt all other communications, an urgency call will pre-empt both safety and routine calls, and a safety call will pre-empt a routine call.

The new IMO criteria were formulated after a maritime incident in November 1994 when the passenger liner Achille Lauro caught fire and sank off the coast of Somalia and 930 passengers were rescued by the tanker Hawaiian King. But the subsequent increased use of the Inmarsat-A terminal on the Hawaiian King prevented the maritime rescue co-ordination center (MRCC) from contacting the ship. The situation was safely resolved by the MRCC using additional safety equipment, Inmarsat C, to alert the Hawaiian King to clear the voice channel on its Inmarsat-A for safety communications.

The incident highlighted the need to provide some form of call pre-emption capability for future GMDSS satellite communication equipment. The eventual result was that, in November 1999, the IMO issued a new Resolution, A.888 (21), which set out criteria for the provision of new mobile satcom systems in the GMDSS. These are that any system being designed for use in the GMDSS must be able to recognize the four levels of priority and that new systems should provide prioritized pre-emption.

At press time, details of Inmarsat's Fleet F77 GMDSS capabilities were scheduled to be presented to the next session of the IMO Sub-committee on Communications and Search and Rescue (COMSAR) at its session in February 2002.

"From the safety point of view, the new Inmarsat



Fleet F77 equipment offers a very important tool to the search-and-rescue community, and enables it to improve its service to seafarers," says **Kees Koning**, Head of the Communications Department of the Netherlands Coastguard, based at the Rescue Co-ordination Center in IJmuiden.

"Many rescue operations have been hampered by the fact that the MRCC could not contact the vessel because the Inmarsat terminal was occupied for other communications," adds Koning.

In addition to the advanced safety service, Fleet F77 can deliver a wide range of superior commercial communications capabilities: voice, fax and data services at speeds of up to 64 kbit/s, including Mobile Packet Data and ISDN data delivery.

Maritime users thus have the flexibility to choose the most cost-efficient two-way communications service for their varying data requirements. The Mobile Packet Data service for the maritime community is currently offered only via Inmarsat, and charges users only for the volume of data they send and receive, not for the time they are connected. This enables mariners to send and receive information on a real-time basis, rather than the traditional practice of dialing up once or twice daily.

For the first time, ships can become an always-connected 'node' or connection in the LAN or WAN network. In effect, they can be fully integrated into the wider business infrastructure and access all the standard desktop and specialist maritime applications available in any office environment, while shore-based managers can get enhanced reporting and connection with their ships - virtually anywhere in the world.

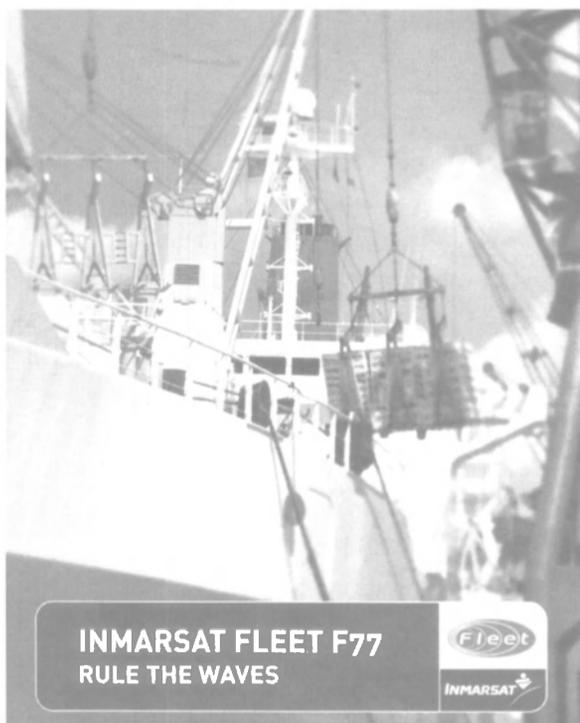
Potential applications include up-to-date meteorological reports, maritime chart and navigational updates, logistics, secure online business dialogue and instant messaging, e-commerce and online procurement applications, berthing information and booking for ports, accessing online safety information, 'real-time' e-mail (business and personal), access to corporate Intranets and telemedicine.

Mobile ISDN connects easily with existing applications using standard ISDN interfaces; it is ideal for data-intensive applications such as oceanographic chart updates and bulk file transfer.

Inmarsat Fleet F77 capitalizes on the established Mobile Packet Data technology, with further advances developed for the maritime environment. The terminals, which utilize a stabilized antenna, are being developed initially by Nera of Norway and Thrane & Thrane of Denmark, with additional models expected from JRC (Japan), Glacom (USA) and STN Atlas (Germany) in coming months.

Thus, the benefits already enjoyed by ship operators between their corporate offices are being made available to the maritime market, which can now harness the speed of ISDN or the flexibility and cost-efficiency of mobile packet data.

(continued on page 52)





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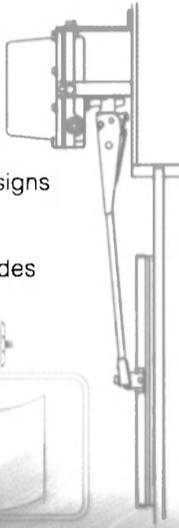
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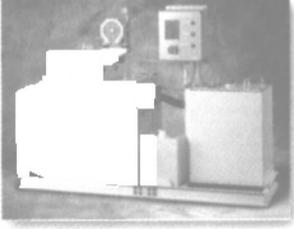


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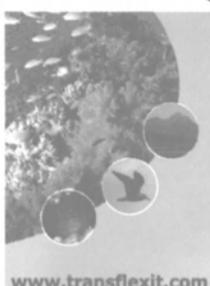


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Transflexit offers a full array of Ecological Engineering Services to the marine industry. The company offers a "Complete Eco-Care Solutions Package" that includes everything from complete systems surveys, inspection, certification, upgrades, maintenance and management, through to new systems design, installation and products.



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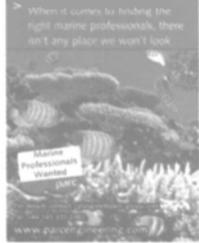
When you work with Lloyd's Register, you benefit from some of the world's finest marine experience and an organization dedicated to delivering the very best customer service during the entire life of your vessel. We aim to help you maximize safety, protect the environment and lower your risks. Building better business.



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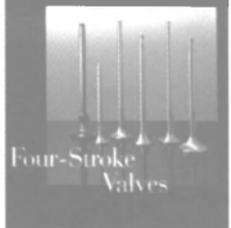
Parc provides highly skilled engineering and technical specialists as well as managed personnel solutions to a broad range of industries in Britain and Ireland. In business since 1975, Parc prides themselves on having a deep knowledge of the engineering and technology sectors and an understanding of the skill sets and needs of the professionals who work within them.



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For decades, MWH has been one of the most important manufacturers of valve systems in the world. Their reputation for excellence is based on a wide product ranged produced to superior quality standards. Engine manufacturers and operators constantly praise MWH products for their outstanding performance and valve.



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Climax

Climax's line of more than 25 machine tools provides effective solutions for repairs at sea and valuable alternatives to costly off-site machining in ship repair or refurbishing operations.



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Wolong Fassmer

Wolong Fassmer Shipyard offers various service works in the field of development, construction and manufacturing of ships, maintenance and repairing of lifeboats, delivery of spare parts. Fassmer-Shipyard has, over the years, turned more and more to new materials such as seawater resistant and/or high quality precipitation-hardened aluminum and aluminum semifinished products as well as high-tech fiber composites.



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Wynn

Wynn manufactures the most comprehensive range of Straight line wipers, Pendulum and Pantograph wipers, clear view screens and associated control systems, with a choice available for heavy duty through to light duty applications. Wynn products are supported with a two-year standard warranty with up to five years.



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Albacore Research Ltd.

ARL develops ShipConstructor, an integrated suite of ship production software, consisting of the four modules ShipCAM, CAD-Link, NC-Pyros, and ShipReport. ShipConstructor utilizes AutoCAD and Microsoft Access, which drastically reduces training requirements, for creating a complete 3-D product model, minimizing re-work, improving product quality.



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Products

NACE

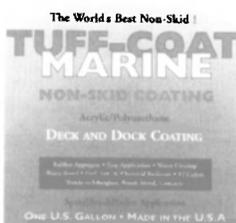
NACE International is a professional technical society dedicated to reducing the economic impact of corrosion, promoting public safety, and protecting the environment by advancing the knowledge of corrosion engineering and science. Established in 1943, NACE has more than 16,000 members worldwide and offers technical training and certification programs, sponsors conferences, and produces industry standards and reports, publications, and software.



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Tuff Coat

Tuff Coat Marine is a state-of-the-art, single pack, acrylic/urethane copolymer, with incredible adhesion, strength, elasticity and durability. It is water based, has no VOCs is non-flammable, solvent free, chemical resistant and UV stable. The product can be applied to aluminum fiberglass, steel, wood and concrete.



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USF Surface Preparation Group

USF Surface Preparation Group (USFSPG) was formed from the merger of more than 20 of the world's best-known and brand names in the surface preparation industry. USFSPG's brands give the company more than 600 years of combined experience in surface preparation techniques, including stationary and portable wheelblast, airblast, painting, mass finishing, and many other technologies.



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BP Shipcare

BP Shipcare, a wholly owned subsidiary of BP Shipping Limited, has developed a lay-up specification which can be applied to plant and equipment afloat. The system has been successfully adapted for rigs, gas carriers, tankers and many other types of ship. The company also provides complete preservation, including regular maintenance carried out by trained marine and engineering staff.



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Desmond-Stephan

Desmond-Stephan's Swirl-Off is a tool that can remove paint, rust, scale and other hard coatings from almost any hard surface. Features for this tool include: built-in safety guard, balanced design for easy operation, operates underwater, environmentally safe, fits 5/8 in. - 11 shaft, no lubrication or maintenance required, drive adaptors for 3/8 in. or .5 in. drill chuck available and cutters for all models are interchangeable and self-cleaning.



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USFilter

USFilter has released a four-page, brochure describing the company's CAPAC corrosion protection systems for fixed structures. The brochure provides a general overview of the CAPAC system, describing its history, benefits and uses. The brochure contains a description of different fixed-structure application where CAPAC systems can be beneficial: vessels; off-shore production and drilling platforms; jetties and piles; and power plants.



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U.S. Coatings

U.S. Coatings has formulated two new high temperature silicone coatings specifically for use where elevated temperatures may provide corrosion difficulty. The HeatGrip 4200 is a high temperature silicone coating custom formulated to withstand temperatures up to 1,200 degrees. The HeatGrip 4750 is an intermediate temperature silicone coating formulated to withstand temperature up to 750 degrees.



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Turtleskin WaterArmor

TurtleSkin WaterArmor by Warwick TurtleSkin WaterArmor is one-size-fits-all, adjustable safety apparel and is specifically designed for UHP waterjet operators. It's flexible, lightweight patented system helps prevent injuries from waterjetting, with specified results at all water pressures up to 40,000 PSI.



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Micro-Surface

Micro-Surface Finishing Products, Inc. manufactures Micro-Mesh, a cushioned abrasive cloth, liquids, and related products. The Micro-Mesh Kits are designed for the removal of scratches from acrylic and plastic surfaces. All of the kits contain Micro-Mesh cushioned abrasive, one or both of the polishing liquids, and easy to follow step-by-step instructions.



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Zerust

NTI's Corrosion Products Division, Zerust relies on proprietary technology and many years of accumulated applications experience in cathodic protection systems, thermal spray applications, and volatile corrosion inhibiting packaging solutions to resolve corrosion problems while increasing profitability by reducing operating costs.



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Sherwin Williams

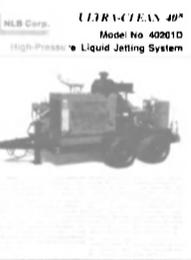
A new 88-page, four-color catalog of Industrial MRO paints, coatings, lubricants, electrical cleaners/degreasers, safety solvents, caulks, sealants, applicators and specialty chemicals has been published by Diversified Brands, a Sherwin-Williams business unit. The catalog features Krylon Industrial paints, including Rust Tough and Tough Coat acrylic enamel; industrial maintenance and general purpose paints.



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NLB

There's a simple solution to virtually every product removal challenge you face: high-pressure water jetting from NLB Corp. With NLB water jets (1,000 to 40,000 psi, or 70 to 2,800 bar) you can quickly remove built-up residue or clear hopelessly-clogged tubes and screens. Water jets cut quickly and cleanly through a wide range of materials, without any blades to be sharpened or sanitized.



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Thermax

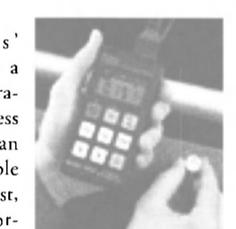
Thermax, non-combustible, non-toxic, marine construction boards are used worldwide for joiner bulk heads, panels, liners, ceilings, door and furniture cores. Thermax has all major regulatory body certificates (USCG, Canada, DNV et al) and meets the requirements of IMO/SOLAS resolutions. Thermax is sold, distributed, warehoused laminated and cut to size in North America by PSI.



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Panametrics

Panametrics' Model 26MG is a pocket-size ultrasonic thickness gauge that can combine simple operation, low cost, and great performance. Despite its small size, the 26MG has a variety of practical measurement features that makes it an ideal inspection tool: Automatic Probe Recognition, Fast Min Mode to hold the thinnest reading in the Fast Scan Rate, Freeze Mode, and High Temperature capabilities.



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Martek

The Sentry from Martek Marine Ltd., is a cargo tank pressure monitoring system designed in compliance with IMO Regulation 59, providing early warning of under/over pressurization in tankships. MMS200 intrinsically safe 316SS absolute pressure transducers installed on deck and protected in Martek's unique 'top hat' arrangement, monitors tank.



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Chugoku Marine Paint (CMP)

CMP manufactures synthetic resin paints for marine vessels. The Nova 5000 Barrier is designed especially for ballast water tanks. The barrier is designed to be easily applied at a high film thickness and then prevents water penetration, and corrosion is halted. The new Umeguard Super-H, a highly abrasive cargo holding coating, is designed to extend the period between major grit blasting of cargo hold up to 50 percent.



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Products

Adrick

Adrick Cooling Corporation is a supplier of marine air-conditioning machinery, self-contained units, refrigerators, coolers and freezers, including design, engineering and fabrication of custom-built units and systems.



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William E. Williams

William E. Williams Valve Corporation manufactures valves that are designed, engineered, manufactured and tested to meet all applicable standards including, ASTM, ANSI and API. Gate Valves are designed to offer minimum pressure drop in the fully open position and are dependable for use in steam, water, oil, vapor and other high pressure services.



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Xenex

Xenex Navigation Inc. has introduced the Navigence line of rugged, waterproof marine displays for radar, electronic charting and general marine applications. The Navigence XD104W, XD121W, XD151W and XD181W are flat-panel, TFT, LCD displays with screens of 10.4, 12.1, 15.1 and 18.1 in, respectively. In addition to being completely waterproof, Xenex Navigence Waterproof displays provide mariners a reliable, high-definition screen image, working as well under direct sunlight as on the bridge at night.



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Eurasia

Eurasia Group of companies is one of the world's leading ship managers specializing in the total management of tonnage across all vessel sectors. Eurasia prides itself in treating its managed ships as if they were its own and building a strong team of experts around the ship to ensure its safe and profitable operation.

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Liebherr

LIEBHERR-Werk Nenzing GmbH, located in Austria, was founded in 1976 for the purpose of designing, selling, manufacturing and providing after-sales service for ship and offshore cranes. Since then the product range has extended to include crawler cranes, as well as harbor mobile cranes. The network of Liebherr service stations throughout the world provides a continuous and reliable after-sales service for all our customers.



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IBM

IBM CATIA's ability to fully develop a 3-D design on the computer helps to eliminate the need for paper design. Ships can be designed and built piece-by-piece, section-by-section, before the first steel is ordered. ENOVIA web-based solutions provide people in an extended enterprise with global access to product, process and resource information.



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ACR Electronics

Fort Lauderdale, Fla.-based ACR is a manufacturer of a sophisticated series of rescue and survival products, including EPIRBs, personal utility lights, marker lights, radios, SARTs and safety accessories.



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Maritime Associates

Maritime Associates has the capabilities to supply signage needs, including complete shipboard conversion projects and sign upgrading services. They are a manufacturer with the flexibility to produce signs, cost-effectively in the U.S., in a wide range of materials, mounting and installations methods. Order online, or contact them for a free CD product guide. See their new product lines, including their innovative photoluminescent material, bright white, and the SlimLine Low Location Lighting System.



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All American Marine & Diesel

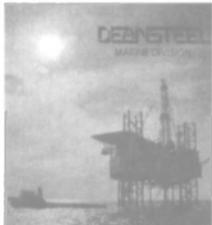
All American Marine & Diesel offers a full line of services to provide complete engine sales, parts and service for Detroit, Cat, Cummins and EMD needs. The company is a professional placement service that specializes in the offshore and inland commercial industry. All American is currently introducing METREZ, which is an oil clean up and containment product line.



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Deansteel Manufacturing

Deansteel Manufacturing Co. manufactures IMO-FTP code marine fire doors and frames certified by USCG and Lloyds. Interior and exterior applications: louvers, lights, and a wide range of hardware. They specialize in standard and custom berths available with drawers and curtains; complete galley design, fabrication, and installation.



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Cotecmar

Cotecmar is an organization that seeks scientific and technological approaches to support the naval development, commercial ships and riverboat industries. Cotecmar offers a multi-faceted focus and a variety of services including: design, construction, repair, and maintenance of ships; specialty technological services; industrial technical services and other services such as refrigeration and air conditioning equipment maintenance, and glass applications.



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Moose Boats

Moose Boats, a builder of aluminum catamarans in the 32-ft range, introduces its Aluminum Catamaran Multi-Purpose Boats. Three models are produced and all are offered with power options of either twin diesel jet drive or twin four stroke outboards. These high performance boats can handle almost any sea condition and provide an exceptionally stable working platform.



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Seavac Marine Services

Seavac Marine Services located in Freeport, Texas, provides underwater hull cleaning for large commercial and non-commercial vessels, and U.S. Navy Ships. Seavac was located previously in San Diego, Calif., where it provided expertise to the United States Navy to clean the underwater hulls of some of their largest warships like the U.S.S. Missouri BB-63.



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Marlow Ropes

Marlow Ropes, an approved ISO 9001 company, are worldwide leaders in pioneering the use of specialist fibers and rope constructions for the marine and offshore industries. Marlow's success is based on technical knowledge, understanding the application requirement and satisfying the user needs.



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G.J. Wortelboer

G.J. Wortelboer B.V. specializes in supplying marine products; essentially anchors, chain-cables, and windlasses — with deliveries on a worldwide basis. The company is headquartered in Rotterdam, where a substantial stock is kept, guaranteeing immediate delivery to virtually every port in the world.



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Hornell

Hornell now offers the Speedglas FlexView which features a 4.75 x 3.6 in. clear polycarbonate lens which can be used for weld preparation under low light conditions. A spring holds the auto-darkening lens on top of the helmet, which gives the welder a clear view behind the protective lens. The user can lift the spring-mounted Speedglas lens assembly for weld prep. The clear lens meets the ANSI Z87 industrial eye and face protection standard.



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Spain: Finding Strength in Specialization

By David Tinsley, technical editor

As the powerful entity created from the merger of Empresa Nacional Bazan and Astilleros Espanoles at the end of 2000, IZAR has underscored a commitment to design and engineering technology development, in conjunction with efficient production, in its drive for business in the specialized vessel markets.

Presently the only European shipbuilder holding contracts for the construction of LNG carriers, IZAR's gas tanker program is impressive by any standards, amounting to five vessels of 138,000-cu m capacity.

The network of facilities encompassed by the state-owned group, including five commercial newbuild yards, offers not only critical mass but also production flexibility, enhanced through the more integrated operational approach now being adopted. Thus, while deliveries of the series of LNG carriers are scheduled from two yards, Sestao and Puerto Real, subcontracting of large elements to other parts of the group taps the organization's wider scope. Double-bottom blocks for two of the ships have been assigned to the Sevilla yard, in a move that confers a better work distribution throughout the company while better ensuring that newbuild completion dates can be met.

IZAR's propensity for the higher value-added categories of newbuild vessel is evident in the composition of the current orderbook. In addition to five LNG carriers and three RoPax ferries, the workload includes a 900,000-barrel FPSO (floating, production, storage and offloading) vessel, a 19,000-dwt chem-tanker and a growing list of large, suction hopper dredgers. The Spanish group's penetration of the international market for sophisticated dredgers has sharpened competition in a field closely associated with builders in the Netherlands, in particular.

Belgian contractor Jan de Nul has entrusted three trailer dredgers to IZAR, for construction at the Sestao yard, which has also landed a 16,500-cu m unit for ToaCorp, while French operator Dragages-Ports has two maintenance dredgers taking shape at the Gijon yard.

IZAR is also keen to break into the cruise ship newbuild market, and is exploring opportunities with regard to the smaller types of vessel. While the accent has thus far been on economies of scale, it is felt that there will be growing demand for more modest carrying capacities. The Sevilla yard, which has recently strengthened its standing in RoPax ferry construction with a contract

from Tunisian operator ENTMV for two vessels arranged for 1,300 passengers and 1,300 lane-m of freight, would be a main candidate for such work. Reflective of the Bazan and Astilleros Espanoles legacies, the company has a balanced spread of business in both the defense and commercial marine sectors. The immediate aim is to increase the mercantile share of the workload to some 60-70 percent from the approximate 50/50 current split in naval and commercial projects.

The group attaches fundamental importance to research and development endeavors in focused areas, convinced of the influence of technological standing on a company's market position. It is understood that IZAR is currently ploughing back some five percent of turnover into R&D.

By taking a more holistic approach to ship design, and by coupling higher vessel performance through improved propulsion, cargo handling and insulation systems with more cost-efficient production, IZAR hopes to raise its game in the face of intense competition from yards in South Korea and elsewhere.

Also reflective of the solid engineering heritage in both the former Bazan and AESA camps, engineering initiatives figure prominently in the current research program. This includes studies into dual-fuel and diesel-electric alterna-



Reefership Salica Frigo was built by Hijos de J Barreras.

tives to steam turbines for LNG carrier propulsion, and cooperation with a foreign firm on a new type of podded propulsion system for other types of ship. Through its Cartagena engine division, IZAR is also undertaking research into marine fuel cells, in conjunction with companies in Germany and the U.S.

In addition, it has set up a working group with Rolls-Royce to explore new marine application possibilities for gas turbines, and to look into other propulsion solutions. Among the various strands of research initiated by the group, several are pertinent to its involvement and interest in high-speed transportation, born of the Bazan track

record in naval ships and light-displacement monohull ferries.

The group has recently undertaken comparative studies into deep-vee monohull, catamaran and surface effect ship (SES) concepts in application to a requirement for a 40-knot, 80-truck carrier. It has come out in favor of the monohull solution, on performance, cost and project risk grounds in the context of the proposed European deployment.

Over-and-above its implications for the shipbuilding market, the merger of Bazan and AESA has had a profound influence on the ship repair and conversion sector, creating a major new Euro-

(continued on page 53)

General Thermodynamics Corporation's



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(continued from page 46)

"Some solutions such as e-mails and web access will benefit from the potential of 'always connected' that the Mobile Packet Data service offers, while more data-intensive applications, such as maritime chart updates, will continue to benefit from a plug-and-play mobile ISDN solution," said **Michael Butler**, managing director of Inmarsat Ltd. "The point is that the customer at sea now has the choice."

Inmarsat Fleet F77 service will be available via Inmarsat's global network of partners. Telenor Broadband Services AS (Norway), Telenor Satellite Services Inc (USA), Xantic (Netherlands and Australia), KDDI (Japan), OteSat (Greece), France Telecom and Telecom Italia are all expected to launch the service in the second quarter of 2002. Other partners, such as Stratos (UK and Canada), MCN (China) and SingTel (Singapore), also plan to offer the service this year.

Inmarsat Fleet F77 is the first in a family of Fleet services that will eventually feature three solutions designed to meet the requirements of specific maritime sectors.

On A Roll

"The development of Fleet F77 illustrates Inmarsat's continued commitment to improving communications and safety provision in the maritime industry," said Butler. "And don't forget that Inmarsat consistently exceeds the minimum IMO requirement for 99.9 percent system availability for ship-to-shore distress alerts."

As evidence of this commitment, Inmarsat launched a new safety database for the maritime community in March 2001, specifically for use by Maritime Rescue Co-ordination Centers (MRCCs) around the world. The database provides MRCCs with immediate round-the-clock access to all the information needed to assist vessels in distress (including the ship's name and call sign, nationality and ship owner's 24-hour contact number), thereby cutting life-saving minutes off emergency rescue operations.

The company has also reaffirmed its support for its original analog communications system, Inmarsat A, which is still used extensively in the maritime market despite being 20 years old, with a \$7 million upgrade of the Inmarsat A system, which was announced in 2001. This includes new generation Network Co-ordination Stations (NCSs) for the system, which are owned by Inmarsat and operated by Partner LESOs in Japan, Norway, Singapore and the UK.

To encourage more seafarers to use onboard satellite communications, last year also saw Inmarsat launching several marketing initiatives, including pre-paid calling cards and installing mini-M terminals and payphones on ships for crews to use independently of the other communications systems onboard.

The pre-paid cards are competitively priced for a set number of minutes, and

call charges made via Inmarsat mini-M from different service providers are affordable for ships' crews.

Mini-C is an evolution of the existing Inmarsat C technology, (which was introduced in 1991), combining a transceiver and antenna in one light compact unit. It facilitates e-mail, position reporting and polling, fax, telex short-code addressing and mobile-to-mobile messaging, using significantly less power, for where the power supply is limited.

This makes mini-C a portable and inexpensive solution, and its low power consumption offers the possibility of using a solar-fed battery power source where required.

Inmarsat mini-C will enable maritime two-way messaging, monitoring and tracking applications, non-SOLAS emergency alerting, reception of weather charts and electronic chart correction. In the merchant sector, it can also deliver commercial information for shipping and transport companies, fishing and merchant fleet data applications. It can also be installed as supplementary terminals for crew communications, to complement existing communications services onboard.

Inmarsat mini-C was developed in conjunction with Inmarsat C manufacturers and was first taken up by Danish hardware manufacturer Thrane & Thrane.

"This is a real example of Inmarsat working in close conjunction with partners to respond to market and customer needs," said Butler. "We have developed and adapted an existing service for the end users who told us they needed a more portable and less power-intensive communications solution. "Mini-C complements the existing Inmarsat C and D+ offerings while being different from them — for example, Inmarsat D+ is specifically geared to support SCADA, remote monitoring, telematics and asset management applications."

Existing Inmarsat C service is designed for full Safety of Life At Sea (SOLAS) GMDSS service, but this will not be available via Inmarsat mini-C.

However, there will be two slightly different models of the mini-C service: a more compact version offering conventional messaging available now and an advanced model incorporating a non-SOLAS emergency alerting facility, which will become available in early 2002.

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Ruth Ling contributes to a variety of global telecommunications, business and consumer publications, and has worked for the BBC, the International Herald Tribune, U.K. national newspapers and magazines, and the British Chamber of Commerce in Brazil.

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pean force while reshaping the industry in Spain. It has given a finer edge to competition in one of the world's most intensely contested areas of marine business. Under the banner of IZAR Carenas, five repair yards encompassing 11 drydocks, one floating dock and a synchrolift-type system have been brought into a common ownership, catering to the needs of vessels up to 400,000-dwt. The network comprises the former Bazan repair facilities at Ferrol, Cartagena and San Fernando, and the previously AESA-controlled Astano and Astilleros de Cadiz, all of which have now adopted an IZAR Carenas prefix.

Besides the scheduled drydockings and general repair work that provides the baseload business for the industry, each of the group's repair yards has a track record in distinct, specialist markets, and its own client contacts in the shipowning and shipmanagement communities worldwide. For this reason, IZAR Carenas decided that the yards be operated autonomously, albeit with a common management for the Ferrol and Fene facilities.

The early part of 2002 has witnessed a healthy level of incoming work, including conventional tanker-to-shuttle tanker conversions, and repair projects involving cruise ship and cablelayer tonnage.

The new business has followed what was regarded as a good year for the group. Over 400 vessels were received during 2001, and the division's estimated turnover was around \$183.9 million, yielding a modest profit of \$876,000.

IZAR Carenas Cadiz gave fresh expression to its longstanding position in the conversion and rebuild sector with the completion at the end of January 2002 of a major stability modification to the 12,684-gt French passenger-car ferry Corse. The vessel had arrived at the Cadiz yard in early November for a program of work which included dismantling the buoyancy tanks on the garage decks, removal of fittings and equipment for relocation on a modified hull, installation of new sponsons of total weight of approximately 300-tons, and painting and surface treatment. The yard also prepared the detailed engineering plans.

A subsequent project currently in hand entails the adaptation and completion of a hull, purchased from the Kherson Shipyard in the Ukraine, as a chemical tanker. The Cadiz shipyard was assigned basic and detailed engineering and comprehensive equipment and system supply and installation, bar the already in-situ main engine, fitting of shaftline, propeller, rudder and steering gear, all accommodation work and painting throughout the ship. She is due to be delivered to Spanish operator in April this year.

In looking to widen its ambit still further, IZAR Carenas Cadiz hopes to enter the cruise ship repair market by October

2002. A dedicated team is to be created to handle such contracts, for which special provisions would be made as regards electrical supply to vessels while drydocked, along with garbage removal and other facilities on behalf of owners.

The integration of the Bazan and AESA interests has also created a new force in engine production. One of the jewels in the crown of Europe's two-stroke diesel engine manufacturing sec-

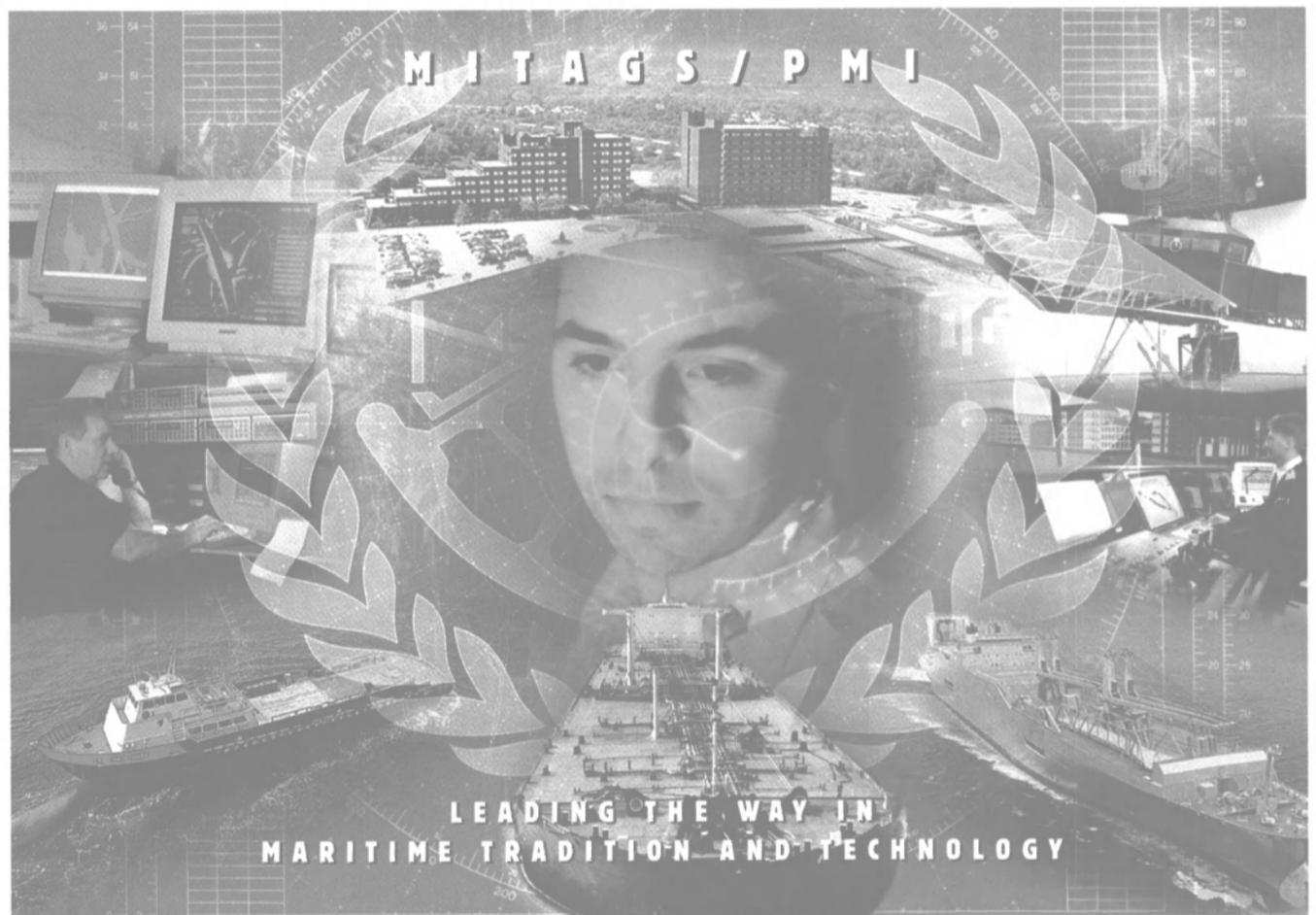
tor, the Manises plant near Valencia gives particular weight to IZAR's activities in delivering large prime movers into the commercial marine market.

Although MAN B&W relinquished its 20 percent stake in the former Manises Diesel Engine Company to the then majority holder AESA in mid 2000, it entered into a wider, long-term licensing agreement with the company. The 10-year deal extended Manises' licensed

area to the whole of the EU and Norwegian market, from its previous orientation to Spanish mainland and island territory. A major deal for eight export engines struck with the factory in its pre-IZAR guise is now coming to fruition, putting Spanish-built two-strokes into the MAN B&W homeland. The program involved eight low-speed diesels totaling 192,250-bhp for delivery to eight containership newbuildings in Germany.

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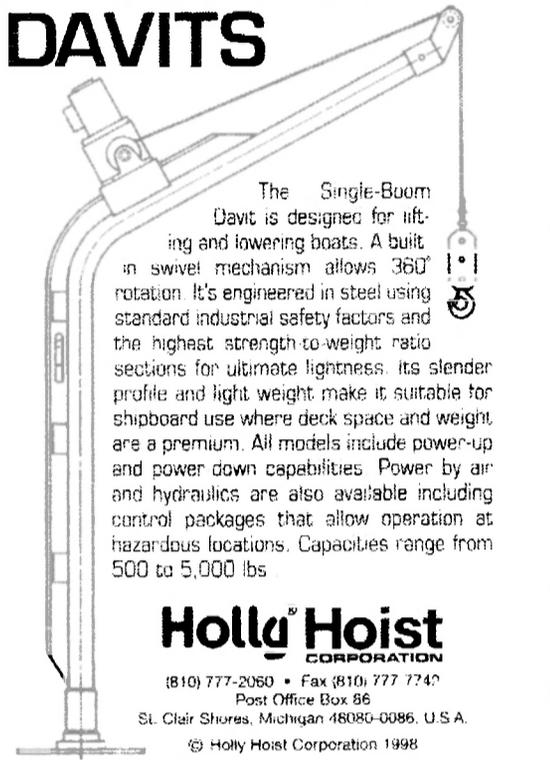
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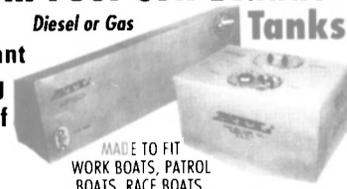
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REQUEST FOR PROPOSALS

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1. Vessel Purchase

Procurement of one (1) existing high speed, passenger-only vessel with the following required characteristics: catamaran hull design; minimum service speed of 30 knots at full load displacement; interior seating for a minimum of 260 passengers; and U.S. Flag with current Certificate of Inspection. Estimate: \$4,000,000 - \$5,500,000.

2. Vessel Sale

Sale of the following two (2) passenger-only ferries: M.V Kalama and M.V Skagit. The vessels are essentially identical and have been operated by WSF in scheduled passenger service since construction in 1989. To assist this sale, an independent marine surveyor has prepared an Inspection and Valuation Report for each vessel, dated January 2002, which will be included in the solicitation package. The particulars for each vessel are as follows:

Builder: Halter Marine, New Orleans, LA; Year Built: 1989; Hull Design: aluminum monohull; Length: 102'0"; Beam: 24'6"; Draft: 8'3"; Speed: 25 knots; Horsepower: 3840; Engines: 4 Detroit Diesel Reliabuilt, Model 16V92TA, with less than 250 operating hours; Passenger Capacity: 250; Gross/Net Tonnage: 96/65.

After February 26th, interested parties may obtain a Request For Proposals (RFP) package for the Vessel Procurement Contract and an Invitation For Bids (IFB) package for the Vessel Sale Contract from the following WSF office. The RFP and IFB packages will also be posted on the following WSF web site at that time: www.wsdot.wa.gov/ferries/contracts.

WASHINGTON STATE FERRIES

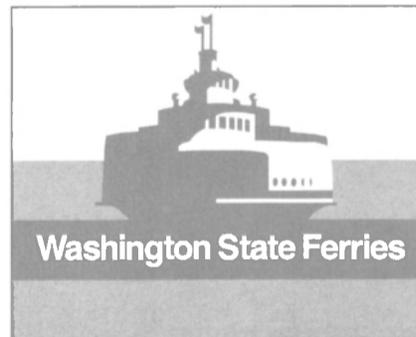
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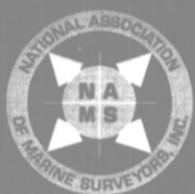
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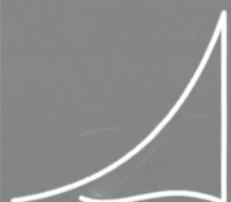
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 Phone: [Blank] Fax: [Blank] E-Mail: [Blank]

Vessel No.	Hull No.	Year on	Official No.	IM	Gross Tons	Net Tons	HP	Len.	Breadth	Depth	H-A
ABBS 151	TAMP	FREIG	D1038906		427	128	144	52	9.3	S	
ABBS 152	TAMP	FREIG	D1039195		427	128	144	52	9.3	S	
BAYOU BR	MIAMI	UNCL	D602002		20	19	650	45	15	5.6	A
BAYOU BR	TAMP	UNCL	D290887		20	14	350	43.6	15	4.6	S
WISENER	TAMP	INDU	D518322		697	697	0	170.2	50	8.9	S
WISENER	MIAMI	INDU	D600683		1139	1139	0	180	60	11.5	S

Company Record: A & K FISHING

Name: A & K FISHING
 Vessel Name: INHERITANCE
 Address: 2 MIDDLE
 Address2: [Blank]
 Address3: [Blank]
 City: FAIRBANKS
 State: MA
 Zip: 027
 Country: United States
 Title: [Blank]
 First Name: [Blank]
 Last Name: [Blank]
 Phone: [Blank]
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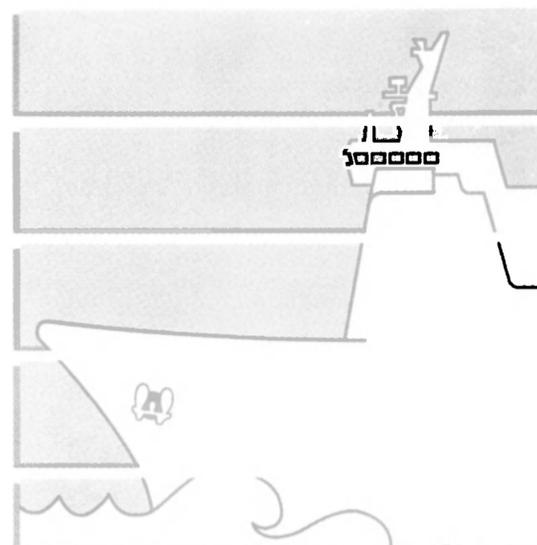
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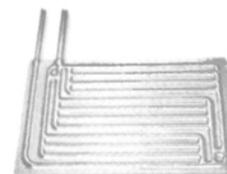
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