

July 2000

MARITIME REPORTER AND ENGINEERING NEWS

Has the Cruise Boom gone Bust?

Celebrity's Millennium marks a new era in cruise shipping, but some contend that too much capacity has come on too fast



Demetrios P. Kaparis, Celebrity's executive senior vice president, newbuilding, standing next to Millennium's gas turbine engines

Gulf Coast Analysis: Floating Production System Report Diesel Power Annual: The
Diesel Engine Technical Specifications investment in Design: Vessel Safety At
Center Stage Ship Repair & Conversion Legal Beat: Heightened Scrutiny on Ship
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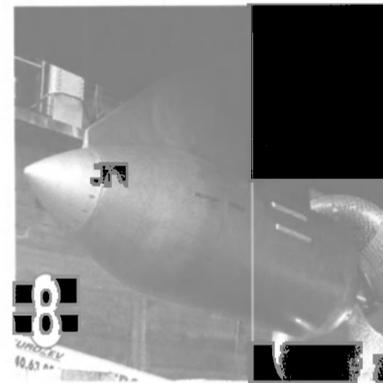
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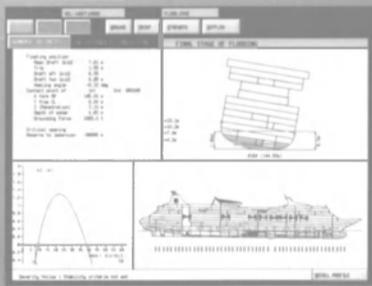
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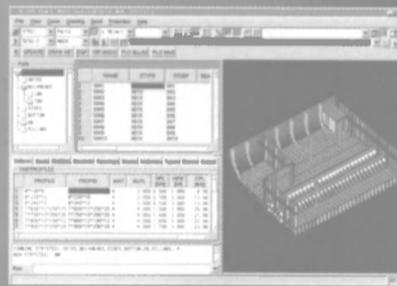
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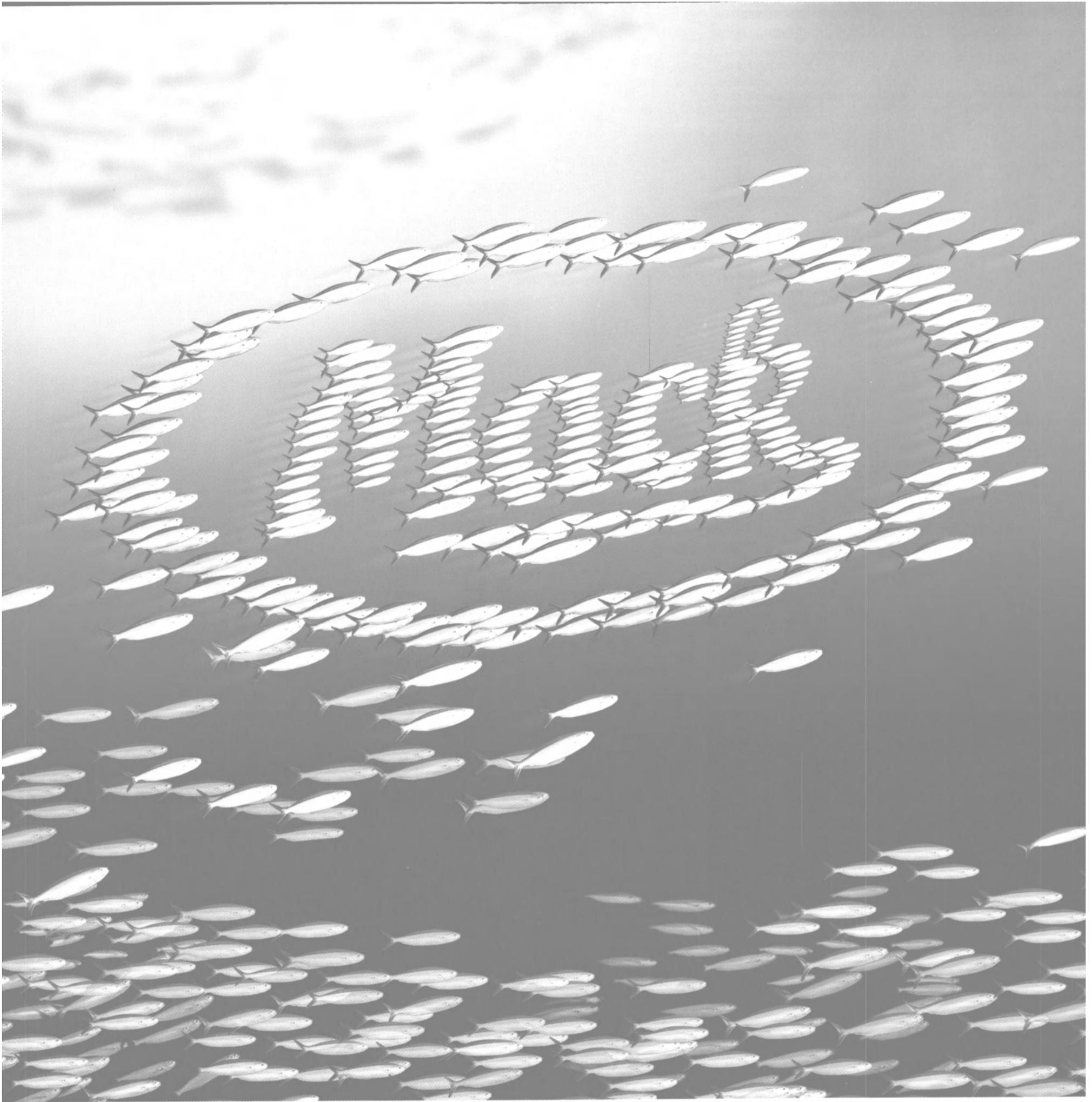
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Editor's Note

To answer the question, in a word, posed on the cover: No! While the cruise market has undoubtedly experienced several painful, and often costly, growing pains of late, it is abundantly clear that the dynamics of the market have changed from when the "boom" began in the early to mid 1990s. While a record amount of tonnage has and continues to enter the workforce and operators are having a difficult time filling them, the cruise industry is truly in its toddler stage, with plenty of growth opportunities domestically and particularly abroad.



Granted, industry watchers and/or investors are aghast at the low valuations of cruise companies, as well as the general financial direction, given Carnival's and Royal Caribbean's profit warnings of last month. Similarly, a string of embarrassing and/or criminal incidents — including pollution, fire and onboard safety incidents — have marred an industry that was otherwise enjoying a spotless record on most counts. However, it is wise to believe in the general strength of cruise concept as a whole, and view current events as a blip on a long and healthy history. Also, through all of the dubious incidents, it is encouraging to watch the industry's response, which has more often than not been rapid and decisive, with strong support from all walks of the maritime industry.

A perfect example of the industry striving for higher ideals is the introduction in the U.K. late last month of Celebrity's new Millennium cruise ship — the first ever with gas turbines as the main propulsion source. As cruise companies are consistently taken to task to protect the precious environs within which they make their profits, the selection of clean propulsion sources will be essential in ensuring future profitability. While the gas turbine trend is gaining steam (literally), it is foolhardy to believe that diesel power will be replaced anytime soon as the prime mover of cruise ships. In fact, Wartsila NSD, a diesel engine supplier to the cruise market, is busily working with Carnival on the development and deployment of the smokeless diesel engine. These efforts, combined with ever tightening IMO and EPA rules regarding marine engine emissions, will help ensure the diesel's place in the cruise industry for some time to come.

Industry support will be essential, particularly in the creation of appealing and functional designs. For example, *The Wall Street Journal* last month reported on a cruise industry legal battle lost with the Federal Appeals Court, which mandates that all cruise ships — whether registered in the U.S. or abroad, must accommodate disabled travelers under the Americans with Disabilities Act. This will be a particular challenger for cruise lines, who place an absolute premium on space.

Read the mid-year cruise report, which begins with Associate Editor Regina Ciardiello's experience in Southampton, U.K. aboard the new Millennium prior to its first cruise for paying customers, starting on page 26.

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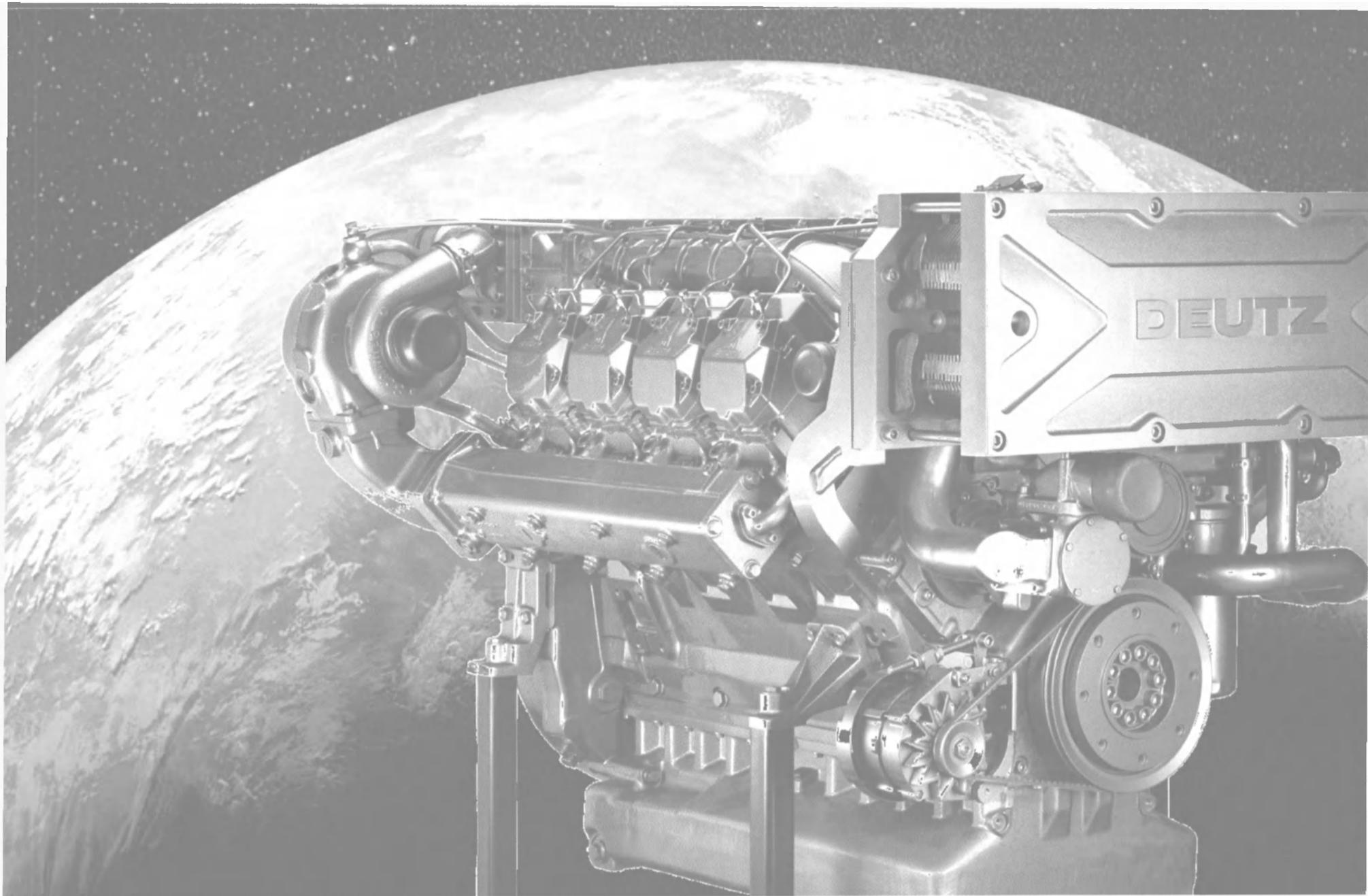
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Vessel Safety Takes Center Stage



By David Tinsley,
technical editor

At a recent industry gathering in London, a series of presentations on passengership safety issues inevitably but rightly raised nightmare scenarios of mass evacuation. However, the tone set by the speakers and participants at the conference "Safety of large passenger ships — looking to the future" was pragmatic rather than alarmist. Organized by the Institute of Marine Engineers and the (U.K.) Maritime and Coastguard Agency, the event drew observations on safety matters and perceptions of upcoming needs from qualified professionals, in the light of major expansion in the cruise

shipping sector.

The consensus view was of a need for a circumspect and proactive approach to operational safety issues, to better ensure the status quo as regards the good safety record demonstrated by the industry. In U.S. waters, it is understood that not a single passenger life has been lost over the past 16 years due to a casualty involving a large passengership.

With the stakes being so high, not only in human terms, but also as regards the well being of shipping's most dynamic business segment, there can be no room for complacency, even if the safety statistics indicate that the industry must be doing a lot that is right and appropriate.

Images brought to mind of possible situations where thousands of passengers and crew might have to be rapidly evacuated from a large cruise vessel in hostile

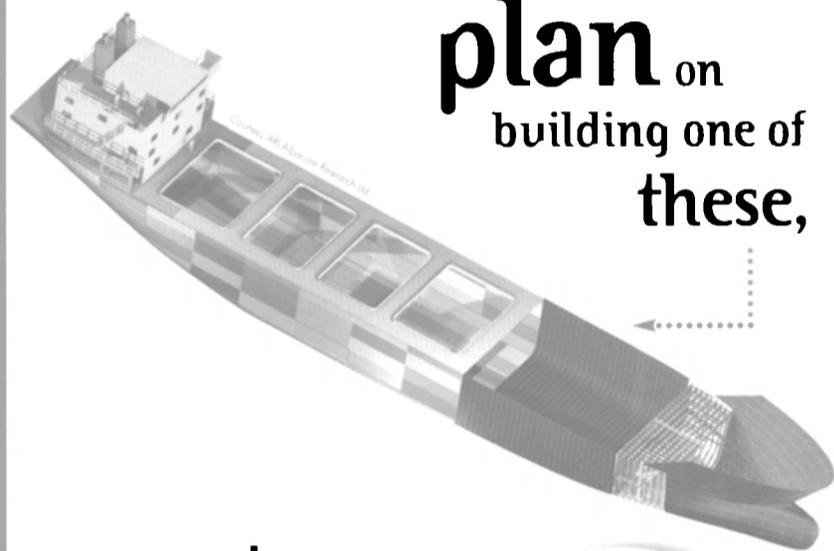


Alstom's Mermaid podded propulsor.

weather conditions, amid great confusion, at night, perhaps in an ocean area with no other ships in the immediate vicinity and distant from search and rescue (SAR) resources, will hopefully never become a picture in reality.

But trends in cruise liner size, scale, complexity and numbers, passenger-to-crew ratios, and crewing aspects have set the alarm bells ringing, as have a number of what might be termed close calls around the world in recent years. The manner in which certain incidents involving shipboard fire and other situations

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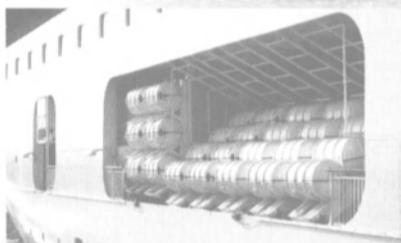
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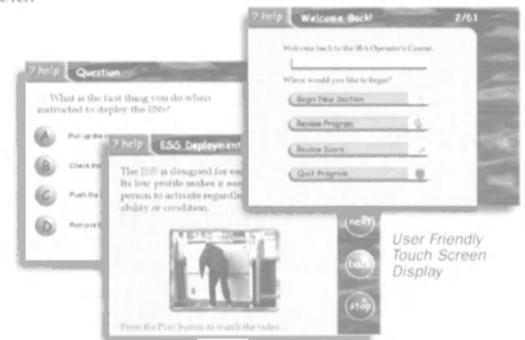
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Investment in Design

have been handled and contained have demonstrated the effectiveness of new standards designed to protect passengers. But several speakers at the London conference alluded to the fact that quite a number of recent years' emergencies involving large cruise vessels had taken place in calm weather, during daylight,

and with SAR facilities and other ships close to hand.

The 'what might have been factor' in conjunction with the considerable technical and operational challenges presented by safely controlling and dispatching floating communities of potentially 5,000 or more people from a

stricken vessel call for all safety-related issues and legislation to be revisited.

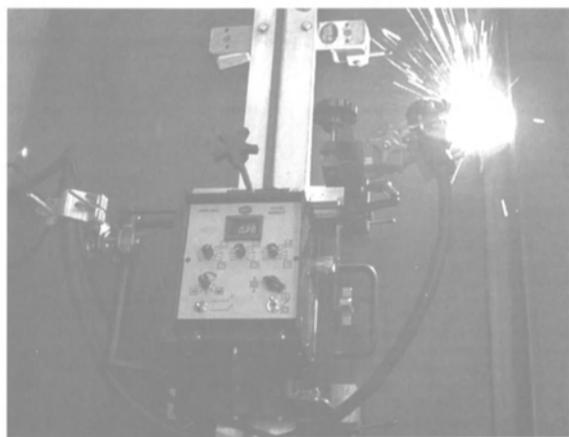
The International Maritime Organization's secretary-general **William O'Neil** has his finger on the pulse. In the immediate run-up to the IMO's Maritime Safety Committee meeting in London during the latter part of May, O'Neil

suggested at the conference that a dedicated working group be established to examine all safety issues relating to passenger ships. Cognizant of major fleet development, reflected in huge investments in luxury cruise liners of unprecedented size, the secretary-general's proposal was colored by a perceived need for a more coordinated and holistic approach to the safety of such vessels, particularly as regards emergency situations. O'Neil said "the safety of recently-built cruise ships is not in doubt, nor is there concern as to whether such ships conform with the most recently adopted safety standards applicable to ships of this category." Rather, he felt that SOLAS and Load Line Convention requirements warranted review to identify whether or not the edicts need enhancing, given the evolution in ship size and complexity, and whether they duly address all safety aspects of operations, especially emergencies.

He also advocated an assessment of the STCW (Standards of Training, Certification and Watchkeeping) Convention in the same light. **Douglas Ward**, president of The Maritime Evaluations Group, calculated that the world fleet of cruise ships carrying more than 1,000 passengers numbered 80 vessels in service as of mid-May this year, including 50 of more than 50,000-gt, of which four were in excess of 100,000-gt. Ward predicted that the population of cruise vessels above the 50,000-gt mark will have swelled to 127 by the end of 2005, on the basis of confirmed shipbuilding contracts, and that 18 of these will measure more than 100,000-gt.

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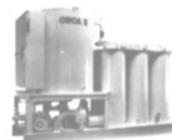
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A podded future

One of the most notable aspects of the new generation of RoPax ferries, which could secure the immediate future of shipbuilding in Northern Ireland is the selection of electric propulsion using podded drives. Furthermore, unlike the vast majority of pods ordered to date for cruise liners, offshore vessels, icebreakers and other types, the favored system is based on water-cooled rather than air-cooled propulsors. The significance of this is the additional space-saving rendered within the ship's aft-end, a vital consideration in RoRo vessels where efficient stern loading and discharge is critical to fast-turnaround performance.

Formalization of Harland & Wolff's contract for a series of 625-ft. (190 m) RoRo passenger vessels, employing a Norwegian-developed, 27-knot ship design, would provide a new reference for all-German technology manifested in the Siemens-Schottel Propulsor (SSP). While the Azipod and Mermaid outboard electric drives have set the

pace in recent years, the SSP is now coming into its own, bringing the concept of podded propulsion to new segments of the market.

Following the breakthrough order for a 5.1-MW unit on a 19,000-dwt Swedish petrochemical tanker newbuild in China, SSP podded electric drives have been selected by German TT-Line for its new class of Baltic ferries. They have also been specified for Costa cruise ship rebuild and COSCO heavy-lift vessel new-construction projects. The particular merits of the system in the context of efficient RoRo design have also been underscored by Fin-

cantieri's nomination of the twin SSP units for a proposed new type of large passenger RoRo ferry.

Unlike its contemporaries, SSP is based on a permanent-magnet motor (PEM), proven in naval applications. Heat generated inside the drive is transferred direct to the surrounding seawater, requiring the smallest possible void space within the stern section of the ves-

sel. By contrast, pod systems using conventional electric motors require internal air cooling, necessitating space for coolers in the after part of the hull.

Harland & Wolff's order from Seamas-ters International of the Bahamas is subject to intervention aid, financing and guarantees. The provisional agreement spans four vessels of the 6,500-dwt Atlantic 4000 class, formulated by

Oslo-based SeaTrade, and carries options on fifth and sixth ships. The diesel-electric podded propulsion system is one contributor to the 15-20 percent improved fuel efficiency claimed for the Atlantic 4000 relative to competing designs. The other main influences are reduced steelweight, optimized hull lines, and special load sharing software controlling the main engines.

Chiles Offshore Files IPO

Chiles Offshore LLC, a unit of offshore oil exploration company Seacor Smit Inc., has filed for an initial public American Stock Exchange listing. The company predicted it will net about \$135 million in proceeds from the share sale, which it plans to use to purchase or retire all of its currently outstanding senior notes. Chiles, which operates three of the seven ultra-premium drilling rigs in the GOM, also plans to use some of the money to fund a fleet expansion.

Aker Wins \$89M Contract

Aker Finnyards and SeaFrance have signed a contract worth more than \$88.9 million for the construction of a new car-passenger ferry for the Dover-Calais route. Touted as the fastest and largest vessel to ever operate on that route, the 607 ft. (185 m) ferry is scheduled for a September 2001 delivery. Able to transport 1,900 passengers and 700 cars at speeds of up to 25 knots, the vessel will reportedly be the fastest of its kind operating on its route; reducing crossing time to approximately one hour.

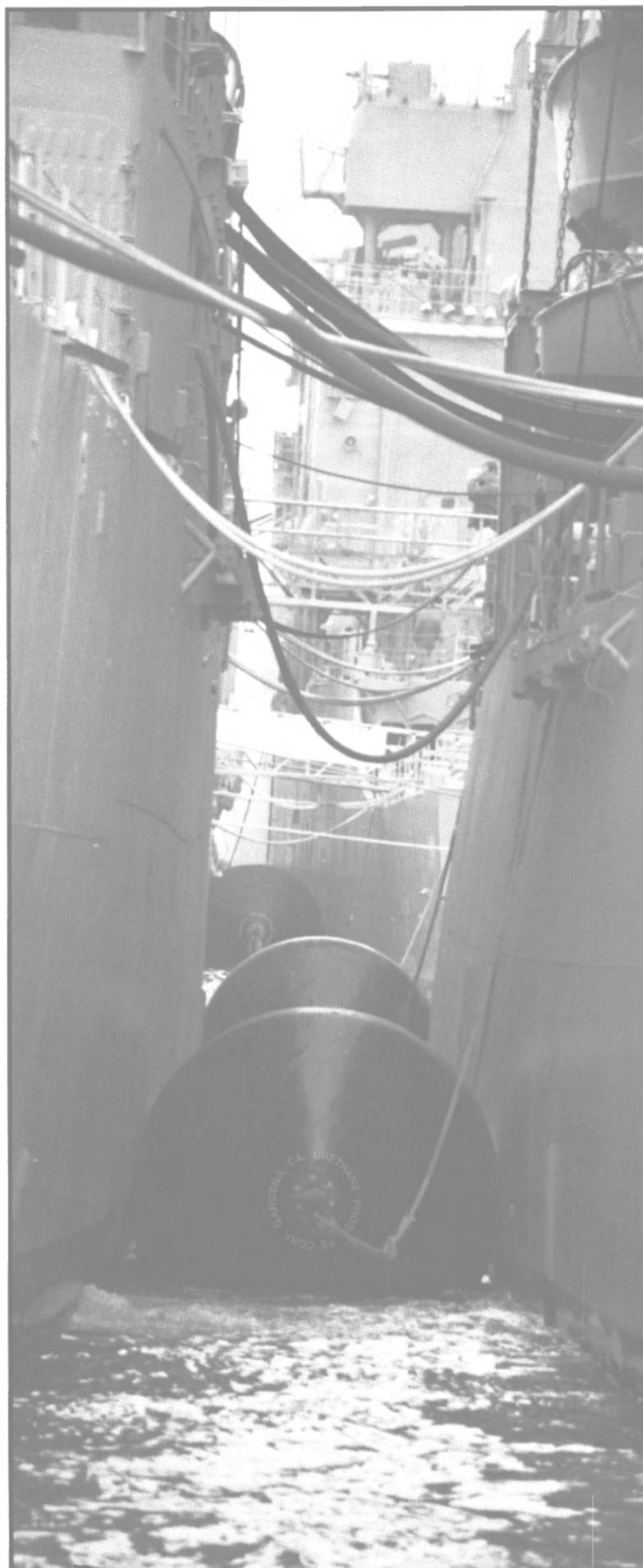
Circle 13 on Reader Service Card

PDVSA Close To LNG Deal

Petroleos de Venezuela (PDVSA) is preparing to sign an agreement with Enron to build the country's first liquefied natural gas (LNG) export plant. Located in the eastern oil port of Jose, the \$600 million facility will have an annual capacity of 2.1 million tons of LNG and should start operation in 2004. It will be the first LNG plant to be built in gas-rich Venezuela.

Tidewater To Purchase PSV

Tidewater has signed a letter of intent to purchase M/V Ace Navigator from the Sanko Steamship Co. of Tokyo, Japan for \$22.5 million. Constructed in October 1999, Ace Navigator is a UT 745 design platform supply vessel that is able to work in both harsh weather and deep water. Measuring 275 ft. (83.8 m), the vessel is rated at 9,600-bhp with full dynamic positioning capabilities.



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Circle 279 on Reader Service Card

ABS Introduces SafeShip

Scrutiny surrounding the carriage of cargo at sea, particularly on the quality of tonnage enlisted to transport potentially hazardous materials, is higher than

ever. In the wake of high-profile disasters such as Erika, which left not only beaches and water but the reputation of many in the shipping industry soiled,

leading companies usually step up.

This is the case with the American Bureau of Shipping, one of the handful of highly regarded classification societies in the world. At the recent Posidonia exhibition, ABS introduced SafeShip, a program designed to apply advanced technology to reduce risk in the design, construction and maintenance

of a new and safer generation of cost-efficient vessels.

"The recent high profile Erika and Leader L casualties have clearly identified a need within the industry for better tools to gather and interpret data critical for maintaining the structural integrity and minimizing the risk of structural failure of a vessel throughout its service life," said **Frank J. Iarossi**, chairman and CEO of ABS.

ABS SafeShip is designed to not only provide a method of collecting this information, starting with the initial design and drawings, but also of applying the most advanced, dynamic based assessment of the hull structure at any time throughout the vessel's life.

"The central elements within ABS SafeShip had been developed to improve the manner in which ABS assessed and recorded the structural condition of ABS classed vessels. With ABS SafeShip we are giving the owner, at no cost, the most complete set of tools available that can be used to plan and implement a through-life structural integrity management program," Iarossi said. "SafeShip is not a product but rather a specific approach to vessel design, construction and maintenance that will promote a safety culture for the ship, for the owner and ultimately within the industry." Free enrollment in the ABS SafeShip program is open to all new and existing vessels designed to meet ABS SafeHull criteria.

How It Works

Enrollment in the ABS SafeShip program begins when a vessel is ordered to ABS SafeHull criteria. SafeShip then takes the engineering first principles approach from SafeHull and builds a complete through-life integrity management system. Once SafeHull identifies the more highly stressed areas, the new ABS Guide for Enhanced Hull Construction Monitoring establishes specific criteria for both tolerances and inspections of these areas during construction to avoid subsequent structural problems in operation. On delivery, a structural database is created utilizing ABS SafeNet Hull Maintenance. Specified as-built drawings are entered into the ABS SafeNet Vessel Drawings system, providing life cycle storage and easy updating of this crucial information. In service, ABS SafeNet Hull Maintenance and Survey Status modules are used to manage the structural condition of the vessel. These allow an owner to monitor and predict the condition and capability of a ship as it ages in a more complete and accurate manner than previously possible.

"As the vessel ages, by using ABS SafeShip the owner will have the tools to rationally predict fatigue sensitive

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areas, to accurately assess the condition of the vessel, and to predict its future service life," said **Robert D. Somerville**, ABS president and COO. "An owner can expect to see significant cost savings over the life of the vessel from improved performance, less down time, greater operating efficiencies and reduced exposure to risk. Owners of vessels enrolled in the ABS SafeShip program can be secure in the knowledge that they have exercised the highest possible level of due diligence in the design, construction and structural maintenance of their vessel."

ABS will electronically scan and store the specified vessel drawings for the owner at no charge. The classification society will also electronically input the as-built structural description of the vessel, including the identification of the more highly stressed areas extracted from ABS SafeHull, into the program, also at no charge to the owner. The requisite operating programs will be installed on the owner's computer, together with appropriate training, by the ABS affiliate, ABS Nautical Systems at no cost to the owner.

Circle 168 on Reader Service Card

RINA Sets New Green Standards

Italian classification society RINA — under the gun of late due to its role in the Erika oil spill disaster — has launched Green Star, a new environmental standard for shipping, and the 82,000 gt Costa Atlantica, due for delivery from Kvaerner Masa yard at the end of June, will be the first ship to meet the green standard. "Passengers want to visit environmentally sensitive areas, but they don't want to damage them," says **Franco Porcellacchia**, international marine manager of RINA. "The Green Star standard is visible proof that their ship is designed and operated to protect the environment, and keep the sea and air clean." The Green Star logo has been awarded to the Costa Atlantica as evidence that the ship meets the requirements of two voluntary RINA class notations, CLEAN SEA and CLEAN AIR. Carnival Corporation has already applied for the first of three sister ships building at Kvaerner Masa, the Carnival Spirit, to be certified to the new standard. A leading feature of the CLEAN SEA notation is that bunker tanks must be installed over double bottoms, to prevent accidental discharge of oil in a low speed accident. Ships must also be fitted with holding tanks for all black and gray water waste, to prevent organic pollution, and must meet the standards set down in the voluntary IMO MARPOL Annex IV. Special requirements ensure garbage is disposed of safely, and ships must not use TBT-based anti-foulings.

The CLEAN AIR notation sets limits on SOx and NOx emissions from the engines, and requires compliance with the voluntary standards of Annex VI to Marpol. There is a three percent limit on sulfur content in fuel that can be burnt. RINA also sets requirements for refrigeration gases and their containment in the case of an accident, and sets controls for incineration plants. "Costa Crociere

and Carnival Corporation know that these new ships meet the requirements of Annex IV and VI to Marpol now," says Porcellacchia. "They don't face expensive retrofits, and they can plan itineraries to areas where any form of waste disposal is prohibited. We believe these standards offer shipowners and their clients the best possible protection for the environment, combined with a

practical approach to dealing with wastes and the energy needs of a passenger ship." RINA is currently overseeing the construction of four ultra-large cruise ships for Carnival Corporation at Kvaerner Masa yards, and seven large cruise vessels for Holland America, Carnival and Princess Cruises at Fincantieri yards.

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Circle 203 on Reader Service Card

Legal Beat

Heightened Scrutiny On Ship Scrapping

Ever since two enterprising reporters for the *Baltimore Sun* decided, in 1997, to take a closer look at ship scrapping, first at a Baltimore shipyard dismantling a Navy ship, and subsequently an in depth review of scrapping conditions in

Alang, India, the light of public attention has been shining on this oldest of maritime practices.

With this scrutiny, the world of scrapping ships will be forever changed — hopefully for the better.

Background

Following the end of the Cold War, the Navy's downsizing its fleet, and the requirement to replace tankers with more modern and environmentally safer ships, the demand to decommission and dispose of obsolete vessels is increasing at a pace more rapid than the capacity exists to handle this demand. Certainly,

this is true in the U. S. And therein lies the nub of this debate. Should the U. S. be required to dispose of obsolete government vessels, from the Navy and the Maritime Administration's (MarAd's) National Defense Reserve Fleet (NDRF), only in U.S. shipyards and facilities? The Clinton Administration, and some Members of Congress, have clearly answered this question in the affirmative.

Between the Navy and MarAd, the Government has close to 200 obsolete vessels to dispose of over the next 10 years, or sooner if possible. Because of their age, these ships contain a number of hazardous substances, including asbestos and solid and liquid polychlorinated biphenyls (PCBs) - all substances now banned or highly regulated by the Environmental Protection Agency (EPA). Also, due to their age, a number of these ships are in very bad or deteriorating condition, and could well be causing environmental degradation to the very U.S. waters and rivers in which they are presently moored. In the case of MarAd, it spends millions of dollars each year simply to maintain and preserve these ships in three NDRF sites around the country.

U.S. Shipbreaking Capacity

Does the capacity exist in the U.S. to dismantle this number of obsolete ships? Probably not at the present time. And, certainly not without additional financial incentives from the Government to encourage more shipyards or shipbreakers in the U.S. to get into this business. At one time, U.S. yards did break up ships, but this largely changed in the 1980s when overseas yards, including those in India and Bangladesh, took over this responsibility. In these Asian nations, labor was cheaper and environmental standards were certainly lower. At the same time, the price of scrap metal and steel was much higher. (For a piercing picture of the conditions in an Indian scrapyards, see the above-mentioned *Baltimore Sun* series.) However, after the Clinton Administration imposed a moratorium on the export of government vessels for overseas scrapping, U.S. yards have gotten back into the business.

Consistent with the moratorium, an interagency panel report on ship scrapping, and legislation sponsored by Senator **Barbara Mikulski** of Maryland, the Navy has recently embarked on a pilot project to ascertain the "true" costs of dismantling a ship in the U.S. in full compliance with U.S. environmental laws and regulations. In September 1999, the Navy awarded four contracts to four companies to scrap one ship

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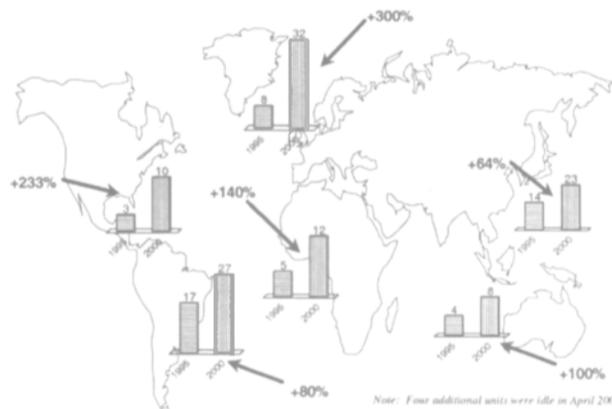
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Circle 302 on Reader Service Card

(Continued on page 19)

Contracts

Keppel FELS Consolidates Philippine Power Barges

Keppel FELS Energy & Infrastructure Ltd. has purchased from SM Development Corporation, its entire stake in Keppel FELS Energy Inc (KFEI), for a total consideration of \$13.3 million.

It has also bought from the Keppel Philippines Group and Keppel Marine Industries Limited (KMI) their individual stake in KFEI and Keppel FELS Energy Manila Inc (KFEMI) for total considerations of \$32.1 million and \$7.3 million, respectively. With the completion of these transactions, Keppel FELS will wholly own KFEI and KFEMI.

KFEI and KFEMI were operating power barges in Calacca, Batangas and North Harbor respectively under BOO contracts with the Philippine National Power Corporation that expired in the October 1998 and July 1999. The power barges are now undergoing maintenance for redeployment.

Charleston Orders Pilot Boat Pair

The Pilots of Charleston, S.C. have called on the team of Hunt/Gladding-Hearn to supply a pair of fast 75 ft. (22.8 m) pilot boats. The Pilots currently operate two 55 footers and a 38 footer, both constructed by Hunt/Gladding-Hearn.

Designed by C. Raymond Hunt Associates and constructed by Gladding-Hearn, the increased size and higher performance of these vessels mirrors the contemporary demand for trips that are farther offshore than normal. A pair of DDEC 16V200 engines, each with an output of 1,285-bhp provides maximum speed of 28 knots via custom Brunton five blade propellers selected for maximum speed and efficiency.

Circle 3 on Reader Service Card

GE To Upgrade Gas Turbines For Venezuelan Navy



Mariscal Sucre and Almirante Brion at Litton Ingalls' Pascagoula, Miss. yard.

GE Aeroderivative and Package Services (GEAPS) will modernize and re-install four GE LM2500 aeroderivative

July, 2000

gas turbines that have been running for 20 years on two Venezuelan Navy frigates.

The gas turbine upgrades are part of the frigate modernization project performed by Litton Ingalls Shipbuilding at the company's Pascagoula, Miss. shipyard.

Utilizing up to 1,000 shipbuilders for the next two years, the project marks the first major retrofit and upgrade of the two 2,500-ton Lupo-class frigates, Mariscal Sucre and Almirante Brion. Work on the vessels includes major upgrades to the gas turbines' high-pressure compressor rotors, high-pressure

compressor stators and the low-pressure turbine stators.

A wedge will also be added in the exhaust to decrease noise and exhaust system distress, while increasing performance and fuel economy.

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(Continued from page 16)

apiece for the Navy. The awards were made to Baltimore Marine Industries, Inc., of Baltimore, Md.; International Shipbreaking Limited, of Brownsville, Texas; Ship Dismantling & Recycling Joint Venture (of New Hampshire and Virginia); and Metro Machine Corp. of Norfolk, Va. The Navy paid these companies between \$1.8 million and \$3.8 million apiece for the disposal of four decommissioned frigates. The proceeds from the sale of the scrap is to be credited toward the value of the contract. If the scrapping at these facilities is successful, they could receive other contracts for scrapping the remaining 55 vessels in the Navy Inactive Fleet designated for scrapping.

MarAd is required to dispose of more than 100 obsolete vessels by September 30, 2001, a deadline that the agency recognizes it cannot meet. However, unlike the Navy, to date, MarAd has not been given the financial resources or the authority to pay U.S. yards for scrapping. Most MarAd ships are being broken up in Brownsville, TX, although one company recently defaulted on its contract. In the meantime, MarAd has had to expend considerable funds to maintain the ships in its Reserve Fleet sites located in the James River, Virginia, Suisun Bay, California, and Beaumont, Texas. A report by the Inspector General of the Department of Transportation, issued in March 2000, recommended that MarAd seek new legislative authority comparable to the Navy's and extend the deadline for scrapping its remaining ships. MarAd has requested an extension to 2006.

International Attention

The U.S. is not alone in examining its ship disposal practices. Heightened scrutiny by Greenpeace, the Basel Action Network (BAN), and the International Federation of Transport Workers, among others, is forcing international organizations as well as foreign scrapping nations to reexamine their laws and practices. As noted above, the majority of scrapping in recent years has taken place in India, Bangladesh, and Pakistan, although China is also scrapping foreign ships.

Greenpeace and BAN would prefer to have ship scrapping controlled under the Basel Convention, a regime that regulates the transboundary movement of hazardous waste. Signatories to the Basel Convention disagree on whether the release of hazardous waste from the dismantling of a ship is itself a practice regulated under the Basel Convention. The U.S. has signed but not yet ratified the Basel Convention, but is a participant in the Basel Convention discussions. The U.S., and most other interested maritime nations, prefer to have ship scrapping reviewed by the International Maritime Organization (IMO), headquartered in London, and made up of most shipping nations. In March 2000, the IMO agreed to have its Marine Environment Protection Committee look at current practices in shipbreaking, including the possibility of having all toxic substances removed before the scrapping takes place. A Correspondence Group, under the leadership of Bangladesh, is undertaking this review.

(Continued on page 35)

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~ for total of 15,115 sq. ft closed passenger space, gift kiosk
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Rebuilt 1997 by Network Marine, Pierre Part, Louisiana Vessel is built on Catamaran Hull of diving support vessel which was originally built in 1973. Hull was stripped, with all houses and fittings above deck removed, hull split in two and lengthened approx 100 ft. Only bow, stern and original m/e remain from original vessel.

(all figures approximate and details are given without guarantee)



Full specifications, pocket plan and condition survey, with photos, available upon request. Owners have instructed us to invite best offers for purchase or long term charter with delivery summer 2000. Vessel is promptly inspectable New York by arrangement.

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Ship Repair & Conversion

Cascade General Gets Crystal Harmony Back In Sync

Subsequent to the departure of Holland America's Statendam in April, Cascade General took in Crystal Cruises' Crystal Harmony for a 10-day stopover in May. The 10-year-old ship underwent maintenance and overhaul work below

its waterline, extensive interior remodeling and steel replacement for pool areas on Deck 11.

With maximization of work in mind, Cascade normally sends advanced crews to join cruise ships on their way to

the yard's Portland, Ore. locale. This time though, the first mobile crew met the ship in Los Angeles, where work commenced immediately on an overhaul of one of Harmony's auxiliary boilers. A second team was then summoned

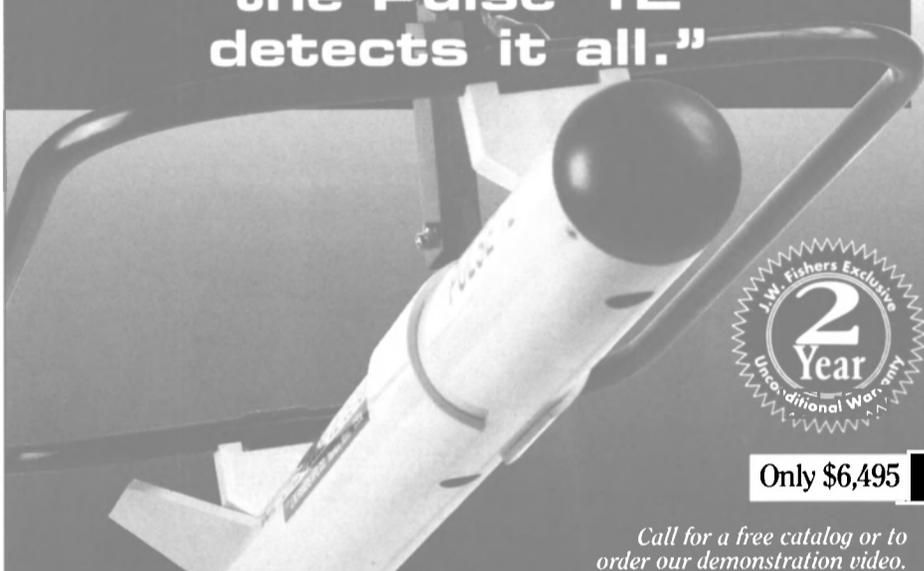
to San Francisco to clean ballast tanks before undertaking structural repairs and preservation work.

Measuring 790 ft. (240 m), the vessel was dry-docked at Cascade's 982 ft. (299 m) Drydock four, beginning with the mechanical systems below the waterline. Sperry stabilizer fins, each weighing 27 tons were removed to a building bay for complete refurbishment, while the 1,000 kW Lips bowthrusters were taken out for complete disassembly, overhaul and testing in one of the shipyard machine shops. Multiple layers of paint were blasted away to clean the hull down to its bare metal so that a five-coat Jotun paint system could be applied. Welding crews replaced corroded steel in several locations, and more than 50 sea valves were overhauled and inspections performed on propellers, shafting and rudders for Lloyd's Register compliance.

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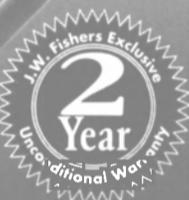
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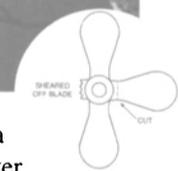
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Sri Lanka Diving Team Goes Beneath The Surface

Following the arrival of M/V Neptune Jasper at the Sri Lankan capitol and port city of Colombo, the vessel's crew spoke of a vibration that was occurring in the propeller shaft. Taking immediate action was the Colombo Engineering dive team who was summoned to examine the 20



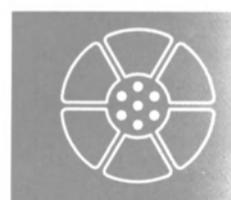
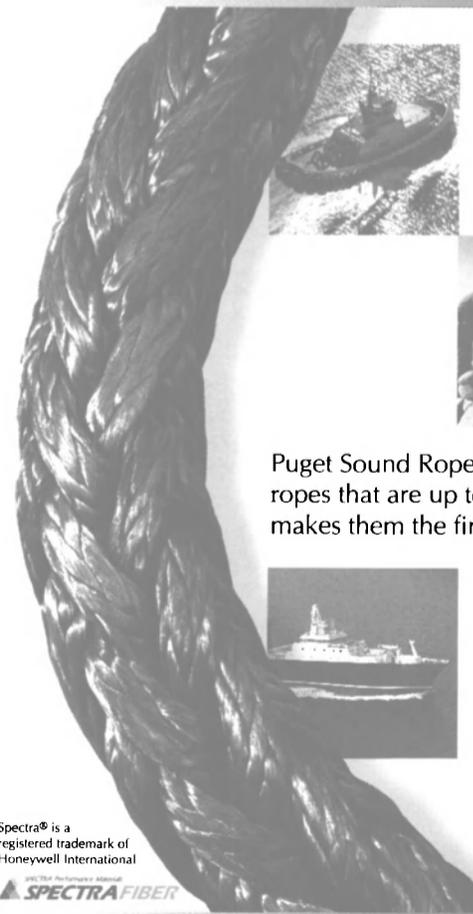
ft. diameter prop. Using a JW Fisher DV-2 underwater camera system, the group was able to shoot an underwater video inspection that was then observed by an agent of Lloyd's Register of Shipping, who in turn discovered that one of the vessel's four propeller blades had been sheared off. The JW Fisher camera allowed the shipping agent to perform an accurate assessment regarding the problem as well as the necessary repairs involved. Actions taken were that the propeller blade opposite the sheared propeller blade should be cut off to balance the rotation. Immediate action was necessary, as the drive shaft bearings would



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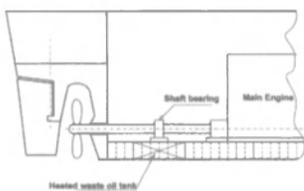
be severely damaged if left unrepaired.

Extensive oxy-arc underwater cutting on the required blade, which measured 97-in. with an 8-in. thickness. Working around-the-clock, the team was able to successfully complete the job despite obstacles as bad weather and underwater currents. Following this, M/V Neptune underwent sea trials where it was discovered that the vibration had been eliminated and the vessel was able to move on to its destination carrying its consignment of containers.

Circle 86 on Reader Service Card

Prop Shaft Misalignment Causes Near Miss

During the recent sea trial of an oil tanker, it was observed that the temperature of the intermediate shaft bearing increased to an alarmingly high value. Subsequent to this, the engine's operation was ceased so that an investigation could be conducted. Although no damage to the shaft bearing occurred, there was excessive loading of the bearing - even though checking in cold condition had shown good alignment compared to calculations.



It was found that heating of the underlying waste oil was the reason for increased loading. The tank was fitted with heating coils so that the temperature could remain between 50-60 degrees C. For reasons unknown, this tank had been heated in excess of 100 degrees C. In turn, the thermal expansion of the steel structures had caused lifting of the shaft bearing, which

then increased loading of the shaft bearing.

Litton Marine Aids In Conversion

Litton Marine Systems supplied electronics equipment for three former vehicle ferries being converted into cable laying ships for Global Marine Systems. Each vessel was equipped with dual interswitched Decca Bridgemaster E 340 X-band and S-band ARPA radars, a BridgeMaster E 250 docking radar, LMX 406 GPS receiver and twin Sperry Marine gyrocompasses with repeaters. The conversions were carried out at Cammell Laird.

Circle 87 on Reader Service Card

Norshipco, Metro Machine Team Up

Norshipco and Metro Machine have agreed to a teaming arrangement — enabling the two companies to raise the level of services provided to the U.S. Navy. The partnership between Norshipco and Metro provides the Navy with the private sector capability and capacity in the Norfolk, Va. homeport to undertake large complex repair jobs, while concurrently performing other scheduled Navy repair work. Additionally, the teaming agreement provides both companies with enhanced flexibilities in the use of their respective facilities - pertaining specifically to the more efficient scheduling and usage of the drydocks - and the ability of each company to achieve specialization in the parties' area of expertise. Despite the joint agreement, each company will still maintain separate core capabilities.

A&P Falmouth Gets Major Tanker Refit

Scheduled to have entered A&P Group's Falmouth facility this past June for major refit and repair work is the 26,218-gwt vessel Trogir.

A member of the fleet of tankers managed by Novoship U.K., Trogir, which is the ninth of the company's T-Class tankers to undergo work at A&P Falmouth in the last three years.

The tanker's workscope includes pipework, alarms, indicators, steelwork and painting.



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Circle 215 on Reader Service Card

New & Notable

Derecktor Delivers Catamaran Ahead Of Time

Derecktor Shipyards delivered its 299 ft. (91 m) high speed catamaran, Flying Cloud, to Woods Hole & Martha's Vineyard Steamship Authority. Completed one week ahead of schedule, the vessel will be used for year-round passenger

and vehicle ferry service to the islands of Martha's Vineyard and Nantucket.

Attaining an excess of 39 knots during sea trials, Flying Cloud demonstrated high stability and ride comfort due to its



dynamic ride control system. Its service speed of 36 knots will allow the ferry to cross from Hyannis Port to Nantucket Island in less than one hour - significantly lower than the conventional two hour crossing time.

Flying Cloud is powered by Paxman 12VP185 diesel engines driving Kame-wa 71SII waterjets. Passenger accom-

modation on two decks hold 171 persons, with exterior seating provided on the upper deck for open-air travel.

Circle 73 on Reader Service Card

Atlantic Marine Goes Coastal

Atlantic Marine, Jacksonville, Fla., launched the first of two 300 ft. (91.4 m) coastal cruise vessels under construction for Coastal Queen Holdings, a subsidiary of American Classic Voyages (AMCV). Named Cape May Light, the 226-passenger vessel is scheduled to be in the water by March 2001.



Each coastal vessel will be powered by two Caterpillar 3516B diesel engines driving two Schottel Z-drives with electrical power supplied by Caterpillar gen sets rated at 1,825 kW each. The vessels' design will be completed by Guido Perla & Associates, and Andrea Piacentini Design was contracted as interior designer, with an interior joiner package provided by Hopeman Brothers Marine Interiors.

Circle 88 on Reader Service Card

Highspeed 2 Ready For Service

Austal Ships has completed the first of a trio of Auto Express high speed vehicle-passenger ferries for Greek operator, Minoan Flying Dolphins Mar-



itime. The 236 ft. (72 m) catamaran named Highspeed 2 is scheduled to enter service for the summer season, preceding identical sisterships Highspeed 3 and the larger capacity Auto Express Highspeed 4.

Boasting various features such as the Seastate Tmax high speed steering system, which takes control from the vessel's waterjets at speeds in excess of 25 knots, the catamaran can hold 620 passengers.

The wheelhouse features 360-degree vision with berthing maneuvering from the wing stations. Electronics include Kelvin Hughes radars, navigational equipment and electronic chart navigation (Nucleus 5000 II and Nucleus2 Ecdis), C.Plath gyro and magnetic compasses, and Icom communications systems. Two Marine Evacuation System (MES) stations, which can be activated locally or from the bridge - and are located forward, to port and starboard - are supplied by Liferaft Systems Australia.

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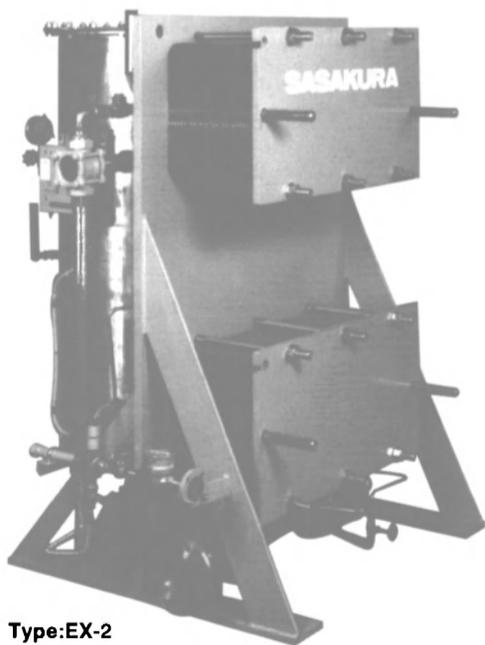
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Crowley Delivers Second Of Three Part Tug Series

Crowley Marine Services has delivered Attentive, the second of three 140-ft. (42.6 m), 10,000-hp Prevention and Response Tugs (PRTs), to Alyeska Pipeline Service Company in Valdez, Alaska. Attentive and its pair of sister-ships - Alert and Aware - will be used by Crowley in the Trans Alaska Pipeline System trade. Alert was deployed in February; Aware is scheduled to be delivered this month. The PRT trio will join Alyeska's Ship Escort Response Vessel System (SERVS), serving as tanker escorts in Prince William Sound.

During its sea trials, Attentive generated a bollard pull of 305,000-lbs. and running speed of 17 knots. Equipped for firefighting, emergency response and oil spill recovery, all three PRTs are powered by twin Caterpillar 3612B engines generating the combined 10,192-hp driving two Kamewa Aquamaster azimuthing thrusters.

The tugs' design scope was developed by Seattle-based Guido Perla and Associates; construction occurred at Dakota Creek Shipyard in Anacortes, Wash. for Vessel Management Services - a subsidiary of Crowley Maritime that owns and leases vessels. Design features include accommodations for up to 16 personnel, Schuyler fendering, a Markey TDS-40 towing winch, 3,000 ft. of oil recovery boom and on-deck stowage for two oil spill recovery skiffs.

Circle 172 on Reader Service Card

Lochnevis Launched At Ailsa-Troon

A new ferry built for Caledonian MacBrayne was launched by Scottish shipbuilding and repair yard Ailsa-Troon. The 164 ft. (50 m) vessel named Lochnevis will be deployed along the Small Isles route, replacing the MV Lochmor that was constructed by the yard for Caledonian MacBrayne more than 20 years ago.

Able to hold up to 200 passengers and 14 cars, the 161 ft. (49 m) vessel holds the latest developments in stabilizer control and propulsion technology.

Circle 71 on Reader Service Card

USNS Charlton Arrives

NASSCO has delivered USNS Charlton to the U.S. Navy. The fifth new construction ship built by the yard under the

Navy's Strategic Sealift Program, Charlton was completed under target cost and delivered five months ahead of schedule. Demonstrated at sea under NASSCO's Single Integrated Trial concept, which helps to reduce costs and cycle time, thus accelerating delivery, the vessel was received by the Navy without any discrepancies. Measuring 950 ft. (289.5 m) with 390,000 sq. ft. of cargo



carrying space, the large, medium-speed RoRo Charlton is named after U.S. Army Sergeant Cornelius Charlton, a posthumous recipient of the Medal of Honor for his heroic actions in Korea.

Circle 74 on Reader Service Card

From now on all Shipbuilders in the World have a common Language.

Let's talk Tribon!



Kockums Computer Systems (KCS) has been acquired by The Sixth National Fund Board of Sweden and is now incorporated as Tribon Solutions.

Being the world market leader within software systems for the design and production of ships Tribon Solutions is now introducing an entirely new business concept focusing on cost efficiency for shipbuilders. It features not only the latest software generation, but also a range of highly competent consulting services such as management and software training, workshops and health checks.

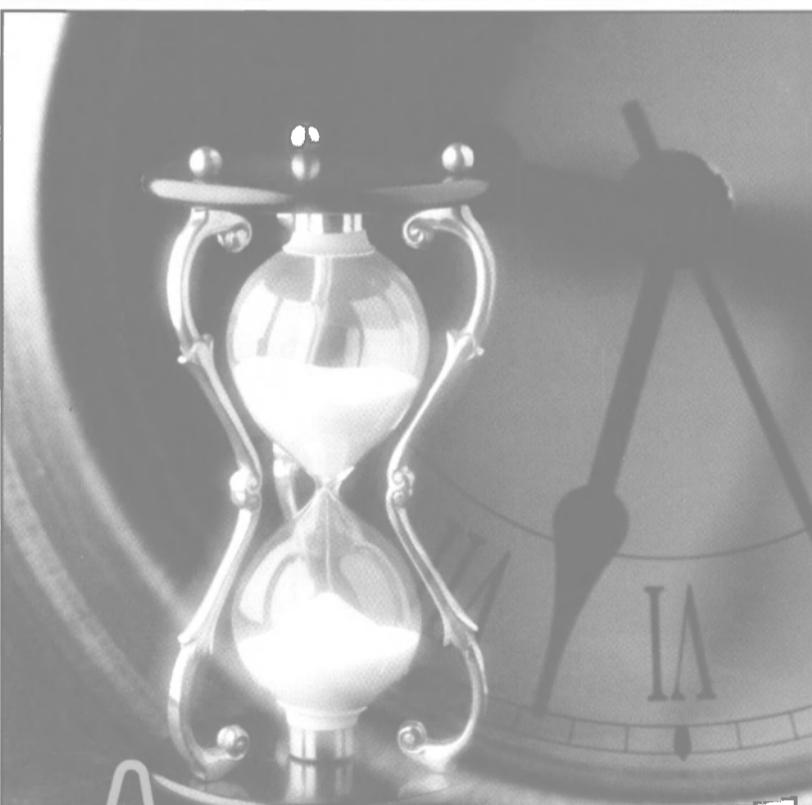
A vital element of this new business concept is the unique possibilities offered by the Tribon Internet Marketplace for shipbuilders and component/equipment suppliers which will be launched in October, 2000.

For further information and contacts, you are welcome to visit

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The leading players in their respective fields of the marine business – engine manufacturer Wartsila NSD and cruise line Carnival Corporation – have joined forces to develop a smokeless diesel-electric propulsion system for cruise ships.

The solution – code-named EnviroEngine – is already on the horizon as the

time-proven technology featured in Wartsila NSD's diesel engines is still today the cleanest and most efficient method for the generation of energy from hydro-carbons.

For more information on the "project EnviroEngine" please go to www.wartsila-nsd.com

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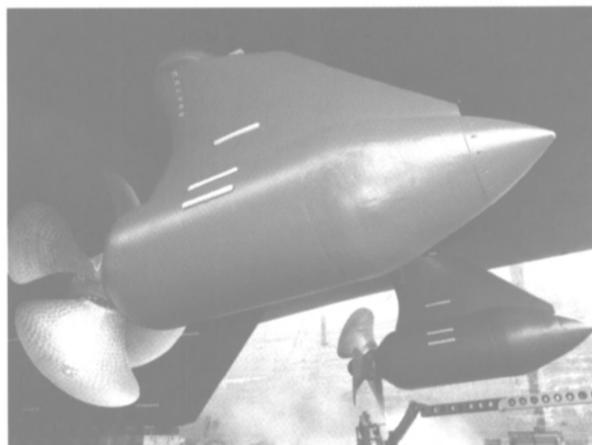
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WARTSILÄ NSD
GENERATORS

Celebrity Links Its Past To Its Future With Millennium



Measuring 965 ft. (294 m), Celebrity's Millennium is the first cruise vessel to house gas turbines.



Millennium's Mermaid podded propellers were developed jointly by Alstom and Kamewa.

Celebrity Cruise Lines experienced its own "Night At The Oscars" by literally rolling out the red carpet this past June for its inaugural christening ceremony of its new "Millennium" while docked in Southampton, U.K. MR/EN was invited to Southampton to spend a few days onboard this technologically driven vessel before it departed for Amsterdam to begin its maiden voyage - a 14-day journey around Russia and the Baltics.

— By **Regina P. Ciardiello**, associate editor

Incorporating old-world style and classic ambiance with its Olympic Restaurant, which houses the original paneling from the R.M.S. Olympic — and delving into new technology by implementing a premiere gas turbine system in its engine room — Celebrity's newest vessel truly exemplifies a "bridge between two centuries," as stated by Royal Caribbean's (RCCL) chairman and CEO, **Richard Fain** at Millennium's christening on June 26.

Fain, who oversees RCCL, which is Celebrity's parent company, along with the latter's president, **Rick Sasso**, made history in the cruise industry with their decision to install the gas turbine system on the 965-ft. (294 m), 91,000-ton Millennium. Comprised of 11 guest decks, the vessel can move at 24 knots holding 1,950 passengers and 999 crew.

In an industry that has relied on diesel engines for power, many executives were not receptive at first to this new innovation. Diesel engines always have, and continue to, capably perform the job of moving these

large floating cities, so why would Celebrity want to fix something that wasn't broken? Eventually the gas turbine concept was seen as a new breed of power for cruise ships by none other than **Demetrios P. Kaparis**, Celebrity's senior executive vice president, newbuildings. Kaparis, who is a firm believer in this new form of vessel power, had designed, administered and supervised work at Meyer Werft's Papenburg shipyard during the construction of all of the company's existing vessels — as well as the current Millennium that was constructed at French-based Chantiers de l'Atlantique. Kaparis, who virtually developed and oversaw Millennium's entire design concept from start to finish, saw a promising technological future in the gas turbine idea.

And who better than Kaparis himself to be the company's firmest believer in its new vision; Kaparis has an impressive technical background that began in 1961 when he joined London-based Chandris Lines as a naval architect and marine superintendent engineer. An added plus is his experience with both turbine and diesel engine operations with noted companies as Vickers Armstrong Shipyards, Austin and Pickersgill and George Sulzer Diesel Works in England.

In fact, since Kaparis has such a broad-based background in naval architecture and has also been described as one of the industry's top experts in specialized safety implementation, he designed and supervised construction of Millennium to expertly meet all the IMO Regulations and SOLAS Requirements without any obstacles. His own innovations on the vessel include a special sprinkler system called HI-Fog, which in case of fire is activated by a light mist rather than the conventional shower spray. Kaparis explained



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Millennium Main Particulars

| | |
|--------------------------------|---|
| Builder | Chantiers de l'Atlantique (Alstom) |
| Vessel name | Millennium |
| Owner/operator | Celebrity Cruise Lines |
| Flag | Liberia |
| Classification | Lloyd's Register of Shipping |
| Number of sisterships on order | 3 |
| Length, (o.a.) | 965 ft. (294 m) |
| Breadth | 106 ft. (32.2 m) |
| Draft | 29.5 ft. (9 m) |
| GT | 91,000 |
| Speed | 24 knots |
| Passengers | 2,449 (1,019 cabins) |
| Crew | 997 (533 cabins) |
| Total developed area | 62,000 sq. m |
| Fuel consumption | 6,055 kg/h |
| Fuel | marine distilled gas oil |
| Main engines | GE LM2500+ aeroderivative gas turbines @ 25 MW each |
| Podded propulsion | Mermaid (developed by Alstom and Kamewa) |
| Propulsion mode | Gas turbine/steam turbine (COGES) |
| Propeller type | 2 19,500 kW electric pods, 3 2,350 kW lateral propellants |
| Thrusters | Brunvoll |
| Fin stabilizers | Thyssen |
| Coatings | Jotun |
| VHF radio | Debeg |
| Radar | STN Atlas |
| Compass | C-Plath |
| Lifeboats | Verhoef Aluminum |



Cruise industry innovator: **Demetrios P. Kaparis**, Celebrity's executive senior vice president, new-buildings stands beside Millennium's prized GE gas turbine.

that the HI-Fog system is better suited for ships because it is able to cool down the fire quicker and is less damaging to interiors on which it is sprayed. He can also be credited for any safety devices that have been implemented in Millennium's bridge room. Kaparis' mission of "Eternal Vigilance is the Price of Safety," which is emblazoned on a plaque in the vessel's bridge area, was created through his own safety center that is up for recommendation to IMO for mandatory placement on all cruise vessels.

Celebrity's History in the Making

The gas turbine concept became a reality in November 1997, when S&S Energy Products, a GE Marine Engines Systems Supplier, located in Houston, Texas, received a proposal from Celebrity outlining its desire for the gas turbines. Subsequent to the cruise line's contracting of Chantiers as Millennium's builder, S&S traveled to the French yard in March 1998 to further convince its engineers that gas turbines were a more integrated approach.

David Whisenhunt, who is vice president, general manager of Commercial Marine Systems at S&S remarked that "gas turbines had been trying to break ground since the late 1980s," so it is accurate to say that this would be a major event in the cruise industry if Chantiers agreed. The outcome was favorable and since the vessel had already been configured to fit a diesel engine package — the yard's engineers had to implement some fine-tuning.

"The engineering team at Chantiers did a great job in optimizing the space that had to be reconfigured for the gas turbines," Whisenhunt said.

Celebrity opted to install a pair of GE LM2500+aeroderivative gas turbines, using a combined gas and steam turbine integrated electric drive system

(COGES) configuration — an extremely efficient use of energy: Energy that would otherwise be lost in the exhaust from the gas turbines is captured to produce steam from boilers for the steam turbines. The gas turbine-based system powers electric motors that move the vessel through the water. COGES is also responsible for all onboard power

requirements, including ventilation systems, electrical power to light cabins and air conditioning.

According to Kaparis, who hosted *MR/EN's* all-encompassing tour of Millennium's engine room, the box holding the turbines takes up about 59 ft. (18 m) — while the actual turbines themselves measure about 26 ft. (8 m)

each.

These measurements allowed for the addition of 50 extra passenger staterooms, measuring 170-sq. ft., as well as 20 additional crew cabins. Aside from the engine room's main event, which is undoubtedly its gas turbines, the vessel also boasts the latest black and gray water treatment systems equipped with

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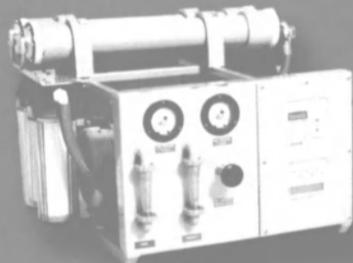
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Cruise Shipping Annual

technologically advanced waste handling environmental equipment. While the turbines offer the environmentally friendly 80 to 90 percent reduction in exhaust emissions and noxious gases, Celebrity has gone a step further in its environmental safety precautions with a flue gas cleaning system and de-ashing incinerators. This concept ensures a "green ship" status at all times with no discharge and stringent monitoring of emissions and residuals at sea and port conditions.

Kaparis pointed out that the 21,000 maximum kW turbines offer less noise and vibration from the engine room. Even those who hold staterooms on the lower decks closer to the engine room will feel virtually no effects from the bowels beneath.

Trendsetters in the Making

While Celebrity will be forever known as the cruise line to implement a world premiere piece of technology to its vessels, two other cruise lines, Princess and Carnival-owned Holland America, have decided to follow Celebrity's trend by outfitting their respective newbuilds with this innovation.

Celebrity is not stopping with just one new product incorporating the gas turbines. The company has contracted Chantiers to construct three additional vessels that will round out the Millennium Class series. Known as Infinity, Summit and unnamed, the vessel trio is scheduled for completion in

January 2001, August 2001 and April 2002, respectively.

In addition, Royal Caribbean plans to employ LM2500+ gas turbine-generator sets for main propulsion and onboard power for its four new Vantage-class ships that are currently under construction.

Hellbergs Neptune Range Is Lightweight

Hellbergs International introduced its LightWeight Neptune range of doors for the marine industry — specifically cruise vessels and ferries. The doors were tested and certified as A-60 and B-30 doors in accordance with IMO Resolution 754 (18). Available as cabin doors, single and double-hinged doors, as well as single and double sliding doors, the Neptune range doors come in custom sizes. Tried in widths up to 150 cm (single hinged door) and 250 cm (single sliding door), respectively, the doors are manufactured with a Rockfibre insulation. Outer surface and stiffeners are comprised of reinforced glass-fiber with a unique calcium-silicate based composite. The doors can be finished in various ways according to owner's specifications, e.g. painted, laminated, PVC-film or with a steel-skin. Glass vision panels and concealed door closure can also be implemented into the Neptune range.

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Schat-Harding Aids With KISS

Safety Specialist Schat-Harding's new series of simple, easily maintained and space-saving boats and davits are specially designed for the offshore and merchant marine industries. Known as the Keep it Safe and Simple (KISS) system, the first 50-person boat and davit system should be launched by the end of 2000. This same philosophy will also be implemented into the revision of Schat-Harding's range of conventional and freefall systems. The system transfers loads onto parts of the ship's side, which are already reinforced, thus simplifying design and installation, while offering the utmost in safety levels.

The system will be available in small, medium, large and extra-large sizes in order to meet the needs of all units and ships. The company's premiere client is the World of Residencea project, which is currently building at Norway's Fose yard. Four sets of the system are scheduled to be supplied in this cruise ship, which features a rolling pivot davit.

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Gas Turbine v. Diesel Debate Heats Up With Delivery of New Millennium

Since Royal Caribbean decided to embrace the advanced marine propulsion technology inherent with gas turbines, power plants aboard cruise ships built and delivered in the new millennium could be much different. Even if all newbuilds do not incorporate gas turbine power, other propulsion suppliers such as diesel manufacturers will be driven by this new competitor in a previously diesel dominated domain — along by new and increasingly stringent environmental emission requirements — to continuously improve their designs in order to meet future needs.

Owners and shipyards will be concentrating heavily on the following power plant issues when considering new ship designs:

Space Utilization

Royal Caribbean and Celebrity selected a COmbined Gas turbine and Steam turbine Electric drive System (COGES) for their new ships. This system, based on GE's LM2500+ aeroderivative gas turbine, was chosen

because RCI was committed to using gas turbines for 100 percent of the ship's normal operational power requirements. The only diesel power aboard will be two small high-speed units to provide emergency standby and auxiliary power when the main gas turbine units are not in operation.

The efficient space utilization of the COGES package added 50 passenger cabins as well as additional public space — an obvious valued-added design feature for RCI.

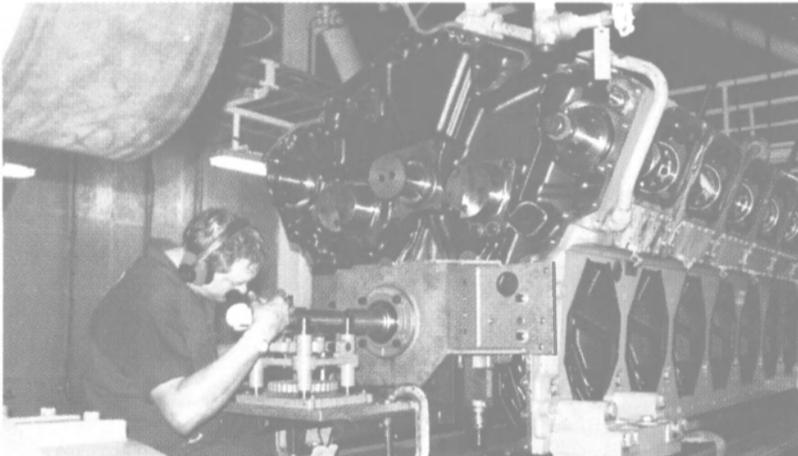
In contrast, Holland America Cruise Line selected a COmbined Diesel And Gas (CODAG) turbine configuration for four new cruise ships. One LM2500 aeroderivative gas turbine-generator set will be applied per ship, operating in parallel with one or more of the diesel generators on board. This configuration will allow the vessels to operate in environmentally sensitive areas using clean gas turbine power.

These two configurations illustrate the flexi-

bility of GE's LM fleet of aeroderivative gas turbines. Currently 27 navies use 968 engines on 388 ships. In the commercial marine arena, 82 GE LM gas turbines can be found on 45 ships, in various hull configurations, and in both mechanical and electric drive propulsion systems.

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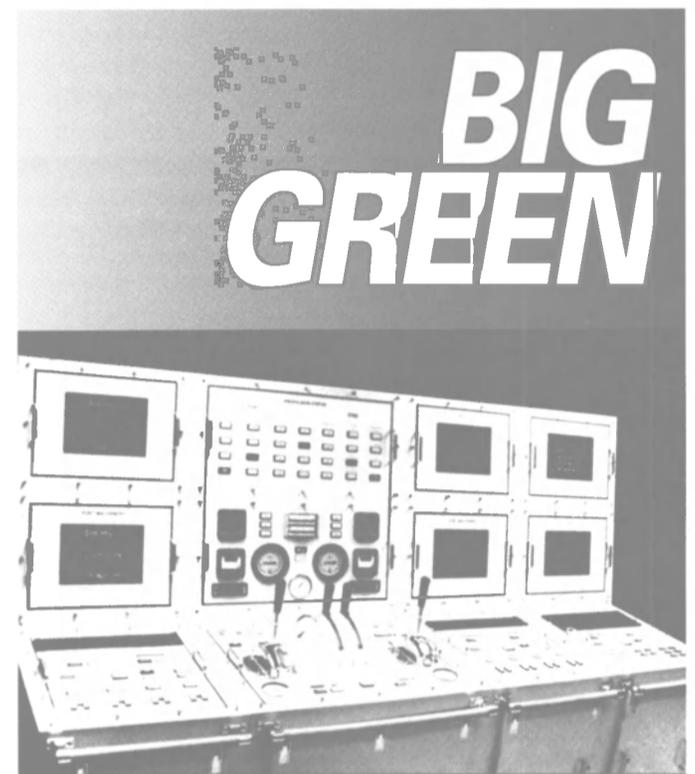
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Environmental Concern

A major driver for Royal Caribbean and Holland America was the desire to make a statement to the world about their concern for the environment.

The COGES plant being installed on the Royal Caribbean and Celebrity ships will produce only 5.0 g/kWh NOx at 47 MW without any emission reduction systems. By using GE's Dry Low Emission system for the LM2500 and

2500+, NOx can be reduced to less than 1 g/kWh. The engine controls monitor emissions on-line and adjust fuel burn automatically to maintain preset levels of both NOx and CO.

Passenger Comfort

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allow it to operate with minimal vibration signature. Airborne noise emitted from the gas turbine genset is limited to 90 dBA by the sound attenuated enclosure around the gas turbine. Exhaust noise normally requires no silencing.

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A gas turbine that is readily available for service is crucial in all marine environments. GE's products are proven, in that the parent aircraft engines from which the LM gas turbines were developed have more than 216 million reliable operating hours on various aircraft. For instance, through more than 300 GE Component Improvement Program initiatives, extensive reliability and maintainability advancements have been made to the LM2500. This program includes the infusion of advanced materials, coatings, improved bearings and electronic fuel control. A continuous improvement has been demonstrated. In fact, when the LM2500 was introduced almost 25 years ago, the incidence of engine removal was estimated at 5,000 hours. U.S. Navy data shows that the removal interval for earlier versions of the LM2500 exceeds 18,000 hours and the most recent versions exceed 23,000 hours.

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Cygnus Goes Beyond Basic

Cygnus Instruments has revised its Cygnus I Basic Model, which accurately measures ship's hulls, bulkheads, decks and tanks through coatings without including the coating's thickness in the measurement displayed. The system also measures on rough corroded surfaces with little preparation and requires no grinding. New features include operator selection of probe frequency for enhanced measuring, calibration by either known thickness or velocity of sound and automatic or manual "off switch." The model also displays sound velocity setting off the gauge; automatic low battery warning; and an innovative error checking facility for accurate measurements.



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McNeece Design Stresses Security

Two of the cruise industry's most renowned organizations have joined forces to develop Securite One, which will lead to a safe and secure cruise vessel. Formulated by **John McNeece**,

chairman of U.K.-based cruise ship designer McNeece and Brigadier, and **Brian Parritt**, chairman of cruise and ship security specialists International Maritime Security (IMS), the vessel holds the most innovative creativity in shipboard safety and onboard security.

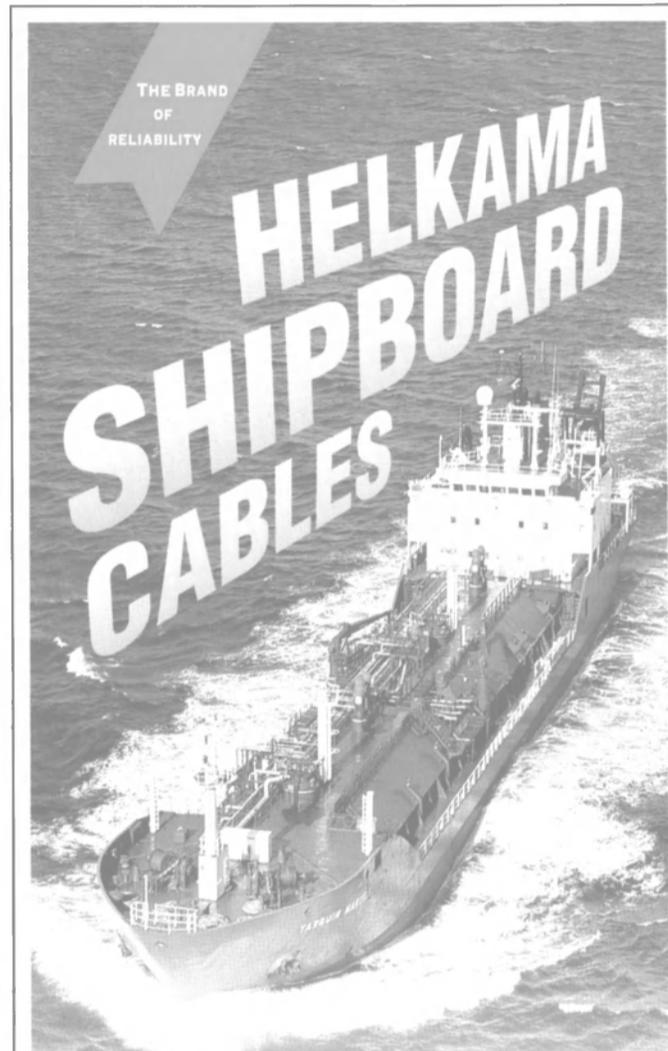
Preliminary developments of Securite One came in response to such disaster as the 1985 hijacking of Italian liner Achille Lauro, as well as a terrorist

attack on the Greek ferry City of Poros, which left nine dead and 46 wounded. To prevent further incidences such as these, IMO and other U.S. directives led a series of maritime security legislation.

Leading this fight is Securite One — a 40,000-grt, 800-capacity high-speed cruise ship designed to meet all threats. Though not a passenger carrying warship, the vessel is designed to meet the needs of all travellers.

Spirit Debuts On Canal

Carnival Cruise Lines' 84,000-ton Carnival Spirit will launch its inaugural season with a 16-day Panama Canal cruise from Miami to Los Angeles in April 2001 — subsequent to a special three-day Pacific Coastal cruise from San Francisco. The line also plans to operate the ship in the fall on a pair of 12-day Hawaii sailings and a 14-day Panama Canal voyage from San Diego.



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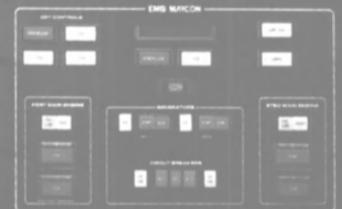
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Station 12 Strives To Corner Satcom

The competitive satellite communications market has taken an additional step toward consolidation, with Station 12 — an independent operating business owned 65 percent by KPN (Royal Dutch Telecom) and 35 percent by Telstra — leading the way having the intention of cornering the market. Station 12 recently outlined its strategy to double its size in the next three years, both through organic growth and acquisitions.

Station 12 already claims to have 24 percent of the competitive Inmarsat maritime and mobile satellite communications sector, with current annual sales of \$215 million. This is expected to rise to \$500 million by 2003. The company is the largest customer and shareholder in Inmarsat, the leading provider of wholesale satellite airtime. To supplement existing services, Station 12 is considering several possible acquisitions including companies with applications expertise, content, software and other value-added services. However, the company's initial focus will be integrating the two satellite operations and developing the best services available.

Targeted growth in annual sales is around 30 percent with an operating margin of at least 10 percent.

Newly appointed chief executive, **Knut Reed** believes that the nature of satcom services is changing, moving from voice 'pipe' to broadband/multi-media end-solutions. Many market changes like deregulation, consolidation and customer focus will reshape the satcom industry.

He notes that users are increasingly looking at satcom to give them total global access. The market will shift from voice to data: by 2004, some 70 percent of all Inmarsat traffic will be data. Indeed, Internet access will become central to many users and, he predicts, up to 10 percent of this access will be served via satellite.

"The key differentiator for Station 12 is our long-term understanding of our customers," said Reed. "We've been working with the maritime industry and remote land area customers for more than 15 years. Our objective is to continue to provide high quality products and services and develop new and advanced services to enable our customers to grow their businesses. We also want to build our content, applications and transactions services; a good illustration is our unique satcom positioning and e-mail application used by fishing fleets." Station 12 offers global connections, combining technical resources with strong sales channels. Much of the company's business is in the maritime sector where it plans to expand services through integrating content and applica-

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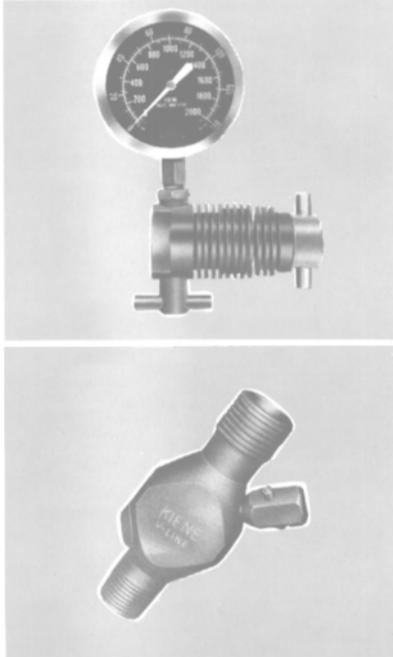
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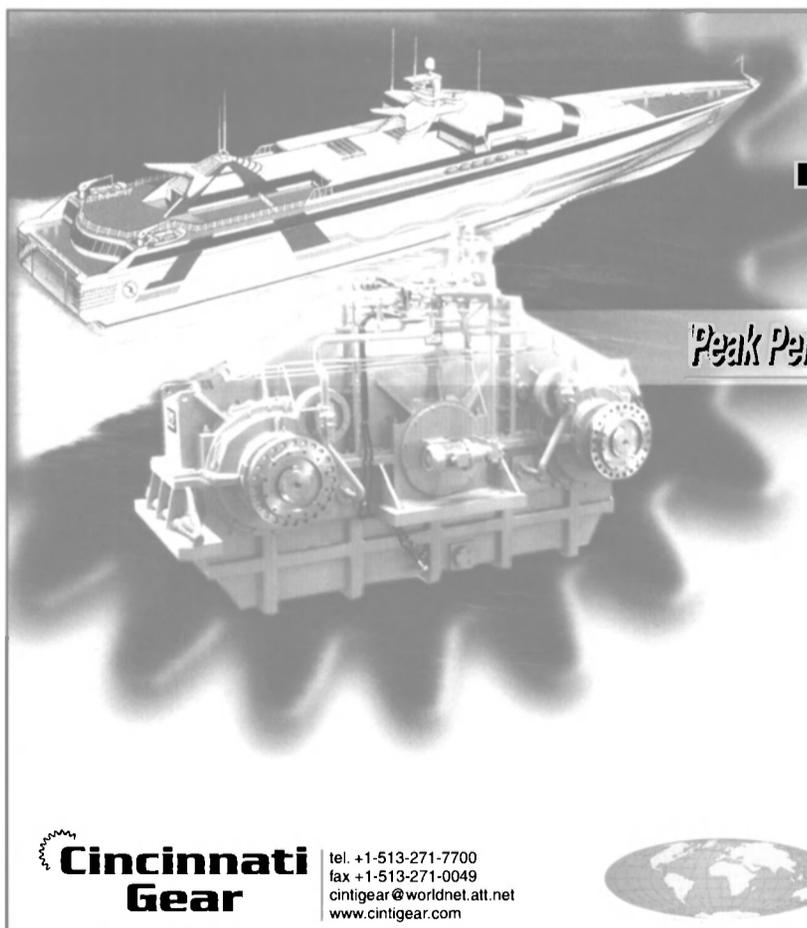
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tions with the intention of strengthening its position as the preferred end-to-end solution provider.

In order to achieve its growth objective, the company plans to aggressively expand its services into the fixed satellite business. This is a sector where there is considerable growth potential for services such as VSAT, IP backbone, high speed Internet and multimedia.

Reed said that to achieve these targets, the company is strengthening the management team. He has joined the company from a position in international management with Norwegian telecom leader, Telenor, and already he has reshaped the organization of Station 12, creating two major operating business units. Station 12 sales and marketing director, **Michiel Struijk** has been appointed to head the Mobile Satcom Division. The company is searching for a top industry professional to head the Fixed Satcom Division.

Michael P. Smith, previously general manager for Telstra Global Satellite, has joined the company to head a new function in corporate strategy and communications. **Paul Peppelman** becomes responsible for network operations, including the Netherlands and Perth land earth stations, the company's link into the satellite network.

The company will operate from its head office in The

Hague, with a strong presence in Australia and selected markets. The CFO for the new company is **Ron Kevenaar**, previously financial officer within KPN Satcom.

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Stratos Acquires Seven Seas

Stratos Global Corporation has entered into a definitive agreement to acquire the assets of Seven Seas Communications, Inc. for \$15.5 million. The transaction is subject to completion of due diligence and other closing conditions. Seven Seas is the largest non-facilities based provider of global and regional satellite communication solutions to customers in the Americas.

The company offers a full suite of products including Inmarsat, MSAT and Globalstar, as well as value-added services and customer care support. With several strategically located sales offices, approximately 20 direct sales individuals and an independent network of more than 100 dealers, Seven Seas has built a leading position in key land and maritime vertical market segments including natural resources, commercial fishing and yachting. Seven Seas has exhib-

ited consistent revenue and EBITDA growth rates of more than 30 percent since 1995, with 50 percent growth in 1999.

"We have had a close relationship with Seven Seas for over eight years and are very excited about the capabilities that Stratos will inherit through this acquisition," said **Derek Woods**, president and CEO of Stratos. "Not only do we strengthen our distribution capabilities in North America and Latin America, but the strong revenue and cost synergies make the transaction immediately accretive to operating income."

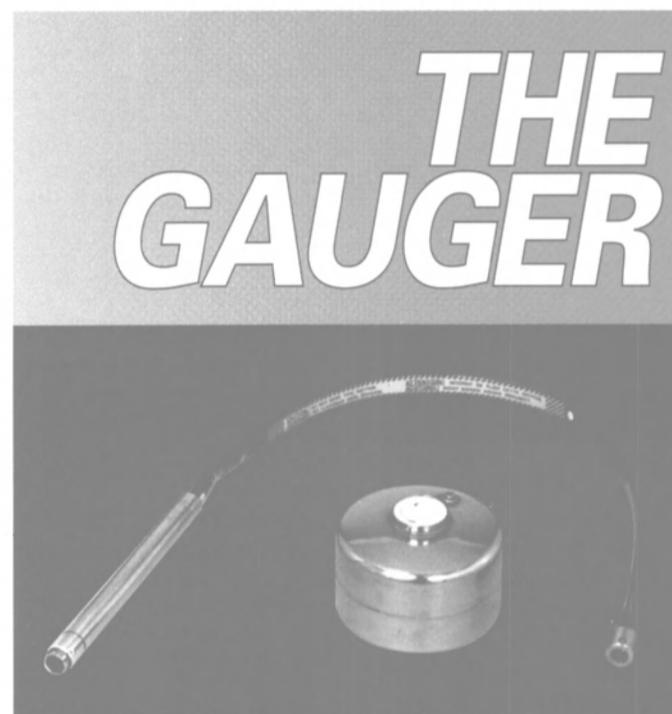
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Satellite Communications

MTN Adds Flex To Communications

In maritime satellite communications, continuous, uninterrupted service is paramount. In development at this time is a revolutionary stabilized antenna system that will simultaneously transmit on C and Ku band and in both linear and circular polarity. The big advantage for MTN customers with the new system is flexibility. Designated the 106M4S3, the system under development is a 2.7-m. stabilized satellite maritime system. The breakthrough technology deployed combines the ability to operate on two diverse frequencies that represent (but are not limited to) C and Ku satellite bands, and to transmit and receive signals that are modulated in both linear and circular polarity from the same compact antenna system. Antenna control, configuration, and mode selection are all quickly and efficiently handled from below deck. Dual system configurations are available for diverse antenna placement to eliminate satellite blockage.

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New Ops Center for Globe Wireless

Globe Wireless has expanded operations with the addition of a new network

operations center in Liverpool, U.K. The new center provides a mirrored site for the company's main operations center in Half Moon Bay, Calif.

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INVSAT Captures First Cruise Contract

Invsat Limited, a subsidiary of Inmarsat Holdings Ltd., has installed and commissioned a new 2.4 m C-Band marine communications antenna on The Aurora, P&O's new \$350 million cruise ship to be fitted with Invsat's new generation of marine stabilized systems.

Circle 161 on Reader Service Card

Royal Navy Seeks SatCom Suppliers

The U.K. MoD are in the closing stages of a Private Finance Initiative (PFI) tender, under the terms of which, the successful bidders will assume responsibility for all existing ship's satcom equipment and airtime requirements, and will provide a complete technology refresh to cover operational requirements for at least the next five years. Kelvin Hughes Limited are competing for this contract. They will provide the project management and the ongoing field support of the user equip-

ment, on a global basis, supported by Stratos, who, as an Inmarsat LESO (Land Earth Station Operator), will be providing a comprehensive range of innovative airtime services, and Babcock Rosyth, who will be providing installation design and implementation services.

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Globalstar Offers Internet Via Sat Phone

Globalstar recently carried out test transmissions of Internet data through the Globalstar satellite network via Qualcomm's Globalstar tri-mode telephone. The service will be offered as a commercial product later this year.

This Internet demonstration, conducted by Globalstar and its technology partner, Qualcomm, is touted as proving that the Globalstar system — which already provides voice communications from virtually any point on earth — will also be able to support data and Internet connectivity as part of its overall range of services.

The Globalstar system provides affordable satellite-based digital voice services to a broad range of subscribers. Globalstar meets the needs of cellular users as well as mobile subscribers out-

side cellular coverage, and residents without existing telephone service.

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GN Comtext, Stratos Expand Deal

GN Comtext has enhanced its partnership with Stratos with the introduction of a new range of worldwide communication services, a range constituting a total package for the maritime industry under the Ocean-Connect brand. Stratos will focus on selling the portfolio to the Americas, while GN Comtext will serve the rest of the world through its network of offices in the world's leading maritime centers. Ocean-Connect brings together store-and-forward and real time, satellite and terrestrial services from a single supplier, enabling customers to benefit from a 'one-stop shop' for maritime communications and a single point of contact.

The new range of OCEAN-Connect services has now been extended to offer a complete range of realtime and store-and-forward mobile maritime communications services. OCEAN-Connect now offers a range of realtime services via Inmarsat through Stratos, serving Inmarsat A, B, C, M and mini-M users.

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Legal Beat

(Continued from page 19)

Conclusions

For the foreseeable future, the U.S. Government will continue to scrap its obsolete ships in U.S. yards, and will have to pay companies to do so in order to assure compliance with all U.S. environmental and labor standards. The backlog of ships to be scrapped is so great that the disposal program will not be complete for 10 years. The market will have to be developed through financial incentives such as cost-plus contracts. As of this writing, key Members of Congress are trying to appropriate additional funds for MARAD and Navy ship scrapping programs in the United States.

On the international front, the IMO and other international groups, will force scrapping countries, including India, to upgrade their programs to the extent they can. U.S. shipping companies can be expected to pay their fair share for disposal of their old ships in an "honorable manner."

The preceding was authored by **Joan M. Bondareff, Dyer Ellis & Joseph** (Washington, D.C.)

Lunde To Leave Intertanko

INTERTANKO announced that **Dagfinn Lunde**, the Association's Managing Director who has so fervently fought for the tanker industry for many years, will leave his post on September 15, 2000, opting to resume his career within international banking. Lunde, who has the ear of most of the world's leading marine industry policy makers, is well regarded and is considered to have done an excellent job during his five-year tenure as INTERTANKO's Managing Director starting with a major reorganization where senior INTERTANKO managers were tasked with the responsibility for looking after the needs of members in particular geographical areas. INTERTANKO's chairman, Mr. **Westye Høegh** said, "I greatly regret that Dagfinn Lunde has chosen to leave INTERTANKO, but we must look forward to building an even stronger INTERTANKO on the firm foundations so ably laid down by **Dagfinn Lunde** during his tenure."



Lunde



Høegh

INTERTANKO's senior vice president & general counsel, **Svein Ringbakken** who currently heads INTERTANKO's United States representation has been chosen to lead the organization until a new managing director has been appointed. A lawyer by training, Ringbakken has been with INTERTANKO for nine years and during this time has

actively been involved in a wide range of industry issues.

His current area of responsibility includes governmental relations with a particular emphasis on the United States, the Association's legal, documentary and insurance activities.

Within the above areas he has also represented INTERTANKO in the IMO,

EU and the International Oil Pollution Compensation Fund.

He has in addition to this had the primary responsibility for activities in the Americas region.

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Gulf of Mexico Analysis

GOM: Number Of Floating Production Systems Projected To Rise

The Gulf of Mexico offshore market is quickly shaping up to be the driving maritime force of 2001 and beyond. While the market today is, and will always be, largely dependent on the

political wranglings of OPEC nations, the recent consolidation which has swept the oil majors and, to some degree, the offshore drilling and supply and service companies, has helped to

alter some of the traditional instabilities. For example, despite the fact that the price per barrel of oil has elevated to and remained in the mid \$20s to low \$30s for much of the year, offshore activity in

the Gulf of Mexico has been sluggish to initially respond. While it appears that offshore business in the region will rebound strongly in the latter part of 2000 through 2001, the more measured approach to the business of discovering and recovering resources in the Gulf of Mexico should be a welcome sign to the myriad of businesses which depend on a

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The Gulf of Mexico and West Africa are the major locations for planned floating production projects, with 52 and 49 projects respectively.

healthy market for sustained business.

The following is excerpted a report entitled Market Prospects for Floating Production Systems, produced quarterly by International Maritime Associates, Inc. (Washington, D.C.), which discusses in great detail the spending plans for all offshore producing areas in the next several years

Current Situation

There are now 116 floating production systems in operation worldwide. This is an 81 percent increase over the inventory of floaters reported in September 1996. Another 60 floating storage vessels (without production capability) are now in operation, two of which are for LPG storage.

Currently, 28 percent of the FPU's in operation are situated off Northern Europe, 23 percent off Brazil, 20 percent in Southeast Asia/China, 10 percent off West Africa, nine percent in the Gulf of Mexico and seven percent off Australia.

Current orders consist of 15 purpose



Advanced-technology deepwater drillships such as the Discoverer Deep Seas and its two sister ships — built for Transocean by Astano — will continue to drive business in the Gulf of Mexico and around the world.

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Gulf of Mexico Analysis

built production systems, 6 production systems based on converted hulls and 5 purpose built storage units. Delivery of these units will increase the inventory of floating production systems by 18 percent.

Hulls or topsides for systems currently on order are being built at 19 facilities. These facilities are spread worldwide - 6

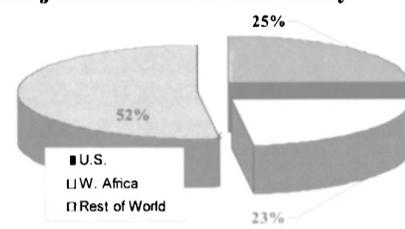
yards in Europe, 7 yards in Asia and 6 yards in North America. U.S. facilities that have garnered orders including Amfels, Friede Goldman, McDermott, B&R Greens Bayou and Omega.

Future Prospects

International Maritime Associates has identified 210 floating production sys-

tems planned or under study, an increase of about five percent over the number of planned projects identified in our previous report. These are projects where a floating system is being considered as the production solution. Some are in the advanced design or bidding stage - some are at an early stage of consideration. Proceeding with individual projects will

Floating Production Systems Projects Planned or Underway



hinge on the economics of the discovery, which in turn will be influenced by the expected price of oil and project development cost. Not all will materialize and in some cases another production solution will be selected. Other projects are likely in the planning and study phase where there is no publicized information.

The Gulf of Mexico and West Africa are the major locations for planned floating production projects, with 52 and 49 projects respectively. West Africa and Southeast Asia saw the largest increase in number of floating production projects under study since our last report - each having an increase of four projects in the planning pipeline. 116 Floating Production Systems and 60 Storage Vessels are in Operation as of April 2000.

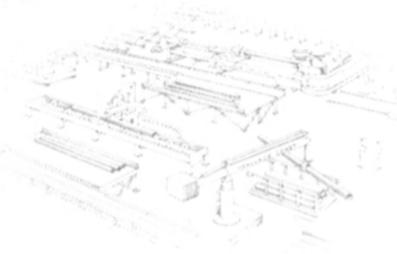
The Drivers

Oil market fundamentals continue to strengthen. The outlook for world economic growth continues to be good, forecasts call for oil demand to increase and the oil producers appear to have engineered a soft landing for oil prices. According to the IMF, the world economy in 2000 will expand at a significantly higher rate than the rate of growth over the past several years. Reflecting buoyant conditions in the world economy, the IEA expects world demand for oil to increase 2.2 percent this year. This is significantly higher than the 0.8 percent and 1.7 percent growth in oil demand in 1998 and 1999. Details for global oil demand are shown on the opposite page.

To meet the growing energy requirements, oil demand will increase at an annual rate of 1.9 percent and natural gas demand increase at an annual rate of 3.2 percent over the next 20 years. This will produce a substantial increase in production requirement for both oil and gas.

The offshore sector is about to see the arrival of a large number of new deep-water drill rigs able to operate on fields to 3,000 m water depth. More than 40 semisubmersibles or drill ships were ordered between 1996 and 1998 - the last 25 of which are to be delivered this year and early 2001. This equipment will provide tremendous additional capability to explore and appraise deep-water fields in the Gulf of Mexico, off-

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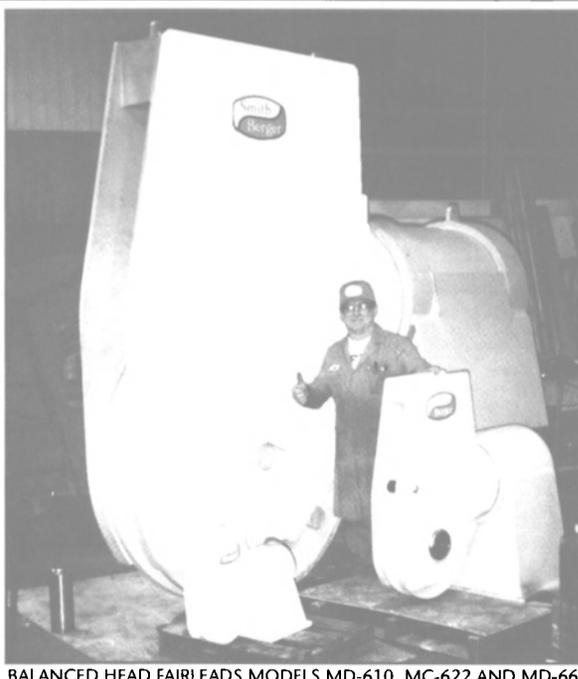
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Gulf of Mexico Analysis

shore West Africa and elsewhere. Increasingly bullish projections about planned E&D spending will certainly encourage utilization of this new equipment.

A recent survey of 177 oil and gas

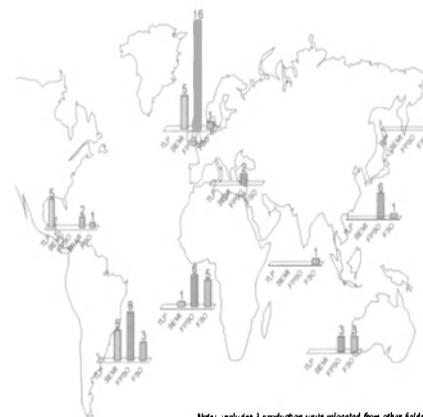
companies by Salomon Smith Barney found that worldwide upstream spending in 2000 will be 11.4 percent higher than last year. Companies surveyed indicated that they plan to spend \$92.6 billion on oil and gas E&P this year vs. \$83.1 bil-

lion last year. A survey by Lehman Bros. at the end of last year found that worldwide exploration and production budgets will increase by 10 percent in 2000. The companies surveyed based their budgeting for 2000 on an assumed average

price of \$19.25 for WTI crude. While these forecasts are bullish, the E&P budgets for 2000 will likely be even higher should there be a sustained crude price higher than those assumed in the surveys.

Responding to political pressures, two bills have been introduced in Congress to provide tax breaks to encourage exploration and development in the U.S. One bill would enable producers to expense geological and geophysical cost of E&D. At present, these costs must be capitalized if the well is successful. The other bill would allow field lessees to expense payments to lessors when production from the lease is delayed. Currently, these payments must be capitalized if the property is being held for development. While these are relatively modest initiatives and there is little expectation that the bills will pass Congress this session, they may be forerunners of a variety of initiatives designed to ramp up onshore and offshore E&D activity in the U.S. The Deep Water Royalty Relief Act of 1995 was an earlier initiative that certainly got the interest of field operators in the Gulf of Mexico.

For additional, explicit details referenced in this report, please contact International Maritime Associates, Inc. at 700 New Hampshire Ave., NW, Suite 103, Washington, DC 20037; tel: 202-333-8501; fax: 202-333-8504; e-mail: imaassoc@msn.com



Note: includes 3 production units relocated from other fields

59 Floating Production and 15 Storage Systems Have Been Installed Since September 1996.



21 Floating Production and 5 Storage Systems are On Order as of April 2000.

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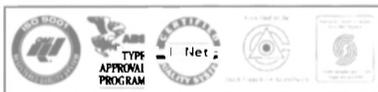
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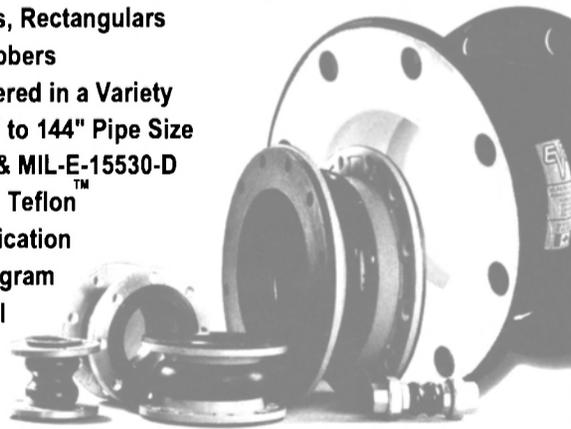
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FGH moves to get house in order

Those searching for tangible effects of a dramatic offshore drawdown need look no further than Friede Goldman Halter. The company, which was riding a crest of business powered by key acquisitions in the mid-90s, saw its plan thwarted when a host of factors conspired to drive oil prices into the ground. The result is a company which is managing a large amount of debt while positioning itself to regain its position atop the Gulf of Mexico boatbuilding and repair heap.

Although the company's backlog stands at an impressive \$543 million, nearly 73 percent of that is due for delivery by the end of the year, and the boatbuilding market in the GOM area is still recovering and considered overcrowded by some, placing further price pressures.

Last month the company announced that it sold its vessel repair unit to Bollinger Shipyards Inc. for \$80 million. The all-cash deal with the Lockport, La.-based company, which is expected to be completed this month, is structured as an asset sale and is subject to certain regulatory conditions. The vessel repair business is an operating unit of Halter Marine, Friede Goldman Halter's Vessel segment, and consists of five vessel repair and maintenance facilities devoted in Louisiana and Texas. The company expects the \$80 million transaction and an additional \$33 million in tax refunds to be collected during 2000 to provide "significant additional liquidity for Friede Goldman Halter as it enters a strengthening marketplace."

In another move to secure its financial future, it was announced that Friede Goldman Offshore Texas has reached a decision with Petrodrill IV and Petrodrill V concerning contract disputes over Friede Goldman's construction of two Amethyst-class deep-water semisubmersible drilling rigs for Petrodrill. The agreements have been approved by the boards of directors for both companies by MarAd, which is providing loan guarantees for the project. The agreements call for the new delivery dates of Amethyst 4 and 5 to occur on September 15, 2001 and December 15, 2001, respectively. Both parties have agreed to increase the float-out milestone payment by \$3 million per rig and to a final \$6.4 million payment per rig at delivery, resulting in a new contract value of \$186.8 million based upon the new delivery schedules. Both companies have also decided to terminate all pending litigation related to the project.

R&B Falcon Reactivates Offshore Fleet

R&B Falcon Corporation announced that six of its shallow water jackups and three of its drill barges would re-enter active service in the near future. To allow for crewing and final preparation for service, the activations are scheduled for the second and third quarters. Of the nine units re-entering service, three have firm contracts, four have contracts under

negotiation, and 2 are in preliminary stages of discussions with operators.

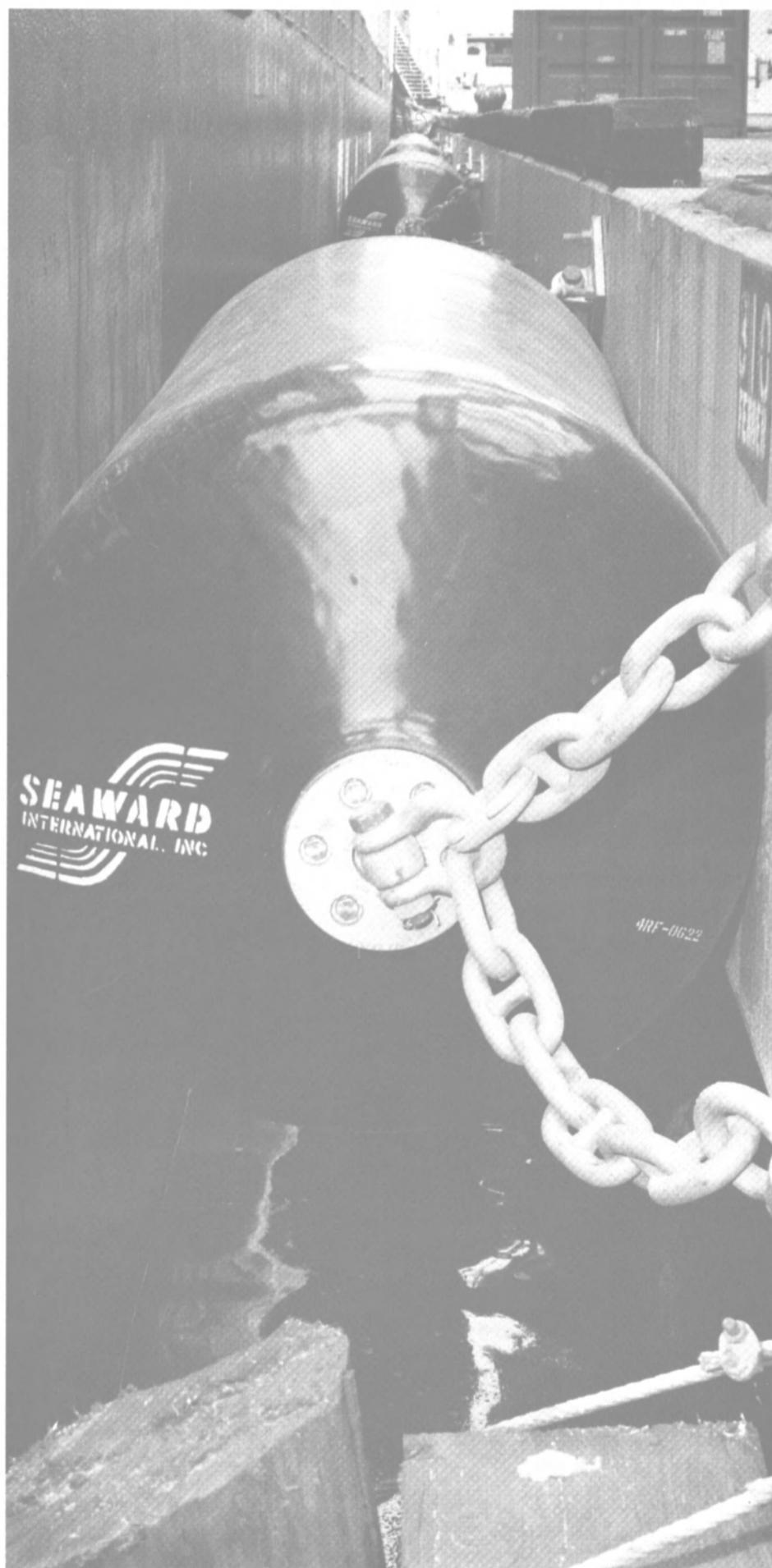
OSV Fleet Expansion

Hornbeck Offshore Services, Inc. has begun a new vessel construction program to significantly increase the size of its seven-vessel offshore supply vessel (OSV) fleet. A contract was signed with Leevac Shipyards to immediately begin construction of two ultra deepwater ves-

sels with four to follow. The first vessel is expected to be delivered in February 2001. All vessels are expected to be completed within the next 20 months.

Hvide Marine/Sun State Christens New Ship

Hvide Marine Incorporated (HMI) and subsidiary Sun State Marine Services, Inc., christened the first in a series of new cargo ships at its U.S. shipyard



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Kawasaki Establishes GOM Service Station

Kawasaki Heavy Industries, Ltd. of Japan has added a service center to its worldwide network for marine machinery. The new operation was established in New Orleans to support Kawasaki's marine propulsion systems, and is a

result of an agreement with AmClyde Engineered Products Co., a division of Friede Goldman Halter, to utilize AmClyde's parts and service center in Covington, La. Kawasaki has found GOM business to its liking, recently supplying a set of four propulsion thruster for Tidewater's ROV support vessel Nautical tide. The equipment

includes two azimuth thrusters for main propulsion, one tunnel bowthruster and one retractable azimuth bowthruster. The vessel was built at Yantai-Raffles Shipyard in China, under subcontract from their U.S. partner FGH.

Circle 164 on Reader Service Card

A & B Industries Gets Contract

A & B Industries has been awarded the contract to build a new 76 x 23 x 10 ft. model tug for Sacramento Tug Company. The vessel will be powered by two Cat engines producing 1,700 bhp.

Bender Joins NSRP

The Executive Control Board of the National Shipbuilding Research Program (NSRP) accepted the membership application of Bender Shipbuilding and Repair Co., Inc., bringing the number of member shipyards to 11.

JRC Taps GOM

JRC is involved in an aggressive campaign to win increased market share in the electronics market in the Americas. JRC offers exciting new developments including a fully daylight-viewable echo sounder for the small commercial market; IMO-compliant radars for the burgeoning oil industry support fleet in the GOM; soon-to-be-released High-Speed Data options for the JUE-310B Inmarsat Standard B Terminal. JRC has added five people to its staff in the last 10

months and is geared up for product line expansion and continued growth.

Circle 165

FirstWave/Newpark Honored

FirstWave/Newpark Shipbuilding was recognized by the Shipbuilders Council of America for its "Excellence in Safety" award for 1999. Recipient of the award for the sixth year consecutive year, FirstWave's president Gerry Walker commented: "There is nothing more important to us than safety. We've worked hard to continuously reduce injury rates."

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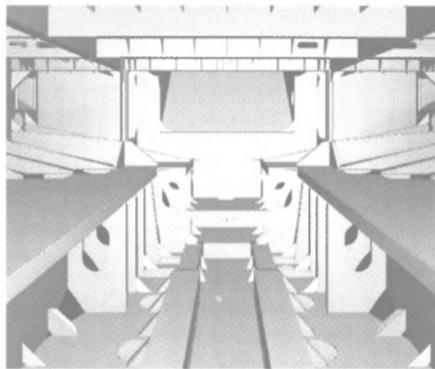
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Circle 206 on Reader Service Card

CadCam Report

German Yard Implements Nupas-Cadmatic



The Peene-Werft in Wolgast, Germany, has chosen Nupas-Cadmatic software solution as their main CAD/CAE/CAM system. During an implementation project of about two months, the shipyard will implement Nupas-Cadmatic for the complete Hull structure, Piping, Machinery and Outfitting including special customizations for the yard's high-tech production facilities like profile cutting robots, automated pipe workshop, web panels and their in-house material management system.

The first project - building the first of a series of heavy cargo vessels - commenced in the beginning of February 2000. A group of about 20 engineers have been trained in several disciplines of the Nupas-Cadmatic system. Furthermore, Numeriek Centrum Groningen will assist in the engineering and help production people on-site at the yard during the start-up phase of the project.

Besides the choice for a proven CAD/CAE/CAM system, the yard's choice for Nupas-Cadmatic is based on the co-operation with 'a solid partner who stands for the delivery and maintenance of a complete solution'.

NCG's Product Manager, Geert Tepper, says: "After a feasibility study of several months, the Peene-Werft concluded that Nupas-Cadmatic is the most compact and effective solution for the yard's engineering and production facilities."

Circle 188 on Reader Service Card

Autoship Upgrades Several Products

Autohydro 5.2 was recently released by Autoship. The following are some of the more salient new features of the product. Torsion moments are calculated for all ship loading conditions. Moments of inertia are calculated for tank contents and can be user-defined for lightship and added weights. Vessel total moments of inertia (about all three axes), radii of gyration (about all three axes), and rolling and pitching periods can also be calculated. There is a new

draft comparison routine, allowing the user to easily calculate constant weight. The user can now input either distributed or point-load weights in user-defined groups. Lastly, the user can view a body-section at any specified longitudinal location.

Autoship is developing a totally new ship structural design program,

Autostructure. It will run on NT 4 or Windows 2000 workstations, with NT Server 4 or Windows 2000 to host large networks. The program will be launched in stages, with release of the first stage expected for last month. For 2-D editing of flat parts, and for drawing production, Autoship chose AutoCAD 2000. Given that AutoCAD is already used in

many ship design operations, Autoship feels that incorporation of AutoCAD 2000 will be viewed as another advantage of Autostructure. Shipyard staff will not need to be trained on new 2-D drawing software; training costs will be reduced accordingly. An important new technology, Microsoft's Common Object Model (COM), is being used



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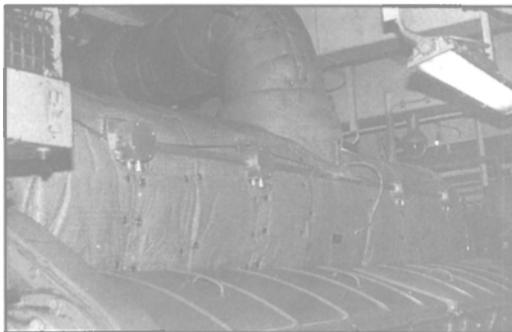
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Circle 286 on Reader Service Card

CadCam Report

extensively to support a strongly object-oriented program structure that allows for the transfer of data among AutoShip (AutoShip's hull modeling program), Autostructure and AutoCAD.

Autostructure will be designed to save the vessel designer time. Where possible, the program carries out multiple operations from one set of user input. This is well exemplified in the Global Design module, where in one session large numbers of flat parts fitted to the hull, to existing parts and to one another can be created. Automatic trimming and fitting is supported where possible.

NNS Installs AutoShip Software

AutoShip announced that Newport News Shipbuilding purchased AutoShip-Pro (hull design/surface modeling), Autohydro-Pro (intact and damage stability), and Autostructure (internal structural modeling).

Circle 196 on Reader Service Card

ShipConstructor2000 Offers New Features

ShipConstructor2000 is scheduled for a July 2000 release from ARL. CAD-Link2000 is the central program within ShipConstructor2000, which allows AutoCAD2000 users to perform 3-D structural modeling with the ease of 2-D drafting. CAD-Link2000 tightly integrates automatic nesting in the structural modeling process, with the advantage of revision tracking and automatic re-nesting after changes, by utilizing the proven AutoNest nesting engine from Radan Systems Pte. ARL's own integrated piping module will further complete the system when released later in 2000. Automatic insertion and sizing of stiffener cutouts including, stretching for non-perpendicular intersections are sure to save many detailing hours. Additional new features include intelligent bridging between nested parts, nest collision checking, definition and revision of identical parts, such as for the parallel mid-body, and automatically detailed and dimensioned profile fabrication plots.

Circle 197 on Reader Service Card

Foran To Be Used In Design Enterprise Project

In 1999, Sener signed an agreement with Alabama Shipyard to take part in the MarAd-funded Design Enterprise Project, a project designed to implement a shipbuilding CAD/CAM system at two North American engineering companies for the shipyard to benefit from their technical support sharing the same computer-aided design and production tools. Alabama Shipyard has been using the Sener 3-D product model CAD/CAM system, most recently to product its new 135,000-barrel

Maritime Reporter/Engineering News

product barge and a 3,000-passenger casino riverboat. The shipyard has just selected Guido Perla & Assoc. of Seattle and MIL Systems of Canada as the two engineering companies to use Foran for the project.

Circle 186 on Reader Service Card

Kockums Computer System Changes Name

Following the lead of its well-regarded product, Kockums Computer Systems has changed its name to Tribon Solutions, and will soon launch a new business plan. Tribon was developed, touted, installed and used as an all-encompassing ship design and production system. Tribon Solutions, the company, will comprise all the design and production stages and all the subcontractors involved in the shipbuilding process. Noting that the supply of materials and components is a critical factor in maintaining shipbuilding efficiency, the new Tribon Solutions concept includes IT applications offering shipyards a cost effective, technically advanced solution.

Circle 185 on Reader Service Card

Ship Stability Program Enhanced

General Hydrostatics (GHS), a ship stability program, recently unveiled a host of improvements designed to better the graphic capabilities of the software. The Condition Graphic Module illustrates the loading condition of any vessel, accurately pictures tank levels and shows the waterline at actual drafts. This new feature, activated through the Display Status command, shows the entire ship rotated to actual heel and trim and includes a variety of selectable views, including plan, profile, body and reversible profiles. The new Multi-Body optional modules allows multiple copies of GHS to interact, solving for simultaneous equilibrium involving vertical forces due to interactions in multiple vessels connected by joints.

Circle 190 on Reader Service Card

Spar Offers New Version

Spar Associates released Perception V 6.5, a planning and resource management system. Version 6.5 allows the interaction of AutoCAD drawings with other shipyard planning information, making it more compatible with the yard's existing systems.

Circle 187 on Reader Service Card

PropCad Has New Owner

HydroComp, Inc. has acquired sole ownership of the PropCad propeller CAD software formerly developed

July, 2000

under a joint venture. PropCad is a software package for the automatic preparation of 2-D design drawings, 3-D views and construction data for marine propellers. More than two-dozen of the world's leading small and large propeller manufacturers use PropCad for their propeller CAD requirements.

Circle 192 on Reader Service Card

Deltamarin Extends Technology

Finland's Deltamarin is widely known and well regarded for its work in the field of cruise shipping, a natural considering its country's dominating foothold in the field with Kvaerner Masa-Yards' presence. Deltamarin's offerings, however, span far beyond the

simple creation of software solutions for the marine industry, and the company is a diversified organization, which specializes in marine consulting and engineering. Fast to help define and respond to customer desire, the company has developed revolutionary ideas including 3-D modeling and virtual reality tours.



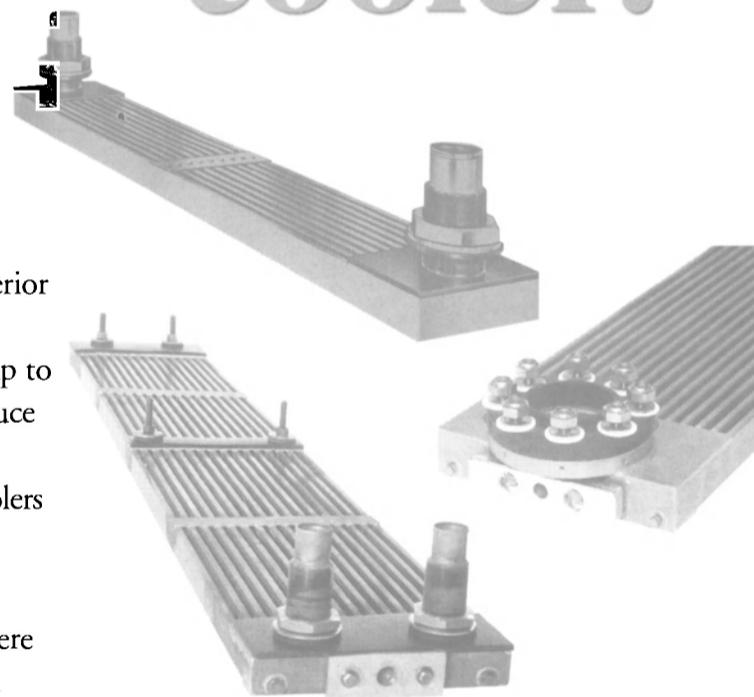
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Circle 285 on Reader Service Card

CadCam Report

Yachting Consult Releases New MasterSHIP 2000

The software side of the newest MasterSHIP version has now been released. MasterSHIP 2000 contains many improvements and a new module, Surface Tools, for the creation of developable and double-curved surfaces. A large number of templates has been added to the Parametrics module and it is now even possible for customers to define their own templates.

The Expand-02 module has been improved with a new algorithm that allows more precise and flexible expansion of double-curved surfaces on hulls and superstructures. The Parts Processor now automatically and interactively closes part contours. Use of the renewed NC-Preprocessor allows faster determination of the cutting order of the parts and the in-lead direction of the burner.

MasterSHIP CAD/CAM software is used by shipyards, designers and engineering companies to turn the design of ships into production information. MasterSHIP operates in combination with AutoCAD and is the first shipbuilding software to support the new AutoCAD version, AutoCAD 2000.

Total service concept for shipyards

Yachting Consult Engineering now offers a total service concept. Besides from the typical CAD/CAM work, all logistic handling can be obtained as an integral part of their services. This includes the purchase of the steel or aluminum, cutting, shaping, bending and subsequent delivery to the yard. This

kits were delivered to aluminum specialist Bayards, who supplied the hulls to Damen Shipyards. The delivery to Bayards was a complete package, containing all parts and profiles. The ferries are used for public transport in The

Netherlands, and were built by Damen under license to NQEA from Australia.

The newest project is a 112 ft. (34 m) research vessel for Scheepswerf Visser from Den Helder in the Netherlands.

Circle 193 on Reader Service Card



The project management team.

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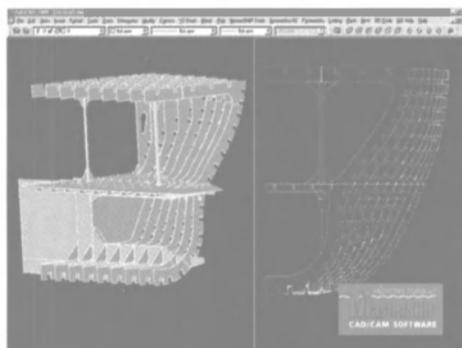
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"one stop shopping" is a very attractive option for yards, enabling them to meet the extremely short delivery times, which seems to be a common trend in shipbuilding lately.

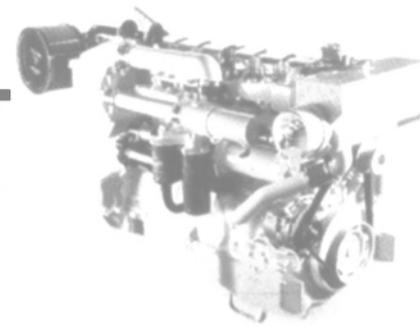
Yachting Consult Engineering is active in both shipbuilding and yachtbuilding markets. In addition to recent work for megayacht builders, several projects in the shipbuilding market have been realized, such as a kit for a 141 ft. (43 m) Crew Supply vessel (Stan Tender 4300) for Damen Shipyards; a kit for a 194 ft. (59 m) car ferry for a German yard; and 5 kits for a 98 ft. (30 m)-catamaran ferry (River Runner 150). These

Mack Powers Into Maritime Market

In the era of consolidation on the maritime diesel engine market, it is refreshing to report news of a new competitor. Mack Trucks - well known and regarded for the quality, durability and life-cycle

performance of its products in land-based markets - has created a new business unit, MackPower, dedicated to manufacturing, marketing and servicing a lineup of Mack diesel engines for a

variety of uses, including marine applications. "There is a lot of potential in the marine (pleasure craft and commercial) market," said **Carrie-Ann Baker**, manager, sales and marketing. "Mack is



known for its durability, reliability and power, and that's what we're delivering to the marine market."

The unit's initial entrant is the Mack E7 mechanical design engine, and the popular Mack E7 E-Tech engine, which is a six-cylinder, 12-liter model featuring an electronic pump-in-line injection system. Both engines offer excellent power-to-weight ratios, and have proven to be miserly in terms of fuel consumption. Mack's robust E9 engine, which is a 16-liter V8 design, will be ready for market in the fourth quarter of 2000, and an electronic version of the E7 engine will be available in the first quarter of 2001, said Baker.

The biggest challenge in readying the proven diesel for marine applications was selection of the correct marinization package, which will ensure the engine is protected in adverse conditions posed by the maritime environment as well as ensure that the engine is producing to its highest potential.

Baker admits that extensive test cell work and testing delayed the engine's entrance a bit, but contends that the wait is well worth it and that these units are very worthy of the Mack name.

Initial power ratings on the marine size (which have been designated MP ME7 engines) will range from 350 to 650 hp.

Commercial and industrial engines (designated MP IE7) will range from 350 to 500 hp. Marine engines include both raw water-cooled and keel-cooled models.

"The Mack engine is a well-known, well-respected product that has proven its mettle for decades," said **Scott Kress**, Mack vice president, business development, and the general manager of the MackPower business unit.

The company is currently developing its distribution network, a network that will be dedicated specifically to the commercial, industrial and marine markets. The company is also offering financial assistance.

Circle 166 on Reader Service Card

Engine Particulars

| | | |
|-------------------|-------|------------------------------|
| Engine type | | 1L 6cyl., 4 stroke |
| Valves | | 4/cyl. |
| Respiration | | Turbocharged and intercooled |
| Bore | | (4 7/8") |
| Stroke | | (6 1/2") |
| Displacement | | 11.93 L |
| Compression ratio | | 15:1 |
| Firing order | | 1-5-3-6-2-4 |
| Dry weight | | 2,525 lbs. |
| Gross HP (kW) | | 350 (261) @ 1,800 rpm |
| | | 650 hp (485 kW) @ 2,300 rpm |
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MR/EN's Diesel Power Annual

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|---|-----------|-------------|-------|----------|------------|-----|------|-------------------|--------------|
| Alaska Diesel Electric | | | | | | | | | |
| 4420 14th Ave NW, Seattle, Wash. 98107, Tel: 206-789-3880; Fax: 206-782-5455, Email: ade@northern-lights.com; Website: http://www.northern-lights.com | | | | | | | | | |
| L12V140A | 140 | 165 | 4 | 12V | 59.80.75 | | | | 708-969 |
| L-6108A2 | 108 | 130 | 4 | 6L | 37.50.5 | | | | 222-303 |
| L-6125A | 125 | 150 | 4 | 6L | 40.61.7 | | | | 240-370 |
| L-6140ALZ | 140 | 165 | 4 | 6L | 61.6-81.3 | | | | 370-518 |
| L-6170A | 170 | 170 | 4 | 6L | 87.2-102.5 | | | | 523-615 |

| | | | | | | | | | |
|--|-----|-----|---|--------|-----|-------|------|------|-------------|
| Anglo Belgian Corp. | | | | | | | | | |
| 9958 North Alpine Rd., Ste. 101, Machesney Park, Ill. 61115, Tel: 815-637-2880; Fax: 815-637-2877, Email: anglobel@aol.com | | | | | | | | | |
| DX | 242 | 320 | 4 | 3,6,8L | 110 | 750 | 12.0 | 8.0 | 330-880 |
| DZ | 256 | 310 | 4 | 6,8L | 221 | 1,000 | 16.6 | 10.3 | 1,032-1,768 |

| | | | | | | | | | |
|---|-----|-----|---|-----|-----------|-----------|-----------|-----------|-----------|
| Cummins Marine | | | | | | | | | |
| 4500 Leeds Ave., Ste. 301, Charleston, S.C. 29405, Tel: 843-745-1620; Fax: 843-745-1549, Email: wawemaster@cummins.com; Website: http://www.cummins.com | | | | | | | | | |
| 4B3.9-M | 102 | 120 | 4 | 4L | 14.3-15 | 2500-2800 | 652-693 | 8.8-11.2 | 57-60 |
| 4B73.9-M | 102 | 120 | 4 | 4L | 24.3-28 | 2500-2800 | 1186-1222 | 10.0-11.2 | 97-112 |
| 6B5.9M- | 102 | 120 | 4 | 6L | 14.3-15 | 2500-2800 | 652-700 | 10.0-11.2 | 86-90 |
| 6B75.9-M | 102 | 120 | 4 | 6L | 22.3-26.2 | 2500-2600 | 925-1228 | 10.0-10.4 | 134-157 |
| 6B7A5.9-M (JW) | 102 | 120 | 4 | 6L | 28-32.3 | 2500-2600 | 1338-1524 | 10.0-10.4 | 168-194 |
| 6B7A5.9M (SW) | 102 | 120 | 4 | 6L | 34.8-39.2 | 2600-2800 | 1462-1712 | 10.4-11.2 | 209-235 |
| 6CTA8.3-M (JW) | 114 | 135 | 4 | 6L | 31.3-37.3 | 2100-2500 | 1286-1296 | 9.5-11.3 | 188-224 |
| 6CTA8.3-M (SW) | 114 | 135 | 4 | 6L | 43.5-53.5 | 2500-2600 | 1517-1841 | 11.2-11.7 | 261-321 |
| N14-M | 140 | 152 | 4 | 6L | 44.8-65.3 | 1800-2100 | 1280-1702 | 9.2-10.6 | 269-392 |
| KTA19-M3 | 159 | 159 | 4 | 6L | 74.5-79.5 | 1800 | 1554-1686 | 9.5 | 447-477 |
| KTA19-M4 | 159 | 159 | 4 | 6L | 87 | 2100 | -- | 11.1 | 522 |
| QSK19-M | 159 | 159 | 4 | 6L | 82 | 1800 | -- | 9.5 | 492 |
| KTA38-M0 | 159 | 159 | 4 | 12V | 46.6-52.8 | 1600-1800 | 1108-1115 | 8.4-9.5 | 559-633 |
| KTA38-M1 | 159 | 159 | 4 | 12V | 55.9-68.4 | 1600-1800 | 1328-1576 | 8.4-9.5 | 671-821 |
| KTA38-M2 | 159 | 159 | 4 | 12V | 65.3-93.3 | 1600-2050 | 1548-1755 | 8.4-10.8 | 783-1119 |
| KTA50-M2 | 159 | 159 | 4 | 16V | 65.3-93.3 | 1600-2050 | 1548-1737 | 8.4-10.8 | 1044-1492 |
| QSM11-M | 125 | 147 | 4 | 6L | 72.2 | 2300 | 2084 | 11.3 | 433 |

| | | | | | | | | | |
|---|-----|-----|---|----------|-------|------|------|------|-----------|
| Daihatsu Diesel Manufacturing Co Ltd | | | | | | | | | |
| 2-10, 2-chome, Nihonbashi-Honcho, Chuo-ku Tokyo 103 Japan, Tel: 81-3-3279-0827; Fax: 81-3-3245-0395 | | | | | | | | | |
| DK20 | 200 | 360 | 4 | 3,5,6,8L | 160 | 900 | 23.0 | 9 | 950-1280 |
| DK26 | 260 | 380 | 4 | 5,6L | 270 | 750 | 22.7 | 9.5 | 1180-1620 |
| DK28 | 280 | 390 | 4 | 6,8L | 316.7 | 750 | 22.4 | 9.75 | 1900-2500 |
| DK32 | 320 | 400 | 4 | 6,8L 12V | 368.1 | 750 | 21.6 | 9 | 2205-4415 |
| DK36 | 360 | 480 | 4 | 6,8L 12V | 334.7 | 600 | 23.0 | 9.6 | 3310-6325 |
| DL16 | 165 | 210 | 4 | 6L | 73.3 | 1200 | 16.4 | 8.4 | 331-441 |
| M2 | 120 | 150 | 4 | 6L | 27.7 | 1800 | 10.8 | 9 | 57-166 |
| M3 | 140 | 160 | 4 | 6L | 44.2 | 1800 | 11.9 | 9.6 | 199-265 |
| M5 | 145 | 160 | 4 | 6L | 51.5 | 1800 | 13.0 | 9.6 | 221-309 |

| | | | | | | | | | |
|---|-----|-----|---|----|-------|-----------|--|--|---------|
| Deere Power Systems | | | | | | | | | |
| 3801 West Ridgeway Ave., Waterloo, Iowa 50704, Tel: 1-800-533-6446; Fax: 319-292-5075, Email: jdpower@deere.com; Website: www.deere.com/jdpower | | | | | | | | | |
| Powertech 4045DFM | 106 | 127 | 4 | 4L | 15.75 | 2400-2500 | | | 56-63 |
| Powertech 4045TFM | 106 | 127 | 4 | 4L | 25.25 | 2300-2500 | | | 78-101 |
| Powertech 6068TFM | 106 | 127 | 4 | 6L | 28 | 2300-2600 | | | 116-168 |
| Powertech 6081 | 116 | 129 | 4 | 6L | 46.7 | 2100-2400 | | | 125-280 |
| Powertech 6125AFM | 127 | 165 | 4 | 6L | 56 | 1800-2100 | | | 254-336 |

| | | | | | | | | | |
|--|-----|-----|---|-----|------|------|------|------|------|
| Detroit Diesel | | | | | | | | | |
| 13400 Outer Drive West, Detroit, Mich 48239, Tel: 313-592-5000; Fax: 313-592-8176, Website: http://www.detroitdiesel.com | | | | | | | | | |
| *piston speed given in m/min. | | | | | | | | | |
| Series 60 | 130 | 160 | 4 | 6L | 46.7 | 1800 | 1463 | *576 | 375 |
| Series 60 | 130 | 160 | 4 | 6L | 49.7 | 1800 | 1561 | *576 | 400 |
| Series 60 | 130 | 160 | 4 | 6L | 77.7 | 2300 | 1907 | *736 | 625 |
| 8V2000 | 130 | 150 | 4 | 8V | 47 | 1800 | 1577 | *540 | 499 |
| 8V-2000 | 130 | 150 | 4 | 8V | 50 | 1800 | 1670 | *540 | 535 |
| 8V-2000 | 130 | 150 | 4 | 8V | 60 | 2100 | 1725 | *630 | 645 |
| 8V-2000 | 130 | 150 | 4 | 8V | 76 | 2300 | 1991 | *690 | 815 |
| 12V2000 | 130 | 150 | 4 | 12V | 50 | 1800 | 1670 | *540 | 805 |
| 12V-2000 | 130 | 150 | 4 | 12V | 60 | 2100 | 1721 | *630 | 965 |
| 12V-2000 | 130 | 150 | 4 | 12V | 76 | 2300 | 1995 | *690 | 1225 |
| 16V2000 | 130 | 150 | 4 | 16V | 50 | 1800 | 1697 | *540 | 1078 |
| 16V-2000 | 130 | 150 | 4 | 16V | 60 | 2100 | 1719 | *630 | 1285 |
| 16V-2000 | 130 | 150 | 4 | 16V | 76 | 2300 | 1997 | *690 | 1635 |
| 8V4000 | 165 | 190 | 4 | 8V | 93 | 1600 | 1700 | *606 | 1000 |
| 8V-4000 | 165 | 190 | 4 | 8V | 112 | 1800 | 1810 | *684 | 1200 |
| 8V-4000 | 165 | 190 | 4 | 8V | 145 | 2000 | 2140 | *762 | 1550 |
| 8V-4000 | 165 | 190 | 4 | 8V | 153 | 2100 | 2150 | *798 | 1650 |
| 12V4000 | 165 | 190 | 4 | 12V | 93 | 1600 | 1700 | *606 | 1500 |
| 12V-4000 | 165 | 190 | 4 | 12V | 112 | 1800 | 1810 | *684 | 1800 |

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|----------|-----------|-------------|-------|----------|--------|------|------|-------------------|--------------|
| 12V-4000 | 165 | 190 | 4 | 12V | 145 | 2000 | 2140 | *762 | 2330 |
| 12V-4000 | 165 | 190 | 4 | 12V | 153 | 2100 | 1810 | *798 | 2450 |
| 16V4000 | 165 | 190 | 4 | 16V | 93 | 1600 | 1700 | *606 | 2000 |
| 16V-4000 | 165 | 190 | 4 | 16V | 112 | 1800 | 1810 | *684 | 2400 |
| 16V-4000 | 165 | 190 | 4 | 16V | 145 | 2000 | 2140 | *762 | 3110 |
| 16V-4000 | 165 | 190 | 4 | 16V | 153 | 2100 | 2150 | *798 | 3285 |

| | | | | | | | | | |
|--|-----|-------|---|----------|-----|------|-------|------|-----------|
| Deutz Canada | | | | | | | | | |
| 4420 Gorand St., Montreal, Que. H4R 2A3 Canada, Tel: 514-335-3150, Fax: 514-332-4173, Email: deutzcan@msn.com; Website: http://www.deutzcanada.com | | | | | | | | | |
| Deutz Corp. - 3883 Steve Reynolds Blvd., Norcross, GA 30093, Tel: 770-564-7100; Fax: 770-564-7222; Website: http://www.deutz.com | | | | | | | | | |
| TBD616 | 132 | 160 | 4 | 8,12,16V | 60 | 2100 | 15.37 | 11.2 | 320-960 |
| TBD620 | 170 | 198.5 | 4 | 8,12,16V | 127 | 1800 | 19.1 | 11.7 | 915-2032 |
| BVM628 | 240 | 280 | 4 | 6,8,9L | 225 | 1000 | 21.3 | 9.3 | 1035-2025 |
| BVM628 | 240 | 280 | 4 | 12,16L | 225 | 1000 | 21.3 | 9.3 | 2070-3600 |
| TBD645 | 330 | 450 | 4 | 6,8,9L | 460 | 650 | 22.1 | 9.8 | 2550-4140 |
| BVM640 | 370 | 420 | 4 | 12,16V | 440 | 650 | 18.9 | 9.1 | 4040-7060 |

| | | | | | | | | | |
|--|-----|-----|---|------------|---------|---------|----------|--|-----------|
| Electro-Motive Div. of General Motors Corp. | | | | | | | | | |
| 9301 West 55th St., La Grange, Ill. 60525, Tel: 708-387-5853; Fax: 708-387-5430; Website: http://www.gmcmd.com | | | | | | | | | |
| 645E6 | 230 | 254 | 2 | 8,12,16 | 71-100 | 750-900 | 5.6-6.26 | | 570-1595 |
| 645F7B | 230 | 254 | 2 | 8,12,16,20 | 126-149 | 750-900 | 8.96-10 | | 1010-298 |
| 710G7B | 230 | 279 | 2 | 8,12,16,20 | 150-187 | 750-900 | 10.69 | | 1200-3730 |

| | | | | | | | | | |
|---|-------|-------|---|----------------|-----------|----------|-----------|-----------|-----------|
| Fairbanks Morse (Coltec Industries) | | | | | | | | | |
| 701 White Ave., Beloit, Wis. 53511, Tel: 608-364-8100; Fax: 608-364-8194, Email: nstiener@fairbanksmorse.com; Website: http://www.fairbanksmorse.com/ | | | | | | | | | |
| 38D8-1/8 | 206.4 | 254 | 2 | 4-12L | 132-149.3 | 750-900 | 5.9-6.2 | 6.35-7.6 | 2528-1790 |
| 38T8-1/8 | 206.4 | 254 | 2 | 6,9,12L | 217.5-261 | 750-900 | 10.2 | 6.35-7.62 | 1305-3132 |
| FM/ALCO 251 | 228.6 | 266.7 | 4 | 6L,8,12,16,18V | 80-184.4 | 750-1200 | 6.4-10.67 | 6.4-10.67 | 480-2950 |

| | | | | | | | | | |
|--|-----|-----|---|-----------------------|------|----------|-------|------|------------|
| GMT | | | | | | | | | |
| Bagnoli Della Rosandra, Trieste 334 Italy, Tel: 39-40-3193111; Fax: 39-40-827371 | | | | | | | | | |
| A32 | 230 | 390 | 4 | 6,8,9L,12,14,16V | 440 | 720-750 | 22.5 | 9.75 | 2640-7040 |
| A32G | 230 | 390 | 4 | 6,8,9L,12,14,16V | 360 | 720-750 | 18.36 | 9.75 | 2160-5760 |
| A55 | 550 | 680 | 4 | 6,8,9L,12,14,16,18V | 1250 | 425-428 | 21.8 | 9.6 | 7500-22500 |
| A55DF | 550 | 680 | 4 | 6,8,9L,12,14,16,18V | 1000 | 428 | 17.4 | 9.7 | 6000-18000 |
| BL230 | 230 | 310 | 4 | 4,6,8,9L,12,16,18,20V | 222 | 1050 | 19.7 | 10.8 | 890-4450 |
| BL230P | 230 | 310 | 4 | 4,6,8,9L,12,16,18,20V | 190 | 720-1000 | 17.4 | 10.3 | 730-3800 |

| | | | | | | | | | |
|---|-----|-----|---|-----|--------|-----------|-------|----------|-----------|
| Hedemora Diesel A/B | | | | | | | | | |
| Box 206, Hedemora 776 28 Sweden, Tel: 46-225-595800; Fax: 46-225-595802, Email: diesel@hedemoradiesel.se; Website: http://www.hedemoradiesel.se | | | | | | | | | |
| V12A | 185 | 210 | 4 | 12V | 75-125 | 1000-1500 | 16-18 | 7.0-10.5 | 900-1500 |
| V12B | 210 | 210 | 4 | 12V | 96-158 | 1000-1500 | 16-18 | 7.0-10.5 | 1150-1900 |
| V18A | 185 | 210 | 4 | 18V | 75-125 | 1000-1500 | 16-18 | 7.0-10.5 | 1300-2200 |
| V18B | 210 | 210 | 4 | 18V | 96-158 | 1000-1500 | 16-18 | 7.0-10.5 | 1700-2850 |

| | | | | | | | | | |
|--|-----|-----|---|-----|-------|------|-------|-------|-----------|
| Isotta Fraschini | | | | | | | | | |
| 800 Principal Ct., Ste. C, Chesapeake, Va. 23320, Tel: 1-888-4-Isotta, Fax: 757-548-6012, Email: isotta@fdgm.com | | | | | | | | | |
| L1306T2 | 130 | 142 | 4 | 6L | 73.5 | 2400 | 19.5 | 11.36 | 320-600 |
| V1308T2 | 130 | 126 | 4 | 8V | 73.5 | 2700 | 18.25 | 11.34 | 450-750 |
| V1312T2 | 130 | 126 | 4 | 12V | 73.5 | 2700 | 19.5 | 11.34 | 670-1200 |
| V1708T2 | 170 | 170 | 4 | 8V | 119.5 | 2000 | 18.5 | 11.33 | 1100-1300 |
| V1712T2 | 170 | 170 | 4 | 12V | 140 | 2000 | 21.7 | 11.33 | 1885-2285 |
| V1716T2 | 170 | 170 | 4 | 16V | 147 | 2100 | 21.7 | 11.9 | 2590-3200 |

| | | | | | | | | | |
|---|-------|-------|---|----|-------|-----------|--|----|--|
| MackPower | | | | | | | | | |
| 2100 Mack Blvd., Allentown, Pa. 18103, Tel: 610-709-3837; Fax: 610-709-3636 | | | | | | | | | |
| MP ME7 | 123.8 | 165.1 | 4 | 6L | 44-81 | 1800-2300 | | </ | |



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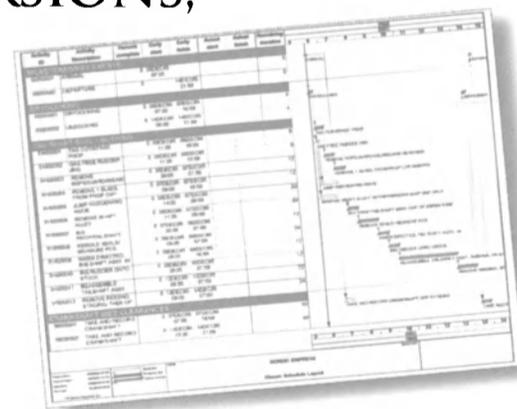
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Marine Diesel Propulsion: Where Less Is More

ANCHORS CHAINS

WORTELBOER

Alstom Diesel engines and its three well-regarded brands — Mirreles Blackstone, Paxman and Ruston — were recently bought by MAN B&W.

Several recent deals have confirmed the continuing trend towards a consolidation of resources in the realm of marine propulsion equipment. The trend, to regular followers of the industry, is hardly a new development. However, a spate of recent new deals and consummations has brought the topic to the forefront again.

As reported in the June 2000 edition of *Maritime Reporter & Engineering News*, the emergence of Rolls Royce as a major force in the field of marine propulsion is solidified with a collection of brand name equipment suppliers. The U.K. based organization has a true global reach, and is a threatening force to dominate any market, which it chooses to enter.

Mid last month, also saw big announcements from two of the world's premier diesel engine manufacturers, MAN B&W and Wartsila NSD.

MAN B&W Diesel AG of Augsburg, Germany formally completed the acquisition of ALSTOM's Diesel engine business, which was immediately renamed MAN B&W Diesel Ltd with its headquarters in Stockport, Cheshire.

"We welcome the new British members of the MAN B&W Diesel team to the MAN family," said Dr. **Hans-J. Schulte**, president of MAN B&W Diesel. "We will strengthen their technical and brand identities, thus bringing a wider range of products into a wider range of markets and placing more resources at the disposal and to the benefit of our customers."

The U.K. company manufactures diesel engines under the long established Mirreles Blackstone, Ruston and Paxman brand names, which will continue to be strongly promoted. The existing engine programs under these brand names will also continue and will be complementary to the extensive range of engines in the power bracket between 500 and 68,640 kW being designed and produced by the MAN B&W Diesel Group at its other locations in Europe. Mirreles Blackstone 500 - 600 rpm medium-speed engines find application in the base load power generation in markets up to 15 MW per unit. Ruston 750 - 1,000 rpm medium-speed engines up to 9 MW are widely used in power generation, marine propulsion and rail traction applications and it is the leading brand in engines for large high-speed

ferries. Paxman high-speed engines are well known in applications demanding high power density engines up to 4 MW including power generation, high-speed marine and high-speed rail traction applications. The U.K. company also manufactures Diesel engine governors and control systems through its Regulateurs Europa subsidiary and has a high quality iron foundry in Stamford.

MAN B&W Diesel AG is a market leader in marine propulsion engines for commercial shipping. The MAN B&W Diesel Group employs some 6,000 people world-wide and has an annual business volume of \$1.1 billion. The acquisition will bring an additional workforce of approximately 1,500 and annual sales of some \$200 million. Wartsila NSD also made headlines when it announced that it and the TI Group, on behalf of John Crane-Lips, signed of a co-operation agreement to develop, market and supply total marine propulsion power systems to the shipbuilding industry. Agreement has also been reached for TI Group to purchase Wartsila NSD's propeller production and related servicing business at Rubbestadneset, Norway, with approxi-

mately
1 2 0 employees
transferring from
Wartsila NSD Norway
to John Crane-Lips.

Tel.: +31 (0)10 429 2222

Fax: +31 (0)10 429 6459

gjl@wortelboer.nl

www.wortelboer.nl

"This agreement is an important milestone for Wartsila NSD in developing our position as The Ship Power Supplier," said **Ole Johansson**, president and CEO of Wartsila NSD. "The requirement for integrated solutions is increasing within the industry and Wartsila NSD is well placed to respond to that need." Wartsila NSD has a substantial share of the marine engine market and John Crane-Lips has a leading position in the market for integrated propulsion systems, including propellers, waterjets, thrusters, shaft seals and bearings. Under the brand name, Wartsila-Lips, customers will be offered total marine

(Continued on page 54)

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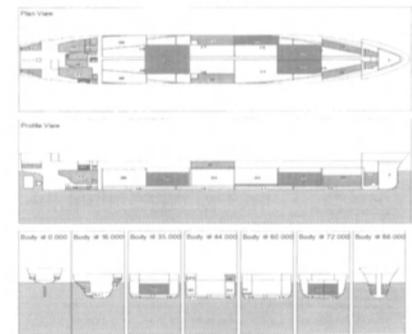
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MR/EN's Diesel Power Annual

| | | | | | | | | | |
|----------|-----|-----|---|-------------------------|-----------|---------|-----------|---------|------------|
| L/V32/40 | 320 | 400 | 4 | 6,7,8,9,11,12,14,16,18V | 480 | 720-750 | 23.9-24.9 | 9.6-10 | 2880-8640 |
| L40/54 | 400 | 540 | 4 | 6,7,8,9,L | 700-720 | 500-550 | 23.1-24.8 | 9.9-9 | 4200-6480 |
| LV48/60 | 480 | 600 | 4 | 6,7,8,9L 12,14,16,18V | 1050 | 500-514 | 22.6-23.2 | 10-10.3 | 6300-18900 |
| L58/64 | 580 | 640 | 4 | 6,7,8,9L | 1300-1390 | 400-428 | 23 | 8.5-9.1 | 8340-12510 |

MAN B&W Diesel AS

Teglhølmegade 41, Copenhagen SV DK-2450 Denmark, Tel: 45-31-492501; Fax: 45-33-85-10-30
Email: manbw@manbw.dk; Website: http://www.manbw.dk

| | | | | | | | | | |
|---------|-----|------|---|----------------------|-----------|---------|-----------|-----|-------------|
| L35MC | 350 | 1050 | 2 | 4,5,6,7,8,9,10,11,12 | 440-650 | 178-210 | 14.7-18.4 | 7.4 | 2600-7800 |
| L42MC | 420 | 1360 | 2 | 4,5,6,7,8,9,10,11,12 | 480-995 | 132-176 | 11.5-18.0 | 8 | 3980-11940 |
| L50MC | 500 | 1620 | 2 | 4,5,6,7,8 | 640-1330 | 111-148 | 10.9-17.0 | 8 | 5320-10640 |
| L60MC | 600 | 1944 | 2 | 4,5,6,7,8 | 920-1920 | 92-123 | 10.9-17.0 | 8 | 7680-15360 |
| L70MC | 700 | 2268 | 2 | 4,5,6,7,8 | 1355-2830 | 81-108 | 11.5-18.0 | 8.2 | 11320-22640 |
| L80MC | 800 | 2592 | 2 | 4,5,6,7,8,9,10,11,12 | 1750-3640 | 70-93 | 11.5-18.0 | 8 | 14560-43680 |
| L90MC-C | 900 | 2916 | 2 | 6,7,8,9,10,11,12 | 2340-4890 | 62-83 | 12.2-19 | 8.1 | 29340-58680 |
| S26MC | 260 | 980 | 2 | 4,5,6,7,8,9,10,11,12 | 275-400 | 212-250 | 14.8-18.5 | 8.2 | 1600-4800 |
| S35MC | 350 | 1400 | 2 | 4,5,6,7,8,9,10,11,12 | 505-740 | 147-173 | 15.3-19.1 | 8.1 | 2960-8880 |
| S42MC | 420 | 1764 | 2 | 4,5,6,7,8,9,10,11,12 | 730-1080 | 115-136 | 15.6-19.5 | 8 | 4320-12960 |
| S46MC-C | 460 | 1932 | 2 | 4,5,6,7,8 | 880-1310 | 108-129 | 15.2-19.0 | 8.3 | 5240-10480 |
| S50MC | 500 | 1910 | 2 | 4,5,6,7,8 | 690-1430 | 95-127 | 11.5-18.0 | 8.1 | 5720-11440 |
| S50MC-C | 500 | 2000 | 2 | 4,5,6,7,8 | 760-1580 | 95-127 | 12.2-19.0 | 8.5 | 6320-12640 |
| S60MC | 600 | 2292 | 2 | 4,5,6,7,8 | 980-2040 | 79-105 | 11.5-18.0 | 8 | 8160-16320 |
| S60MC-C | 600 | 2400 | 2 | 4,5,6,7,8 | 1085-2255 | 79-105 | 12.2-19.0 | 8.4 | 9020-18040 |
| S70MC | 700 | 2674 | 2 | 4,5,6,7,8 | 1350-2810 | 68-91 | 11.5-18.0 | 8.1 | 11240-22480 |
| S70MC-C | 700 | 2800 | 2 | 4,5,6,7,8 | 1490-3105 | 68-91 | 12.2-19.0 | 8.5 | 12420-24840 |
| K80MC-C | 800 | 2300 | 2 | 6,7,8,9,10,11,12 | 2470-3610 | 89-104 | 11.5-18.0 | 8 | 21660-43320 |
| S80MC | 800 | 3056 | 2 | 4,5,6,7,8,9 | 1840-3840 | 59-79 | 12.2-19.0 | 8 | 15360-34560 |
| S80MC-C | 800 | 3200 | 2 | 6-8 | 1860-3880 | 76-57 | 12.2-19.0 | 8.1 | 23280-31040 |
| K90MC-C | 900 | 2300 | 2 | 6,7,8,9,10,11,12 | 3100-4560 | 89-104 | 11.5-18.0 | 8 | 27360-54720 |
| K90MC | 900 | 2550 | 2 | 4,5,6,7,8,9,10,11,12 | 2200-4570 | 71-94 | 11.5-18.0 | 8 | 18280-54840 |
| S90MC-C | 900 | 3188 | 2 | 6-9 | 3140-4890 | 61-76 | 12.2-19.0 | 8.1 | 29340-44010 |
| K98MC-C | 980 | 2400 | 2 | 6,7,8,9,10,11,12 | 4130-5710 | 94-104 | 14.6-18.2 | 8.3 | 34260-68520 |
| K98MC | 980 | 2660 | 2 | 6,7,8,9,10,11,12 | 4090-5720 | 84-94 | 14.6-18.2 | 8.3 | 34320-68640 |

MAN B&W Diesel AS Høleby

Ostervei 2, Høleby DK-4960 Denmark, Tel: 45-5469-3100; Fax: 45-5469-3030; Email: holeby@manbw.dk

| | | | | | | | | | |
|-----------|-----|-----|---|----------------------|-------------|-------------|----------------|---------|-----------|
| L16/24 | 160 | 240 | 4 | 6,7,8,9L | 90-100 | 1000-1200 | 22.4-20.7 | 8.9-6 | 450-900 |
| L23/30H | 225 | 300 | 4 | 5,6,7,8L | 130-135-160 | 720-750-900 | 18.2-18.1-17.9 | 7.2-9 | 650-1280 |
| L-V28/32H | 280 | 320 | 4 | 5,6,7,8,9L,12,16,18V | 210-220 | 720-750 | 17.8-17.9 | 7.7-8 | 1050-3960 |
| L27/38 | 270 | 380 | 4 | 5,6,7,8,9L | 300-320 | 720-750 | 23.0-23.9 | 9.1-9.5 | 1500-2880 |
| L32/40 | 320 | 400 | 4 | 6,7,8,9L | 480 | 720-750 | 24.9-23.9 | 9.6-10 | 2880-4320 |

MAN B&W Diesel A/S-Alpha Diesel

Niels Juels Vej 15, Frederikshavn DK-9900 Denmark, Tel: 45-9620-4100; Fax: 45-9620-4030
Email: alpha@manbw.dk; Website: http://www.manbw.dk

| | | | | | | | | | |
|---------|-----|------|---|-----------------------|----------|---------|-----------|--------|------------|
| L23/30A | 225 | 300 | 4 | 6,8L | 133-160 | 825-900 | 16.3-17.9 | 8.25-9 | 800-1280 |
| V23/30A | 225 | 300 | 4 | 12V | 160 | 900 | 17.9 | 9 | 1920 |
| L27/38 | 270 | 380 | 4 | 6,7,8,9L | 340 | 800 | 23.5 | 10.1 | 2040-3060 |
| L28/32A | 280 | 320 | 4 | 6,7,8,9L | 245 | 775 | 19.3 | 8 | 1470-2205 |
| V28/32A | 280 | 320 | 4 | 12,16V | 245 | 775 | 19.3 | 8 | 2940-3920 |
| S26MC | 260 | 980 | 2 | 4,5,6,7,8,9,10,11,12L | 275-400 | 212-250 | 14.8-18.5 | 8.2 | 1600-4800 |
| L35MC | 350 | 1050 | 2 | 4,5,6,7,8,9,10,11,12L | 440-650 | 170-210 | 14.7-18.4 | 8.8 | 2600-7800 |
| S35MC | 350 | 1400 | 2 | 4,5,6,7,8,9,10,11,12L | 605-740 | 147-173 | 15.3-19.1 | 8.1 | 2960-8880 |
| L42MC | 420 | 1360 | 2 | 4,5,6,7,8,9,10,11,12L | 480-995 | 132-176 | 11.5-18 | 8 | 3980-11940 |
| S42MC | 420 | 1764 | 2 | 4,5,6,7,8,9,10,11,12L | 695-1025 | 115-136 | 14.5-18.5 | 8 | 4320-12960 |
| S46MC-C | 460 | 1932 | 2 | 4,5,6,7,8L | 880-1310 | 106-129 | 15.2-19 | 8.3 | 5240-10480 |
| L50MC | 500 | 1620 | 2 | 4,5,6,7,8L | 640-1330 | 111-148 | 10.5-17 | 8 | 5320-10640 |
| S50MC | 500 | 1910 | 2 | 4,5,6,7,8L | 690-1430 | 95-127 | 11.5-18 | 8 | 5720-11440 |
| S50MC-C | 500 | 2000 | 2 | 4,5,6,7,8L | 760-1580 | 95-127 | 12.2-19 | 8.5 | 6320-12640 |

Man B&W Diesel AG (Mirreles Blackstone)

Bramhall Moor Lane, Hazel Grove, Stockport, Cheshire SK7 5AH United Kingdom, Tel: 44-161-483-1000; Fax: 44-161-487-1465
Email: mirreles.blackstone@ind.alstom.com; Website: http://www.engines.ind.alstom.com

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|---------|-----------|-------------|-------|---------------|--------|-----|------|-------------------|--------------|
| K Major | 400 | 457 | 4 | 6,8,9L,12,16V | 544 | 600 | 19 | 6.14 | 2980-8710 |
| MB430M | 430 | 520 | 4 | 12,16,18V | 865 | 600 | 23 | 10.4 | 8682-15627 |
| MB430L | 430 | 560 | 4 | 6,8,9L | 800 | 514 | 23 | 9.6 | 4680-7200 |
| MB430V | 430 | 480 | 4 | 12,16V | 730 | 600 | 23 | 9.6 | 7997-11683 |

Man B&W Diesel Ltd., (Paxman)

Hythe Hill, Colchester, Essex CO1 2HW United Kingdom, Tel: 44-1206-795151; Fax: 44-1206-797869

| | | | | | | | | | |
|---------|-----|-----|---|----------------|---------|-----------|-----------|------------|-----------|
| VALENTA | 197 | 216 | 4 | 6L,8,12,16,18V | 101-192 | 1200-1640 | 15.4-21.3 | 8.64-11.81 | 610-3450 |
| VP185 | 185 | 196 | 4 | 12,18V | 156-222 | 1500-1950 | 25.96 | 9.8-12.74 | 1875-4000 |

Man B&W Diesels Ltd., (Ruston)

Newton-Le-Willows, Merseyside WA12 8RU United Kingdom, Tel: 44-1925-225151; Fax: 44-1925-222055

| | | | | | | | | | |
|-----------|-----|-----|---|------------------|-----|----------|-------|-------|-----------|
| RK215 | 215 | 275 | 4 | 6L, 8, 12, 16V | 198 | 720-1000 | 21.64 | 9.2 | 780-3160 |
| RK270 | 270 | 305 | 4 | 6,8L,12,16, 20 V | 378 | 720-1032 | 20.48 | 10.16 | 1480-7550 |
| RK 270 HF | 270 | 305 | 4 | 6.8L 12,16, 20V | 253 | 720-1000 | 17.36 | 10.16 | 1320-5050 |

MAN Engines & Components, Inc.

595 S.W. 13th Terrace, Ste. A, Pompano Beach, Fla. 33069, Tel: 800-MAN 2842; Fax: 954-946-9098
Email: man@man-mec.com; Website: http://www.man-mec.com

| | | | | | | | | | |
|------------|-----|-----|---|-----|----|-----------|------|-------|---------|
| D0826LE40 | 108 | 120 | 4 | 6L | 45 | 2100-2600 | 13.9 | 10.4 | 147-270 |
| D2866E | 128 | 155 | 4 | 6L | 31 | 1500-2200 | 8.4 | 11.37 | 125-185 |
| D2866TE | 128 | 155 | 4 | 6L | 39 | 1800-2200 | 10.7 | 11.37 | 190-235 |
| D2866LXE40 | 128 | 155 | 4 | 6L | 54 | 1800-2200 | 14.8 | 11.37 | 250-324 |
| D2866LE402 | 128 | 155 | 4 | 6L | 61 | 2200 | 16.8 | 11.37 | 368 |
| D2866LE403 | 128 | 155 | 4 | 6L | 61 | 2100 | 17.6 | 10.85 | 368 |
| D2866LE405 | 128 | 155 | 4 | 6L | 75 | 2200 | 20.5 | 11.37 | 449 |
| D2876LE401 | 128 | 166 | 4 | 6L | 86 | 2200 | 21.8 | 12.2 | 515 |
| D2848LE | 128 | 142 | 4 | 8V | 43 | 1800-2300 | 12.4 | 10.89 | 280-347 |
| D2848LE401 | 128 | 142 | 4 | 8V | 63 | 2100-2300 | 17.8 | 10.89 | 397-500 |
| D2848LE403 | 128 | 142 | 4 | 8V | 74 | 2300 | 21 | 10.89 | 588 |
| D2848LE405 | 128 | 142 | 4 | 8V | 60 | 2100 | 18.7 | 9.94 | 478 |
| D2840LE | 128 | 142 | 4 | 10V | 59 | 2300 | 12.4 | 10.89 | 346-590 |
| D2840LE401 | 128 | 142 | 4 | 10V | 60 | 2300 | 17.2 | 10.89 | 478-603 |
| D2840LE402 | 128 | 142 | 4 | 10V | 44 | 1800 | 16.1 | 8.52 | 441 |
| D2840LE403 | 128 | 142 | 4 | 10V | 77 | 2300 | 22 | 10.89 | 772 |
| D2842LE | 128 | 142 | 4 | 12V | 43 | 1800-2300 | 12.4 | 10.89 | 420-520 |
| D2842LE401 | 128 | 142 | 4 | 12V | 61 | 2100-2300 | 17.5 | 10.89 | 588-735 |
| D2842LE402 | 128 | 142 | 4 | 12V | 67 | 2300 | 19.2 | 10.89 | 809 |
| D2842LE403 | 128 | 142 | 4 | 12V | 44 | 1800 | 16.1 | 8.52 | 529 |
| D2842LE404 | 128 | 142 | 4 | 12V | 80 | 2300 | 22.8 | 10.89 | 956 |
| D2842LE406 | 128 | 142 | 4 | 12V | 74 | 2300 | 21 | 10.89 | 882 |
| D2842LE408 | 128 | 142 | 4 | 12V | 61 | 2100 | 19.2 | 9.94 | 735 |

MAN Nutzfahrzeuge AG, Nuremberg Works

Vogelweierstr 33, Nuremberg D-90441 Germany, Tel: 49-911-420-6218; Fax: 49-911-420-1915
Email: brigitt@koehler@mn.man.de; Website: http://www.man-nutzfahrzeuge.de

| | | | | | | | | | |
|-----------------------|-----|-----|---|-----|-----------|-----------|-----------|-------------|---------|
| D2866E/TE/LE | 128 | 155 | 4 | 6L | 27.5-41.7 | 1800-2200 | 7.9-13.9 | 9.3-11.37 | 165-250 |
| D2866LE/402/3/5 | 128 | 155 | 4 | 6L | 61.3-74.8 | 2100-2200 | 17.5-20.5 | 10.85-11.37 | 368-449 |
| D2876LE/401 | 128 | 166 | 4 | 6L | 86 | 2200 | 21.9 | 12.2 | 515 |
| D2848LE/401/403/5 | 128 | 142 | 4 | 8V | 35-73.5 | 1800-2300 | 12.8-21 | 8.52-10.9 | 280-588 |
| D2840LE/LE401/2/3 | 128 | 142 | 4 | 10V | 34.6-77.2 | 1800-2300 | 12.6-22 | 8.52-10.9 | 346-772 |
| D2842LE/401/2/3/4/6/8 | 128 | 142 | 4 | 12V | 35-79.7 | 1800-2300 | 12.8-22.8 | 8.52-10.9 | 420-956 |

Mitsubishi Heavy Industries Ltd

5-1 Marunouchi, 2-chome, Chiyoda-ku Tokyo 100 Japan, Tel: 81-33212-9080; Fax: 81-33212-9779

| | | | | | | | | | |
|-----------|-----|------|---|------------|-----|---------|------|------|-----------|
| UEC33LSII | 330 | 1050 | 2 | 4,5,6,7,8L | 566 | 162-215 | 17.6 | 7.35 | 1230-4530 |
| UEC37LA | 370 | 880 | 2 | 4,5,6,7,8L | | | | | |

MR/EN's Diesel Power Annual

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|----------------|-----------|-------------|-------|----------|--------|------|------|-------------------|--------------|
| 6NVD 48 A-2U | 320 | 480 | 4 | 6L | 123 | 428 | 8.9 | 6.85 | |
| 6NVD48 AL-2U | 320 | 480 | 4 | 6L | 140 | 428 | 10.2 | 6.85 | |
| 6VD 18/16 AL-2 | 160 | 180 | 4 | 6L | 75 | 1500 | 16.6 | 9.0 | |
| 6VD 18/16 AL-2 | 160 | 180 | 4 | 6L | 90 | 1800 | 16.6 | 10.8 | |
| 6VD 26/20 AL-1 | 200 | 260 | 4 | 6L | 88 | 1000 | 13.0 | 8.67 | |
| 6VD 26/20 AL-2 | 200 | 260 | 4 | 6L | 110 | 1000 | 16.2 | 8.67 | |
| 6VD 29/24 AL-2 | 240 | 290 | 4 | 6L | 150 | 750 | 18.3 | 7.25 | |
| 6VD 29/24 AL-2 | 240 | 290 | 4 | 6L | 220 | 1000 | 20.1 | 9.67 | |
| 8NVD48A-2U | 320 | 480 | 4 | 8L | 121 | 428 | 8.9 | 6.85 | |
| 8NVD 48 AL-2U | 320 | 480 | 4 | 8L | 138 | 428 | 10.2 | 6.85 | |
| 8VD 18/16 AL-3 | 160 | 180 | 4 | 8L | 90 | 1500 | 20.0 | 9.0 | |
| 8VD 18/16 AL-3 | 160 | 180 | 4 | 8L | 109 | 1800 | 20.0 | 10.8 | |
| 8VD 24/16 AL-1 | 160 | 240 | 4 | 8L | 80 | 1000 | 20.0 | 8.0 | |
| 8VD 24/16 AL-1 | 160 | 240 | 4 | 8L | 96 | 1200 | 20.0 | 9.6 | |
| 8VD 26/20 AL-2 | 200 | 260 | 4 | 8L | 110 | 1000 | 16.2 | 8.67 | |
| 8VD 29/24 AL-2 | 240 | 290 | 4 | 8L | 169 | 750 | 20.9 | 7.25 | |
| 8VD 29/24 AL-2 | 240 | 290 | 4 | 8L | 225 | 1000 | 20.6 | 9.67 | |
| 9VD 29/24 AL-2 | 240 | 290 | 4 | 9L | 196 | 750 | 24.0 | 7.25 | |
| 9VD29/24 AL-2 | 240 | 290 | 4 | 9L | 261 | 1000 | 24.0 | 9.67 | |

Ulstein Bergen AS

P.O. Box 924, Bergen N-5808 Norway, Tel: 47-55-53-6000; Fax: 47-55-53-6104, Email: sales.ube@ulstein.no; Website: www.ulstein.no

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|---------|-----------|-------------|-------|-----------------------|---------|---------|-------|-------------------|--------------|
| B(AUX) | 320 | 360 | 4 | 6,8,9L,12,16,18 V | 424-442 | 720-750 | 24.4 | 8.6-9 | 2545-7945 |
| B(PROP) | 320 | 360 | 4 | 6,8,9 L,12,16,18 V | 442 | 750 | 24.4 | 9 | 2650-7945 |
| K(AUX) | 250 | 300 | 4 | 3,5,6,8,9L,12,16,18 V | 195-221 | 720-900 | 20-22 | 7.2-9 | 585-3975 |
| K(PROP) | 250 | 300 | 4 | 6,8,9L,12,16,18 V | 202-223 | 750-825 | 22 | 7.5-8.25 | 1215-4010 |

Volvo Penta of the Americas

Gothenburg S-40508 Sweden, Tel: 46-31-235460; Fax: 46-31-510348
1300 Volvo Penta Dr., Chesapeake, Va. 23320, Tel: 757-436-2800; Fax: 757-436-5158, Website: http://www.penta.volvo.se

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|--------------|-----------|-------------|-------|----------|-----------|-----|------|-------------------|--------------|
| TAMD31L | | | | 4 | 3800 | | | 96 | |
| TAMD31M | | | | 4 | 3250 | | | 81 | |
| TAMD31P | | | | 4 | 3900 | | | 110 | |
| AD31L | | | | 4 | 3800 | | | 95 | |
| AD31P | | | | 4 | 3900 | | | 110 | |
| TAMD41H | | | | 6 | 2500 | | | 107 | |
| TAMD41M | | | | 6 | 3250 | | | 125 | |
| TAMD41P | | | | 6 | 3800 | | | 147 | |
| AD41L | | | | 6 | 3600 | | | 121 | |
| AD41P | | | | 6 | 3800 | | | 147 | |
| TAMD42WJ | | | | 6 | 3800 | | | 170 | |
| KAMD43P | | | | 6 | 3900 | | | 170 | |
| KAMD43P/DP | | | | 6 | 3900 | | | 170 | |
| KAMD43P/DPX | | | | 6 | 3900 | | | 170 | |
| TAMD63L | | | | 6 | 2500-2800 | | | 173-234 | |
| TAMD63P | | | | 6 | 2800 | | | 272 | |
| TAMD71B | | | | 6 | 2000-2600 | | | 160-280 | |
| TAMD73P EDC | | | | 6 | 2600 | | | 316 | |
| TAMD73WJ | | | | 6 | 2600 | | | 331 | |
| TAMD74C | | | | 6 | 2500-2600 | | | 316-331 | |
| TMD102A | | | | 6 | 1800-2000 | | | 175-200 | |
| TAMD102A | | | | 6 | 1800-2000 | | | 235-265 | |
| TAMD102D | | | | 6 | 2200-2250 | | | 315-335 | |
| TMD122A | | | | 6 | 1800 | | | 221-235 | |
| TAMD122A | | | | 6 | 1800-1900 | | | 280-294 | |
| TAMD122P | | | | 6 | 2100-2250 | | | 390-441 | |
| TAMD122P EDC | | | | 6 | 2100-2250 | | | 390-449 | |
| TAMD162C | | | | 6 | 1800 | | | 375 | |
| TAMD163A | | | | 6 | 1800-2250 | | | 404-441 | |
| TAMD163P | | | | 6 | 2100 | | | 500-566 | |

Wartsila NSD

P.O. Box 252; Vaasa FIN-65101 Finland
Tel: 358-6-3270 Fax: 358-6-356-7188
Email: outi.riikonen@wartsila-nsd.com; Website: http://www.wartsila-nsd.com

Wartsila NSD Nederland B.V. - P.O. Box 10608, Zwolle 8000 GB The Netherlands; Tel: 31-38-4253-253; Fax: 31-38-4253-352

Wartsila NSD Norway A/S - Rubbestadneset N-5420 Norway; Tel: 47-534-225-00; Fax: 47-534-225-01

Wartsila NSD Switzerland AG - P.O. Box 414, Winterthur CH-8401 Switzerland; Tel: 41-52-262-4922; Fax: 41-52-212-4917

Wartsila NSD Italia - Bagnoli della Rosandra 334, Trieste I-34018 Italy; Tel: 39-040-319-5000; Fax: 39-040-319-5728

Wartsila NSD France S.A. - 1, rue e la Fonderie B.P 1210, Mulhouse Cedex F-68054 France; Tel: 33-389-666-868; Fax: 33-389-666-830

Wartsila NSD North America Inc - 201 Defense Highway, Suite 100, Annapolis, Md. 21401; Tel: 410-573-2100; Fax: 410-573-2200
Email: christerbraman@wartsila-nsd.com; Website: http://www.wartsilausa.com

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|-----------------------|-----------|-------------|-------|---------------------|-----------|-----------|-----------|-------------------|--------------|
| Wartsila 38B | 380 | 475 | 4 | 6,8,9L,12,16,18V | 725 | 600 | 26.9 | 9.5 | 4350-13050 |
| Wartsila 200 | 200 | 240 | 4 | 12,16,18V | 175-200 | 1200-1500 | 21.2-23.2 | 9.6-12 | 2100-3600 |
| Wartsila 20 | 200 | 280 | 4 | 4,5,6,8,9L | 130-180 | 720-1000 | 24.6-25.8 | 6.7-9.3 | 720-1620 |
| Wartsila 26X | 260 | 320 | 4 | 12,16,18V | 400 | 1000 | 28.2 | 10.7 | 4800-7200 |
| Wartsila 26A | 260 | 320 | 4 | 6,8,9L,12,16,18V | 310-325 | 900-1000 | 23-24.3 | 9.6-10.7 | 1860-5850 |
| Wartsila Vasa 32/32GD | 320 | 350 | 4 | 4,6,8,9R,12,16,18V | 405-410 | 720-750 | 21.3-24 | 8.4-8.8 | 1480-7380 |
| Wartsila 32 | 320 | 400 | 4 | 6,8,9L,12,16,18V | 450-460 | 720-750 | 22.9-23.3 | 9.6-10 | 2700-8280 |
| Wartsila 38A | 380 | 475 | 4 | 6,8,9L,12,16,18V | 660 | 600 | 24.5 | 9.5 | 3960-11880 |
| Sulzer ZA40S | 400 | 560 | 4 | 6,8,9L,12,14,16,18V | 750 | 510 | 25.1 | 9.5 | 4500-13500 |
| Wartsila 46/46GD | 460 | 580 | 4 | 6,8,9L,12,16,18V | 905-1050 | 450-514 | 21.9-26.1 | 8.7-9.9 | 5430-18900 |
| Sulzer RTA60C | 600 | 2250 | 2 | 5,6,7,8L | 1650-2360 | 91-114 | 19.5 | 8.5 | 8250-18800 |
| Wartsila 64 | 640 | 770-900 | 4 | 6,7,8,9L,12,16,18V | 1940-2010 | 327.3-428 | 22-25.5 | 9.8-11 | 12060-34920 |
| Sulzer RTA48T-B | 480 | 2000 | 2 | 5,6,7,8L | 1020-1455 | 102-127 | 19 | 8.5 | 5100-11640 |
| Sulzer RTA52U-B | 520 | 1800 | 2 | 5,6,7,8L | 1120-1600 | 110-137 | 18.3 | 8.2 | 5600-12800 |
| Sulzer RTA58T-B | 580 | 2416 | 2 | 5,6,7,8L | 1490-2125 | 84-105 | 19 | 8.5 | 7450-17000 |
| Sulzer RTA62U-B | 620 | 2150 | 2 | 5,6,7,8L | 1600-2285 | 92-115 | 18.4 | 8.2 | 8000-18280 |
| Sulzer RTA68T-B | 680 | 2720 | 2 | 5,6,7,8L | 2060-2940 | 75-94 | 19 | 8.5 | 10300-23520 |
| Sulzer RTA72U-B | 720 | 2500 | 2 | 5,6,7,8L | 2155-3080 | 79-99 | 18.3 | 8.3 | 10775-24640 |
| Sulzer ZA40S | 400 | 560 | 4 | 6,8,9L,12,14,16,18V | 750 | 510 | 25.1 | 9.5 | 4500-13500 |
| Sulzer RTA84T-D | 840 | 3150 | 2 | 5,6,7,8,9L | 2870-4100 | 61-76 | 18.5 | 8 | 14340-36900 |
| Sulzer RTA84C | 840 | 2400 | 2 | 4-12L | 2800-4050 | 82-102 | 17.9 | 8.2 | 11360-48600 |
| Sulzer RTA96C | 960 | 2500 | 2 | 6-12L | 3840-5490 | 90-100 | 18.2 | 8.3 | 23040-65880 |

Westerbeke Corporation

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Email: wrbk@aol.com, Website: http://www.westerbeke.com

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl# L/V | kw/cyl | RPM | BMEP | Mean Piston Speed | Output Range |
|-----------|-----------|-------------|-------|----------|--------|------|------|-------------------|--------------|
| 108C Six | 91.9 | 101.6 | | 6L | | 3600 | | | 80 |
| 90A Four | 100.1 | 110 | | 4L | | 3600 | | | 67 |
| 82B Four | 95 | 105 | | 4L | | 3600 | | | 61 |
| 71C Four | 88.9 | 101.6 | | 4L | | 3600 | | | 52 |
| 63C Four | 88.9 | 89.1 | | 4L | | 3600 | | | 47 |
| 55A Four | 86 | 94 | | 4L | | 3600 | | | 41 |
| 42B Four | 78 | 78 | | 4L | | 3600 | | | 31 |
| 38B Four | 73 | 78 | | 4L | | 3600 | | | 28 |
| 35B Three | 78 | 78 | | 3L | | 3600 | | | 24 |
| 30B Three | 76 | 70 | | 3L | | 3600 | | | 20 |
| 20B Two | 76 | 70 | | 2L | | 3600 | | | 13 |
| 12C Two | 76 | 70 | | 2L | | 3000 | | | 9 |
| M-50B | 80 | 92.4 | | 4L | | 2800 | | | 31 |
| M-35B | 76 | 73.6 | | 4L | | 3000 | | | 26 |
| M-25XPB | 76 | 73.6 | | 3L | | 3000 | | | 19 |
| M3-20B | 67 | 68 | | 3L | | 3600 | | | 15 |

Caterpillar

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Fax: 309-578-2559
Email: cat_power@cat.com
Website: http://www.cat-engines.com

| Model | Bore (mm) | Stroke (mm) | Cycle | Cyl # L/V | kw/Cyl. | RPM | Piston (m/sec) | Output (kW) |
|---------|-----------|-------------|-------|-----------|-----------|-----------|----------------|-------------|
| 3126TA | 110 | 127 | 4 | 6L | 37.3-52.2 | 2800 | 11.85 | 224-313 |
| 3196 | 130 | 150 | 4 | 6L | 42.2-82.0 | 1800-2300 | 9-11.50 | 253-492 |
| 3208T | 114 | 127 | 4 | 8V | 14.0-19.6 | 2400-2800 | 10.16-11.85 | 112-157 |
| 3208TA | 114 | 127 | 4 | 8V | 21.9-42.0 | 2400-2800 | 10.16-11.85 | 175-336 |
| 3304NA | 121 | 152 | 4 | 4L | 15.8-18.8 | 2000-2200 | 10.1-11.1 | 63-75 |
| 3304T | 121 | 152 | 4 | 4L | 23.3-35.5 | 2000-2200 | 10.10-11.1 | 93-123 |
| 3306BTA | 121 | 152 | 4 | 6L | 26.7-44.2 | 2000-2200 | 10.10-11.1 | 160-265 |
| 3176C | 125 | 140 | 4 | 6 L L | 74.7 | 2300 | | 448 |
| 3406E | 137 | 165 | 4 | 6L | 56.0-99.5 | 1800-2300 | 9.90-12.6 | 336-597 |
| 3406CTA | 137 | 165 | 4 | 6L | 31.0-72.2 | 1350-2100 | 7.43-11.5 | 186-433 |
| 3408CTA | 137 | 152 | 4 | 8V | 37.5-50.4 | 1250-2100 | 6.30-10.6 | 300-403 |
| 3412CTA | 137 | 152 | 4 | 12V | 37.3-62.2 | 1800-2100 | 9.12-10.64 | 375-746 |
| 3412E | 137 | 152 | 4 | 12V | 31.3-87 | 1800-2300 | 9.12-11.6 | 375-1044 |
| 3508B | 170 | 190 | 4 | 8V | 72.3-140 | 1200-1925 | 7.60-12.2 | 578-1119 |
| 3512B | 170 | 190 | 4 | 12V | 68.3-140 | 1200-1925 | 7.60-12.2 | 820-1678 |
| 3516B | 170 | 190 | 4 | 16V | 76.9-140 | 1200-1925 | 7.60-12.2 | 1231-2238 |
| 3606TA | 280 | 300 | 4 | 6L | 288-338 | 900-1000 | 9-10 | 1730-2030 |
| 3608TA | 280 | 300 | 4 | 8L | 288-339 | 900-1000 | 9-10 | 2300-2710 |
| 3612TA | 280 | 300 | 4 | 12V | 288-354 | 900-1000 | 9-10 | 3460-4250 |
| 3616TA | 280 | 300 | 4 | 16V | 288-386 | 900-1000 | 9-10 | 4600-6175 |
| 3618TA | 280 | 300 | 4 | 18V | 400 | 1050 | 10.5 | 7200 |

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Circle 306 on Reader Service Card

Marine Diesel Annual

(Continued from page 51)

propulsion power systems from a single source, integrating all aspects of propulsion and maneuvering systems from the engine, through the gear box to the ship's propellers and controls.

The global commercial shipbuilding market is expected to grow significantly over the next decade. In the face of com-

petitive pressures, environmental regulations and greater complexity in ship design, shipowners and shipbuilders are now seeking to outsource substantial elements of ship construction, including marine propulsion power systems, to suppliers. Under the co-operation agreement, Wartsila NSD, with 560 marine support people worldwide, will act as prime contractor to shipyards for total

marine propulsion power systems. It will provide diesel engine based prime movers and gearboxes while John Crane-Lips will supply on-board propulsion and sealing systems. Using innovative and advanced technology, the co-operation agreement addresses the entire commercial marine market, from fishing vessels and tug boats to cruise ships and VLCC's, as well as defense

markets, and should provide significant growth opportunities for both companies. Both Wartsila NSD and John Crane-Lips retain the right to market their own product ranges independently.

Wärtsilä NSD Helps Powers Greek Ferry Revolution

In the past two years, Wartsila NSD has sold medium-speed diesel engines to the value of more than \$220 million for ferries, RoRo vessels, cruise ships and other vessels contracted by Greek owners. These involve a total of 103 main diesel engines having an aggregate power of 1.13 million kW.

Most of these newbuildings are ferries for upgrading domestic services to the Greek islands and for providing greater capacities on the Adriatic services. A recent order is for the engines to be installed in the pair of 30,000 grt ferries contracted by Attica Enterprises at the German shipyard Flender Werft. Due for delivery early in 2002, these ferries will each be powered by four Wartsila 12V46C engines of 48,000 kW output for a service speed of 28.5 knots.

Circle 194 on Reader Service Card

Maxim: Keeping It Quiet

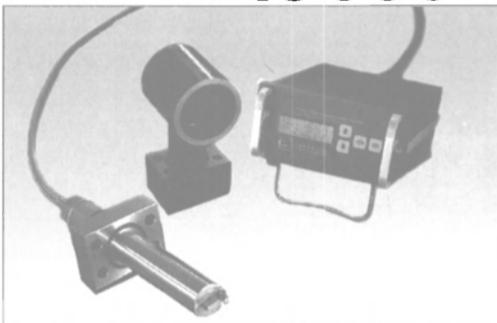
As a pioneer in the field of engine exhaust silencing and with more than 100 years of experience, MAXIM products, manufactured by Beard Industries in Shreveport, La., has earned its place in the silencer industry. A complete line of silencers is available for noise control of both dry or wet engine exhausts, high pressure gas vents, compressor and blower silencers, ASME Code designs for pressure service, waste heat recovery, and catalytic units. Many stock and standard design silencer models are available but one of MAXIM's strong points is its ability to custom design a silencer to meet a specific design requirement.

Circle 195 on Reader Service Card

ALSTOM Supplies Propulsion Systems For New Cruise Ships

ALSTOM Power Conversion has been selected by Princess Cruises and Nagasaki Shipyard & Machinery Works, Mitsubishi Heavy Industries, Ltd. to supply electric propulsion systems for two Grand Class cruise ships. Each ship will be equipped with two ALSTOM's electric motors each with a rated power of 20,000 kW/145 rpm. ALSTOM is also to supply the main and auxiliary generators, the 11 kV main switchboard, the induction motors for thrusters and compressors and all the Synchrodrive and control units dedicated to the electric propulsion.

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Hanging fire hose box features stainless steel hardware, nylon webbing, decals included. Two standard sizes (21"x24"x7" pictured, and 25"x28"x7"). Fire suit boxes also available.

PORT HOLE CASING

Fiberglass hull insert for ready-made application. Available in any size (24" x 24" x 7" pictured).



PERSONAL EFFECTS TRAY

Molded tray for crews quarters, heads and showers. Available in any size (11" x 5-1/4" x 4-1/2" pictured).

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Marine Literature Review

Fuel Tek Marine Cal 5

Fuel Tek Marine Cal 5 is a multifunctional fuel conditioner designed to address fuel storage and handling problems. It creates an environment that is unsuitable for the formation and growth of fungi, algae, and bacteria in fuel systems. It also increases power and performance, eliminates soot in the exhaust stream, lubricates the fuel system, extends filter life, disperses water, dissolves sludge, protects the "O" rings, prevents tank-side corrosion and removes varnish and deposits from injectors. **Circle 100**



ARL 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 3D product model, minimizing re-work, improving product quality and therefore helping to save money, because the job is done right the first time. **Circle 101**



King Engineering LevelPRO

LevelPro multiple tank processor provides continuous monitoring of liquid levels in cargo or service tanks. The processor accepts up to 8 transmitter inputs (4-20 mA), supplies 24Vdc excitation, overload protection and multidrop network connectivity up to 256 inputs. Operator interface panel permits direct entry of density values, supervisory password protection, manual and automatic scanning display modes. An alphanumeric LCD panel provides a 10-character tank identification and 8-digit display resolution of weight, volume or depth. Dual RS-485 communications ports can be configured for different protocols so the LevelPRO processor can be simultaneously linked to different data networks. **Circle 102**



Webtec Digital Hydraulic Testers

Over 15 models are available for hydraulic fluid ranging from 0.03 to 350 GPM at pressures to 7000 PSI. Easy to read chart provides technical information, model numbers as well as flow, pressure and porting information. Describes features such as bidirectional loading valve, linearized flow reading accuracy of +/-1% of indicated reading, pressure gauge and remote inputs. Products selector matrix helps guide users in selecting hydraulic test equipment for specific applications. **Circle 103**



Enercon Engineering Inc.

Enercon Engineering Inc. has served the needs of the power industry since 1975. We are a listed manufacturer for engine generators controls and switchgear under UL 891 and



UL 1558. System designs are available 50/60 HZ applications up to 15 kV. Also available are engine generator assembly, packaging and testing services. Currently our control systems are operating in over 60 countries worldwide. These systems range from single unit generator mounted controls to multiple unit automatic paralleling systems using state-of-the-art computerized controls with remote monitoring and control capabilities. **Circle 104**

JAN VERHAAR OMEGA THRUSTERS, The Netherlands

Jan Verhaar builds reliable, long-life Omega bow and stern thrusters. With a thrust direction that's adjustable over 360°, Omega thrusters will keep any ship on the right course. They're the ideal complement to a Bollard Pull DP system of 24.9 LBF/kW. The thrusters' extremely compact size allows their installation in even the smallest room. The

state-of-the-art Omega thrusters are available with power ratings ranging from 150 to 1500 kW. **Circle 105**



Washington Aluminum Company

The Washington Aluminium Company has supplied thousands of accommodation ladders and gangways on Naval and commercial ves-



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Marine Literature Review



sels since 1942. WACO is also the leading manufacturer of vertical and inclined ladders including replacement treads and tread caps. For deck grating, battens and all custom fabricated marine products in aluminium and steel, contact Washington Aluminum. **Circle 106**

Hand Cast bronze ship bells



Custom cast bells with any lettering cast around the outside rim. Commemorate a ship or special event such as a retirement, officer or reunion with an heirloom bronze bell. <http://www.bronzebells.com>. USCG compliant. **Circle 107**

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Tampa Bay Shipbuilding & Repair Co.



Tampa Bay Shipbuilding & Repair Company is a full-service conversion, and repair facility located in the protected harbors Tampa, Florida. With easy access from the Gulf of Mexico, and being the largest, most complete

shipyard between Pascagoula, Mississippi, and Hampton, Roads, Virginia. Tampa Bay Shipbuilding & Repair Company is your only choice for vessels up to 907 ft (276.4m) in length and 15 ft (45.7m) in width at keel block. **Circle 109**

Surface Preparation for Marine Applications

NLB Corp.'s latest brochure demonstrates high-pressure and ultra-high pressure water jetting for marine surface preparation applications. NLB's new HydroPrep™ quickly removes coatings, rust and other tough adherents from hulls. NLB's ship bottom cleaner, VORTEX™ floor and deck cleaners and other popular accessories are also highlighted. NLB Corp., 877-NLB-7990 or www.NLBcorp.com. **Circle 110**

Silex Co.

At Silex, we design and manufacture noise control products for various markets including marine and power generation. Our products include both standard and custom silencers manufactured from aluminized, carbon or stainless steel as well as other products such as connectors, exhaust accessories, insulation blankets, emission control, vibration isolation, UL Fuel subsystems and acoustic enclosures. Silex- your exhaust system specialist. **Circle 111**



The Sea Switch by Electronic Marine Systems

This overflow, level sensor with Self-Test and no moving parts is constructed of Stainless steel and mates to a standard 4" Butterworth flange. It is waterproof and yet can be replaced by the tankerman in less than a minute without venting to the atmosphere. It comes complete with intrinsically safe barriers and on deck weatherproof LCD display, which names the tank in alarm. The Sea Switch also comes with complete Mil Spec Self-Diagnostics. **Circle 112**



The Gauger by Electronic Marine Systems

This closed tank gauging system designed, specifically for military and shipboard application, is constructed of all Teflon and stainless steel. The simple installation requires no standpipes or in-tank structures. This system comes complete with single line LCD and Graphic Display options available for on deck viewing in one glance. If any tank changes ullage 1% while underway, the sea Mode Alarms are in place for leak detection, giving the user a 1/10th inch level accuracy. **Circle 113**



Machine Tool Components

Wedin supports on ship board machine shops and ship builder operations. Included in the catalog is information on the machine tool components needed to keep your machines up and running: Ballscrews to Acme Screws, Nuts to Gears, Shafts to Splines. Wedin offers design and engineering services along with a 24 hour ballscrew repair service. **Circle 114**



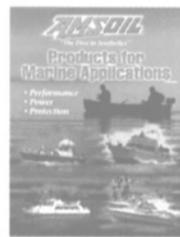
Aquamist Fire Protection Technology

The Grinnell Aquamist Marine System is a low-pressure automatic wet pipe system that can penetrate fires, absorb heat, strip room smoke, cool room gases, etc. Grinnell designs, engineers, manufactures, install, inspect and service fire alarm detection equipment, sprinklers and special hazards equipment. Visit their website: Grinnelfire.com **Circle 115**



Synthetic Lubricants

AMSOIL'S new Products for Marine Application Catalog contains information about AMSOIL products specifically designed for Marine operating conditions. These include Synthetic engine oils, Engine Oil By-Pass Filters, Engine Oil flow filters, Coolant, Gear Lubricant as well as products designed specially for Diesel Marine Crafts, Inboard Gasoline-powered Craft, four-cycle outboard crafts, two cycle outboard engines and Marine Trailers. **Circle 116**



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Navy Boats

Halter Responds To Venezuelan Navy Needs

Halter Marine has answered the call from the Venezuelan Navy for a variety of patrol boats. The company recently delivered four 80 ft. (24.3 m) boats to the country's government, which completes the contract for the design and construction of 12 total vessels in this size range.

Main Particulars

Flag Venezuelan
 Length 80 ft. (24.3 m)
 Breadth, (molded) 18 ft. (5.4 m)
 Displacement 48 LT
 Draft 6 ft. (1.8 m)
 Speed, service 26 knots
 Bunker fuel capacity 2,500 gallons
 Main engines Detroit Diesel
 Generator engines Perkins
 Generators Marathon
 Motor starters Square D
 Reduction gears/Nigata/Detroit Diesel
 Engine controls Morse
 Steering controls Orbital hydraulic
 Shafting Aquamet
 VHF radio Harris
 Radar Raytheon
 Compass Ritchie magnetic;
 Litton Sperry gyrocompass
 GPS Garmin
 Davits Nautical Structures

Designed for high speed operations in coastal and riverine environments, the vessels will be used for a variety of patrolling efforts in Venezuelan territorial waters, specifically to counter illegal drug traffic, provide search and rescue assistance, and disaster relief.

Powered by a pair of Detroit Diesel marine engines, the vessels will have a range of 1,000 nm

and a maximum speed of 25 knots.

Halter also supplied the last two 54 ft. (16.4 m) patrol boats for the Venezuelan National Guard. This particular contract called for the design and construction of 10 vessels, all of which are propelled by two MTU marine diesel engines with a maximum speed of 36 knots.

Circle 183 on Reader Service Card

Halter Marine's 80 ft. (24.3 m) patrol boat for the Venezuelan government.



Halter's patrol boat for the Venezuelan government was also constructed as a 54 ft. (16.4 m) version.

Bollinger-Built Tornado Kicks Up A Storm

Bollinger Shipyards of Lockport, La. launched the USS Tornado, the U.S. Navy's newest Patrol Coast Ship. The 14th member of the Cyclone Class to be built by Bollinger under a sole-source contract with the Navy, it is the first to include design modifications, equipment and armament upgrades as part of the Navy's Pre-Planned Product Improvement.

The vessel is modeled after the successful Vosper Thornycroft Ramadan class design, modified to meet Navy requirements, which entail change in the stern - including a ramp for the launching and recovery - while underway — of naval special warfare boats. Throughout its design/construction process, Tornado was extended from 170 - 179 ft. (51.8 - 54.5 m) and adjusted to decrease its susceptibility to radar detection by reducing its signature.

Featuring a new, fully integrated bridge command and control system to increase its capabilities, Tornado houses a satellite navigation system, forward looking infrared and surface radar with collision avoidance capabilities. Communications encompass Navy standard interior and external voice communications systems.



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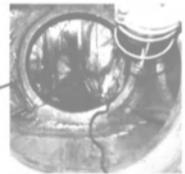
Stitching restores a hard to replace pump manifold.



Plating a worn lofting cylinder on an ore carrier.



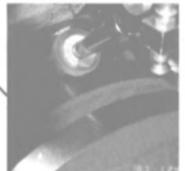
Stitching approximately 100 in. of crack on a ship's propeller hub.



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Also included is an impressive weapons suite, as well as hull and main decks — as on all Bollinger-

built Cyclone Class patrol boats — made of steel and aluminum superstructures. Measuring 179 ft. (54.5 m), with a beam of 26 ft. (7.9 m) and a draft of less than eight ft. (2.4 m), Tornado is fully operational through Sea Sate 3. Power is provided by four Paxman diesel engines developing a total of 13,400-hp, driving four, 42-in. diameter propellers through Reintjes reverse/reduction gears. Electrical power is supplied by two 150 kW Caterpillar generators. Holding a fuel capacity of 15,000 gallons, and 1,200 gallons of potable water produced by three water makers, Tornado's continuous speed is above 35 knots.

Circle 184 on Reader Service Card

Chevron And Mitsui Award Kawasaki

Through a joint venture company, Chevron Corp. and Mitsui & Co. have awarded Kawasaki Heavy Industries with a contract for the construction of two 82,200 cu.m. Liquefied Petroleum Gas (LPG) carriers, with delivery expected during the last quarters of 2001 and 2002, respectively. Financial details of the contract were not disclosed. The vessels will be designated on a long-term charter to Dynergy Global Liquids, and operated by Chevron. They are expected to enhance Dynergy's ability to move large volumes of LPG at competitive market rates. With a laden speed of 17 knots, the vessels will transport volumes of propane and butane to global markets, as well as being able to trade to eastern and western hemisphere markets.

Circle 12 on Reader Service Card

Litton To Supply For Car Carriers

Litton Marine has been tapped to supply navigation, communication, control and stabilization systems for a trio of new car carriers under construction in Japan. The three 21,000-grt feeder-type car carriers - Hulls 1184-1186 - are being constructed for UECC (Norway) at Tsuneishi Shipbuilding for delivery in 2000 and 2001. Each will be equipped with a complete Integrated Bridge System (IBS) and Voyage Management System (VMS), as well as Electronic Chart Display and Information System (ECDIS), with separate navigation, planning and conning stations. Litton's package also includes X-band and S-band BridgeMaster E ARPA radars, gyrocompasses, autopilot and steering systems.

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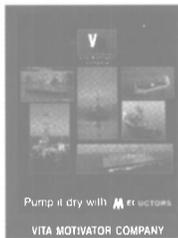
Wärtsilä To Outfit Costa Classica

Wartsila NSD has received a contract for additional diesel engines from Italian cruise ship owner Costa Crociere to outfit its ship Costa Classica with six more Sulzer diesel engines for increased propulsion power and shipboard electrical supplies. Cammell Laird will perform the modification of the 1991-built Costa Classica this fall for a March 2001 completion. The vessel will be extended by 147 ft. (44.8 m) to 871 ft. (265.4 m) overall, in addition to a new full-length superstructure deck. Passenger occupancy will expand from 1,308 to 2,020 persons, and the gross tonnage will go from 52,950 to 78,000. The vessel's propulsion plant is being extended for an increased service speed of 21 knots in spite of increased ship's length. Power for the thruster and shipboard electrical services will be provided by six Sulzer engines with a combined output of 27,000 kW.

Maritime Reporter/Engineering News

Marine Literature Review

(continued from page 56)

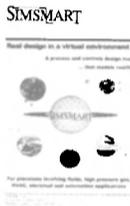


Pump it Dry with VM Eductors

The new Vita Motivator Company Catalog includes information on their complete line of products designed to keep your boat dry. Permanent and portable eductors give you the ability to pump areas dry, including liquids from cargo spaces, bilges, ballast, tanks and decks. **Circle 118**

SIMSMART

SIMSMART... The Virtual Engineer is a product line that will enable industries to design visualize, test drive and optimize the reality of fluids, gas, HVAC and electrical processes prior to large scale expenditures. It also assists in operation problems analysis and diagnostics. The SIMSMART family of productivity tools are utilized by engineers to design stimulate, build, and refine new and existing processes. **Circle 119**



Spill Watch from Applied MicroSystems LTD.

Spill Watch, designed by the US Navy is an innovative monitoring system for the detection of spilled petroleum products. The upward looking design detects sheen as well as emulsion layers below the surface day and night, in all weather conditions. A multiple wavelength fluorometer allows for product type classification. Data can be hardwired or telemetered to a base station where powerful spill view software differentiates between background levels and petroleum spills and telephone authorities from a phone list database in the event of an alarm condition. **Circle 120**



Breakthrough in Viscosity Measuring Technology

New four-color brochure describes the Brookfield Model TT-100 in line Viscometer. The TT-100 rotational viscometer measures velocity continuously in the product stream of a fully flooded system under pressure. The instrument's unique torque tube design enables it to discriminate minute changes in viscosity that is compatible with standard industrial control and measurement instrumentation. **Circle 121**



Gaylord Industries, Inc. — Galley Exhaust Hoods

Gaylord is the first choice in galley ventilation. From offshore drilling rigs to cruise ships, Gaylord offers a complete line of high efficiency water-wash extract hoods, with built-in fore protection, to meet your galley needs. We offer complete design and engineering service with worldwide sales and manufacturing to serve the ever-growing Maritime Industry. **Circle 122**



Aurand

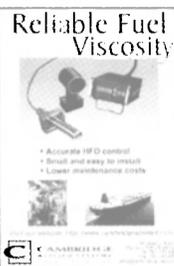
Aurand introduces "Certifi-Clean," a new generation of time money and work saving tools that literally "peel" almost any accumulation from any hard surface. Here is the power of sandblasting in a compact, hand-held tool that can be used wherever iron, steel, brick or concrete need to be prepped prior to painting or refinishing. **Circle 123**



Bug-O-Systems

Since 1948 Bug-O-Systems has been manufacturing high quality, affordable automated welding and cutting systems for hand held tools. Our systems are versatile as well as easy to set up an use. Operations such as

grinding, touch up material handling, distortion and operator fatigue are virtually eliminated. These are a few reasons why automating hand held tools can increase the production and the quality of your product while saving you money. **Circle 124**



Cambridge Applied Systems

Cambridge Applied Systems manufactures patented electromagnetic viscosity management systems for "In-line" and bench top/ laboratory use. Applications include accurate Heavy Fuel Oil viscosity control and reliable Condition Based Maintenance monitoring of diesel, turbine and compressor lubricants. **Circle 125**

Dayton T. Brown

The Dayton T. Brown Engineering and Test division is one of the most complete, Independent engineering and testing facilities in the United States, Providing objective and independent test and commercial companies, as well as defense and government entities, Dayton T. Brown tests include some of the following: Hammer Shock, Vibration EMI/EMC, Climatics, Inclination, Ship-board Power and Noise. **Circle 126**



Desmond-Stephan

The amazing Swirl-Off Tool — The new Swirl off tool from Desmond Stephan Mfg., scours surfaces rapidly to remove paint, rust, barnacles, graffiti, and other hard coatings. The rotary tool attaches to portable grinders, sanders drills or polishers. Swirl Off reduces the time and effort needed to clean and refinish almost any floor, wall or other structure. **Circle 127**



Harbormaster

Harbormaster Marine Inc. (HMI) is a United States Manufacturer of Heavy Duty Outboard Drive Marine Propulsion systems and Tunnel (Bow) Thrusters. Think of HARBOR MASTER products as durable and high quality. Visualize tapered roller bearing, special seals pressurized oil for lubrication and cooling, SAE 4140 steel shafting, precisely engineered shim sets, bronze components, and other premium features. **Circle 128**

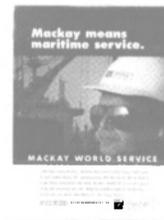


Jamestown Metal Marine

Jamestown has provided quality products and services on thousands of vessel, both naval and commercial. From complex turnkey packages to the smallest detail, Jamestown has the experience and capability to design, supply and install complete joiner systems. **Circle 129**

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When it comes to one-stop marine and offshore communications capabilities, the name to know is Mackay. A turnkey provider of marine equipment, service and airtime, Mackay understands your needs start to finish. We deliver timely cost efficient solutions from commercial ships to the oil patch, and from sea to land. Mackay can help you select the right equipment and design the service package and technical assistance program that best meets your needs. **Circle 130**



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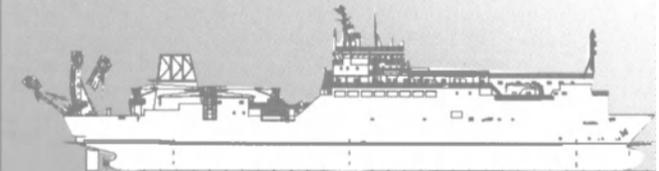
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Marine Literature Review



Omnithrusters

For 25 years, Omnithruster has been a world leader in the development of waterjet maneuvering systems. Our unique patented designs, which provide diverse maneuverability and auxiliary propulsion, have been the installation choice on vessels worldwide. An omnithruster produces thrust continuously... with nozzles in or out of the water... in rough seas... in strong currents... while pitching, yawning, rolling or heaving. An Omnithruster can even produce thrust while a vessel is underway at several knots, a condition in which conventional propeller thrusters are subject to cavitations and do not produce thrust, if at all.

Circle 133

Owens Kleen Tank

Marine Waste Water Treatment Systems - The Owen's Kleen Tank uses aeration and operates as an extended biological aeration system. It is self contained and delivered to a site ready for operation when site electrical and mechanical connections are in place. The Kleen Tank can be

designed for small, hard to fit areas and have a capacity from 33 GDP to thousands of gallons per day. **Circle 134**

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. **Circle 138**

Thordon Bearings — Proven Bearings System Solution

Thordon Bearings, a pioneer in the development of pollution free bearing designs offer a choice of sealed or open, water lubricated propeller shaft bearing systems. The Thor-Lube sealed stem tube system combines proven XL bearings with Thor Lube, a water soluble, non-polluting

lubricant. Thordon's open water lubricated system choices are COMPAC, XL and composite; each offering specific advantages in different water environments. **Circle 139**

USMMA Global Maritime and Transportation School

The primary mission of the USMMA Global Maritime and Transportation School is to offer leading -edge education and training programs that will benefit professionals from the maritime and transportation industry (private-sector, military and government). Through its education and training initiatives, the USMMA GMATS is dedicated to optimizing America's economic and strategic intermodal transportation system and its global transportation interest. **Circle 140**

American Bureau of Shipping

ABS comprises three operating divisions: ABS Europe, ABS Pacific, and ABS Americas with divisional headquarters in London, Singapore and Houston, respectively. The corporate office also located in Houston. This divisional arrangement allows decisions to be made at a local level, providing for quick response to industry needs. Each division is staffed with a complete complement of administrative, technical and operational personnel able to provide the full range of classification services. ABS, the classification society, has several affiliates, which operate under ABS Group of Companies, Inc. They provide verification, certification, training, risk and reliability services to land and marine based industries worldwide. **Circle 141**

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A marine industry breakthrough ILSmart.com lets you buy and sell parts, equipment and services easily and quickly --- directly on the Internet. Powerful searches and innovative communications, including company directories, e-mail, fax capabilities and web links, will help keep your business sailing along. Log on today and find out more --- www.ILSmart.com. ILS (Inventory Locator Service, Inc.) 3965 Mendenhall Road, Memphis, TN 38115; tel: 901-794-5000; fax: 901-794-1760 or **Circle 142**

Seven Seas Communications

Seven Seas Communications offers a complete portfolio of land mobile communications equipment and services. Wherever you are, Seven Seas offers solutions to meet your communications needs. Its global customer base includes some of the world's largest oil, mining and construction companies as well as international travelers. **Circle No. 143**

Gibbs & Cox

Gibbs & Cox, a leader among the world's naval and marine engineers, provides design and engineering services for government and

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SUPERBOLT

Revised SUPERBOLT catalog contains technical information on mechanical stud/bolt tensioners and an updated Installation/Removal procedure designed to decrease installation and removal times. Multi-Jackbolt tensioners require only hand torque wrenches to tension bolts tighter than any other method. They eliminate the need for hydraulic wrenches, sledgehammers and heating methods commonly used. This makes bolting safer and more economical than ordinary means. **Circle 145**

Jastram Steering Gear

Jastram Model S steering cylinders are specifically designated for commercial marine hydraulic steering service under the ABS-Type Approval Program. They are most frequently installed on commercial workboats, large passenger vessels, supply vessels, tankers and icebreakers, and can be used in either new steering system applications or in retrofit and repair programs. **Circle 146**

Raytheon — Integrated Bridge System BridgeControl

The modern, flexible design can be used for all ship's bridges and all conceivable operating requirements. The user-friendly technology designed for One Man required extensive testing for many of these whistles and the accessories supplied with them, which have proven the exceptional qualities of Kahlenberg design and manufacturing. **Circle 147**

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Damen Shipyards

Damen Shipyards has developed into a leading, internationally operating enterprise in the fields of new building and repair of ships as well as maritime services. It is committed to the design and newbuilding of a wide range of tugs, workboats and other specialized vessels in a power range of up to 15,000 h.p. and cargo vessels with a deadweight of 2,000 tons - 10,000 tons. **Circle 149**

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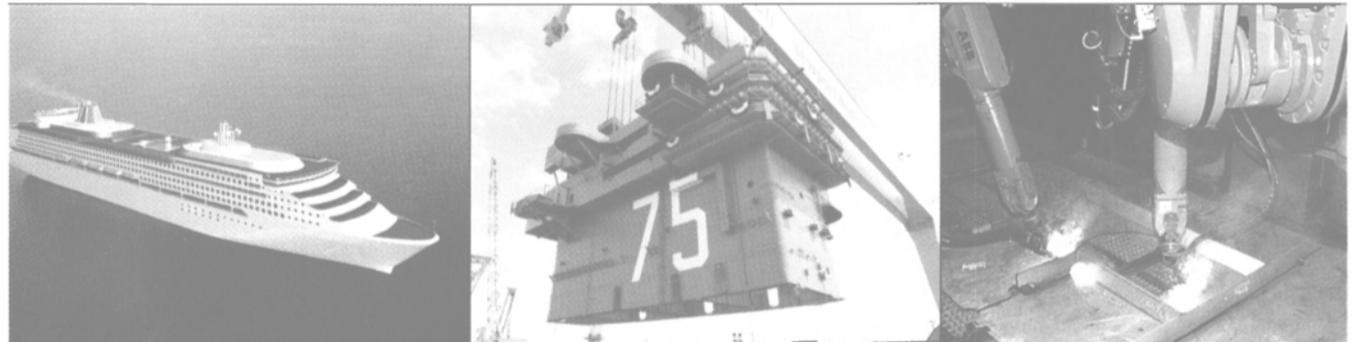
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FCS, Inc., 22 Main Street, Centerbrook, CT 06409
Icon Research, 8 Market Street, Ellesmere, Shropshire SY12 0AN, England
Hermont Marine Inc., 3528 Griffith, St. Laurent, Quebec, Canada
DIESEL ENGINE - Spare Parts & Repair
Scardana Americas Bkg., 502 Empire St., Greefield Park, J4V1V7 Canada
Brigantine Services Ltd., 48 Wang Lok St., Yuen Long
Hermont Marine Inc., 3528 Griffith, St. Laurent, Quebec, Canada
Industrial Estate, New Territories, HONG KONG

DIESEL ENGINE - Spare Parts & Repair

Caterpillar, Inc., Engine Div., P.O. Box 610, Mossville, IL 61552-0610
Castoldi S.p.A., Viale Mazzini, 161, 20081, Abbadiategrasso, ITALY
Cummins Engine Co., 4500 Leeds Ave., Ste. 301, Charleston, SC 29405-8521
Cummins Mid-South, Inc., 110 E. Airline Highway, Kenner, LA 70062
John Deere, John Deere Rd., Moline, IL 61265
Deutz Canada Inc., 4420 Garand St., Montreal, Que. H4R 2A3
Goltens - New York Corp., 160 Van Brunt St., Brooklyn, NY 11231
Governor Control Systems, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315
Kawasaki Heavy Industries, Ltd., Tokyo Head Office, World Trade Center Bldg., 4-1 Hamamatsu-cho 2-chome, Minato ku, Tokyo 105-6116 Japan
MAN B&W Diesel AG, Stadthofstrasse 1, D-86153 Augsburg 1, GERMANY
Centofanti Marine Systems, Inc., P.O. Box 660, West Elizabeth, PA 15088-0660
MAN B&W Diesel A/S, Teglhøjsgade 41, DK-2450 Copenhagen SV, DENMARK
MAN B&W Diesel, 17 State St., New York, NY 10004
Mariso USA, Inc., 100 Davidson Ave., Somerset, NJ 08873
Motor Service AB, Box 2115, S-144 04 Ronninge, SWEDEN
Motor Service-Hugo Stamp, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315
Paxman Diesels, P.O. Box 8, Paxman Works, Colchester, Essex, CO1 2HW, ENGLAND
Ulslein Bergen AS, PO Box 924, N5002 Bergen, NORWAY
Wartsila Diesel, 201 Defense Highway, Annapolis, MD 21401
CMB Cummins Engine Co., 500 Jackson St., Cornubus, IN 47202
FM / Alco 701 Lawton Ave., Beloit, WI 53511
Kiene Diesel, 325 South Fairbanks, Addison, IL 60101
H.P. International, Inc., 3812 W. Linebaugh Ave., Tampa, FL 33624
Anglo Belgian Corp., 9958 N. Alpine Rd., Machesney Park, IL 6115
Powerhouse Diesel, 5505 Broadway, American Canyon, CA 94589

DIESEL ENGINE OVERHAUL

Goltens - NY Corp., 160 Van Brunt St., Brooklyn, NY 11231

DIESEL FUEL DECONTAMINATION

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

DIVING & SALVAGE

Coast Diving Services, Inc. 793 B Mira Flores, San Pedro CA 90733
Bisso Marine Co., P.O. Box 4113, New Orleans, LA 70178
H.J. Merrhue, P.O. Box 23123, New Orleans LA 70183
JW Fishers, 65 Anthony St., Berkley, MA 02279
Muldron Marine Services, Inc., P.O. Box 3221, Terminal Island, CA 90731
DOCK FENDERING SYSTEMS
Plastic Piling Inc., 1485 South Willow Ave., Rialto, CA 92376
Urethane Products Corp., 17007 South Broadway, Gardena, CA 90248

DOORS - MARINE & INDUSTRIAL

Branton Inc., 1101 Edwards Ave., Jefferson, LA 70181
Mapeco, Inc., 90 Forest Ave., Locust Valley, NY 11560
Juniper Intl., 72-15 Metropolitan Ave., Middle Village, NY 11379
Waiz & Krenzer, 91 Willenbrock Rd., Unit B4, Oxford, CT 06478
Manly Marine, PO Box 86788, Vancouver B.C. Canada V7L 4L3
Railway Specialties Corp., 2979 State Rd., P.O. Box 29, Bristol, PA 19007
Beclawat Manufacturing Inc., #2-200 Jamieson Bone Rd., Belleville, Ont. Canada K6N 5T3

DRY DOCKS-Design

Conrad Industries, 1501 Front Street, P.O. Box 790, Morgan City, LA 70381
Crandall Dry Dock Engineers Inc., P.O. Box 505804, Chelsea, MA 02150
Heger Dry Dock Engineers, Inc., 13 Water St., Holliston, MA 01746

EDUCTORS

Vita Moinvator, 566 Parker St., Newark, NJ 07104

ELECTRICAL EQUIPMENT

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

ELECTRONIC INFORMATION SUPPORT

Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolboton, NORWAY

Scientific Manne Svcs., 101 State Pl., Ste. P, Escondido, CA 92029

ELECTRICAL INSTRUMENTS

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

ELECTRICAL MOTOR DRIVES

Tech Power Controls, 10507 Fallstone, Houston, TX 77099

ELECTRONIC CHARTS

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

ELECTRONICS

Azonix Corp., 900 Middlesex Tpke., Bilena, MA 01821

C-MAP, P. O. Box 212, 4371 Egersund Norway

ELEVATORS

Jered Industries Inc., P.O. Box 904, Brunswick, GA 31521

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

EMPLOYMENT

Boat Crews, 1 Seine Court, Suite 309, New Orleans, LA 70114

Marine Jobs Inc., 800 Downtown Blvd., Ste 111, Mobile, AL 36609

Peter D. Juan ESG, 14 Lafayette Court, Greenwich CT 06830

ENGINEERING SERVICES / MARINE ENGS

NKF Engineering, Inc., 4200 Wilson Blvd., Arlington, VA 22203

Maritime Design, 13000 Sawgrass Village Circle, Ponte Vedra Beach, FL 32082

Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029

Vibtech, Inc., Box 435, N. Kingston, RI 02852

ENGINE HEATERS

Kim Hostatn Mfg. P.O. Box 11245, Spokane, WA 99211-0245

ENGINE ROOM LIGHTING/MONITORING & CONTROL SYSTEMS

Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851

Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

G.R. Bowler, 2261 Lake Rd., Ontario, NY 14519

ENGINE ROOM REPLACEMENT PARTS

Mariso USA, Inc., 100 Davidson Ave., Somerset, NJ 08873

ENGINES

GE Marine Engines, 1 Neuman Way, Cincinnati, OH 45215

Fairbanks Morse, 701 White Ave., Beiot, WI 53111

WARTSILA NSD CORPORATION, Box 252 Vassa Finland Fin-65101

EVACUATION SYSTEMS

DBC, 12351 Bndgeport Rd., Richmond, BC Canada

EVAPORATORS

Sasakura Engineering, 7-32 Takeshima, 4-chome, Nishiyodogawa, KY, Osaka555, Japan

Alfa-Laval Separation Inc., 955 Meams Rd., Warminster, PA 18974

EXHAUST GAS CLEANER

Gyro Chemical, P.O. Box 853, Deer Park, TX 77536-0853

EXPANSION JOINTS

Silex Inc., 6659 Ordan Dr., Mississauga, Ontario L5T1K6

Applegate Industrial, 1440 Government Street, Baton Rouge, LA 70802

FAIRING COMPOUND

Phiadelphia Resins, P.O.B. 309, Montgomeryville, PA 18936

FANS - VENTILATORS - BLOWERS

Dry Air Technologies, 313 N. Oak St., Burlington, VA 98233

Jon M. Liss Associates, Inc., 411 Borel Ave., San Mateo, CA 94402

FASTENERS

Jamestown Distributors, P.O. Box 348, Jamestown, RI 02835

Superbolt, P.O. B. 683, Carnegie, PA 15106

FENDERING SYSTEMS/BUOYS - Dock & Vessel

Plastic Piling Inc., 1485 South Willow Ave., Rialto, CA 92376

Kahlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241

Duramax Marine, 16025 Johnson St., P.O. Box 67, Middlefield, OH 44062-0067

Viking Fender Co., 1160 State St., Perth Amboy, NJ 08861

Ultra Poly, Inc., 2926 South Steele St., Tacoma, WA 98409

Urethane Products Corp., 17007 South Broadway, Gardena, CA 90248

Promar, 115 Industrial Blvd., Kearneysville, VA 25430

Schuyler Rubber Co., 16901 Woodred Rd., Woodinville, WA 98072

FILTERS/FILTER SYSTEMS

Boll-Filter Corp., 15 Inft Dr., E. Granby, CT 06026

Luber-Finer, Inc., 200 South 4th St., Abion, FL 62806-1313

G.E.T., Inc., 3135 Golden Avenue, Long Beach, CA 90806

FIN STABILIZERS

Blomh & Voss Industres GmbH, P.O. B. 112289, D-2042

Hamburg 1, GERMANY

U.S.A. Repts. Simplex-Turnar Inc., P.O. B. 675, Tonawanda, NY 14151

FINANCING

Summit Bank, 65 Madison Ave., Morristown Ave., NJ 07960

FIRE & SAFETY PRODUCTS

Brookdale International, 1-8755 Ash St., Vancouver BC, V6P6T3

Fr.Fassmer & Co. D.27804 Beme/Molzen, Germany, IndustriestraBe2

Nautical Safety Products, P.O. Box 590462, Houston, TX 774259

IMSSCO, 2040 Harbor Island Dr., Suite 201A, San Diego, CA 92101

Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807

Grimmel Fire Protection Systems, 835 Sharon Drive, Westlake, OH 44145

NoFire Technologies, 21 Industrial Ave., Upper Saddle River, NJ 07458

Panel Specialists, Inc./Thermax, 3115 Range Rd., Temple, TX 76501

FLANGES

Jesse Engineering, 5225 7th St. E. Tacoma, WA 98424

FLUID HANDLING EQUIPMENT

Graco, Inc., P.O. Box 1441, Minneapolis, MN 55441

FRESH WATER GENERATOR

Sasakura Engineering, 7-32 Takeshima, 4-chome, Nishiyodogawa, KY, Osaka555, Japan

FUEL CONSERVATION

Instruments Computer & Controls, Inc., 70 South Bow Rd., Hooksett, NH 03106

FUEL DECONTAMINATION

Algae X Intl, PO Box 4011, Ft. Myers Beach, FL 33932

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

GALLEY EQUIPMENT

Cospolich Refrigerator Co., 949 Industry Rd., Kenner, LA 70062

Dutchess Baker's Machinery Co., 1101 John Ave., Superior WI 54880

Jamestown, Meta Marine Sales, Inc., 4710 Northwest Second Ave., Boca Raton, FL 33431

Lang Manufacturing, 6500 Merrill Creek Pkwy., Everett, WA 98203

Richard Galleys Supply, PO Drawer 4035, Houma, LA 70361

GANGWAYS, LADDERS

Schoellhorn-Albrecht, 575-105 Rudder Rd., St. Louis, MO 63026

SlipNot Safety Flooring, 2545 Beaufait St., Detroit, MI 48207

Wooster Products Inc., 1000 Spruce St., P.O. Box 896, Wooster, OH 44691

GASKETS/CLEATS

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

GEARS & GEAR REPAIR

Goltens - New York Corp., 160 Van Brunt St., Brooklyn, NY 11231

Haley Marine Gears International, Inc., 2600 N. Concord Belle Chasse, LA 70037

Nico Marine Specialties, 39 Louisiana St., West Vago, LA 70094

The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492

Marine Gears, P.O. Box 689, Greenville, MI 38702

Centofanti Marine Systems, Inc., P.O. Box 660, West Elizabeth, PA 15088-0660

Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227

GENERATOR

Insulnade Recycling B.V., Deccaweg 3, 1042 AT Amsterdam, NETHERLANDS

GMDS

Furuno USA, Inc., 271 Harbor Way, S. San Francisco, CA 94080

Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

GOVERNORS

Governor Control Systems, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315

Motor Services Hugo Stamp, 3190 S.W. Lauderdale, FL 33315

HATCHES AND DOORS

Juniper Intl., 72-15 Metropolitan Ave., Middle Village, NY 11379

Railway Specialties Corp., 2979 State Rd., Bristol, PA 19007

Baer Hatch Co., 16901 Wood-Rd Red, Woodinville, WA 98072

Manly Marine, P.O. Box 86788

HEAT EXCHANGERS

Alfa-Laval Separation Inc., 955 Meams Rd., Warminster, PA 18974

Computube (Briantia Heat Transfer) Ltd., 15-20

Coleshill Industrial Estate, Station Road, Coleshill, Birmingham B46 1UP UK

Crane Heatex, 17 Grandview Ave., West Orange, NJ 07052

Tranter, Inc., P.O. Box 2289, Wchita Falls, TX 76307

HEAT TRANSFER FLUID

Paratherm Corp., 1050 Colwell Rd., Conshohocken, PA 19428

HOISTS

Holly Host Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086

HOIST RINGS

Jergens Inc., 15700 S. Waterloo Rd., Cleveland OH 44110

HORNS/WHISTLES

Archime M

Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Trimble Navigation, 585 North Mary Avenue, P.O. Box 3642, Sunnyvale, CA 94086
Waterway Communications System, Inc. 453 E. Park Pl., Jeffersonville, IN 47130
Offshore Systems International, 5013 Pacific Hwy East, File, WA 98424
Offshore Systems International, 107-930 W. 1st St., Vancouver, BC Canada V7P3N4
Liton Marine Systems, 1070 Seminole Trail, Charlottesville, VA 22901-2591
Magellan Systems Corp., 960 Overland Cr., San Dimas, CA 91773-1742
Icom America, Inc., 2380 116th Ave. NE, Bellevue, WA 98004
KVH Industries, Inc., 110 Enterprise Center, Middletown, R.I. 02842-5268

NOISE & VIBRATION

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

NOZZLES/NOZZLE SYSTEMS

Harrington Metals, 6720 124th Ave., Fenwick, MI 49408

OFFSHORE BUILDINGS

Pinnacle Building, 306 Caldwell Ave., Erath, LA 70533

OIL—Marine—Additives—TESTING

Mobil Oil Corporation, 3225 Galloway Road, Fairfax, VA 22037-0001
Castrol North America, 1500 Valley Rd., Wahne, NJ 07470

OIL TANK CLEANING

Brain Industries Australia, Pty. Ltd., 21 Bearing Rd., Seven Hills, NSW 2147 AUSTRALIA

OIL/WATER SEPARATORS

Sasakura Engineering, 7-32 Takeshima, 4-chome, Nishiyodogawa, KY, Osaka555, Japan
Alfa-Laval Separation, Inc., 955 Meams Rd., Warminster, PA 18974-0556
Alfa-Tec, Inc., 4027 21st Ave. West, Seattle, WA 98199
Bohm & Voss Industrie GmbH, P.O. B. 100720, D-2000 Hamburg 1, GERMANY
Fast Systems, 3240 North Broadway, St. Louis, MO 63147
MGC International, 60 Inip Dr., Inwood NY 11096
Nelsson Industries, Highway 51 West, Stoughton, WI 53589

PAINTS/ANTI-FOULANTS

Jotun Paints Inc., 1401 Severn St., Baltimore MD 21230

PARTS LOCATOR SERVICE

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

PIPE FITTINGS/CUTTINGS/CONNECTING/ SYSTEMS

Jesse Engineering, 5225 7th St. East, Tacoma, WA 98424
Georg Fischer D/SA Pipe Tools Div., 407 Hadley St., Holly, MI 48442
Lokring Corp., 396 Hatch Drive, Foster City, CA 94404
Blucher-Josam, 2501 S. Front Street, Philadelphia, PA 19148

POLLUTION CONTROL PRODUCTS

Enlcon Corporation, 125 Baylis Rd., Melville, NY 11747-3600

PORF DEVELOPMENT

Sasakura Engineering, 7-32 Takeshima, 4-chome, Nishiyodogawa, KY, Osaka555, Japan

RTM Star Center, 2 W.Dixie Hwy., Dania, FL 33004

POWER SUPPLIES

Schaefer, Inc., 200 Butterfield Dr., Ashland, MA 01721

PROPELLERS—Repairs

Kahlenberg Bros, P.O. Box 358, Two Rivers, WI 54241
Byrne Rice & Turner, 1172 Camp St., New Orleans, LA 70130
Holland Roer Propellers, 2273 Batararia Blvd, New Orleans LA, 70072
Rice Propeller, Av Ricos Espinoza No. 88, Col. Benito Juarez, Mazatlan, Sin, Mexico 82180
Proper Pitch, P.O. Box 314, Seyberville, DE 19975

PROMULSION EQUIPMENT

Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
Avondale Industries, Harvey Quick Repair, P.O. Box 116, Harvey, LA 70058
American Air Filter, P.O. Box 35690, Louisville, KY 40432
ABB Drives Inc., P.O. Box 372, Milwaukee, WI 53201-0372
ABB Industry Oy, P.O. Box 185, 00381 Helsinki, FINLAND
ABB TURBOCHARGER, INC., 1460 Livingston Avenue, N. Brunswick, NJ 08902
Aquamaster-Rauma Ltd., Box 220, SF-26101, Rauma, FINLAND
Kamewa America Inc., 106 Park Place, Suite 200, Covington, LA 70433, USA
Kamewa AB, Box 1010, S-68129, Kristinehamn, Sweden
Kamewa Finland Oh, "Aquamaster", Box 220, FIN-26101 Rauma, Finland
Kawasaki Heavy Industries, Ltd., Tokyo Head Office, World Trade Center Bldg., 4-1 Hamamatsu cho 2-chome, Minato-ku, Tokyo 105-6116 Japan
Brunvoll A/S, P.O. Box 370, N-6401, Molde, Norway
ZF Marine 3131 SW 42nd St., Ft. Lauderdale, FL 33312
Caterpillar, 100 NE Adams Street, Peoria, IL 61629-2320
Centa Corp., 8185 Cass Ave., Darien, IL 60561
The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492

Fincantieri, Diesel Engines Div.—GMT, Bagnoli della Rosandra 334, Trieste, ITALY

Jan Verhaar Omega Thrusters, P.O. Box 119, 2340 AC Oegstgeest, NETHERLANDS

GEC ALSTHOM Diesels Inc., 10801 Kempwood Dr. Ste 1, Houston, TX 77043-1412

Gottens Worldwide, 160 Van Brunt St., Brooklyn, NY 11231

Harbormaster Marine Inc., 31777 Industrial Rd., Livonia, MI 48150

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

Kahlenberg Bros Co., P.O. Box 358, Two Rivers, WI 54241

Kaplan and Association, 30808 Crest Forest, Farmington MI 48331

Krupp Mak, 7555 Danbro Crescent, Mississauga, Ontario, CANADA L5N 6P9

LIPS B.V., P.O. Box 6, 5150 BB Drunen, The Netherlands

Lothmann & Stollterfohl, P.O. Box 1860, D-58408 Witten, Germany

Lo-Rez Vibration Control, 186 West 8th Ave., Vancouver, BC CANADA, V5Y 1N2

Mapeco, Inc., 91 Willenbrock Rd., Unit B4, Oxford CT 06478

Markisches Werk, P.O. Box 1442, D-5884 Halver GERMANY

MAN B&W Diesel, 17 State St., New York, NY 10004

MAN B&W Diesel A/S, Ostervej 2, DK-4960 Højeby, DENMARK

MAN B&W Diesel A/S, Alpha Diesel, Niels Juels Vej 15, DK-9900

Frederikshavn, DENMARK

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

Augsburg 1 GERMANY

Ornithruster Worldwide, 30555 Solon Ind. Pkwy., Cleveland, OH, 44139

Oron Corp., 1111 Cedar Creek Rd., Grafton, WI 53024

Oy Wartsila Ab, Vasa and Abo Divisions, P.O. Box 244, SF65100 Vasa, FINLAND

Karl Senner Inc., 25 W Third, Kenner LA 70062

Schottel-Werft, Manizer Strasse 99, D-56322 Spay/Rhein, GERMANY

Schottel Inc., 500 Industrial Blvd., Sugar Land, TX 77478

Siemens Electric Ltd., 1180 Courtenaypark Rd., Mississauga, ONTARIO

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

Thrustmaster of Texas, P.O. Box 840189-12227 IFM 529, Houston, TX 77264-0189

Ustein Bergen Diesel A/S, P.O. Box 924, N-5002, Bergen, NORWAY

Ultra Hydraulics Limited, Cheltenham Road East, Gloucester, GL2 9QN, ENGLAND

Voith Hydr Marine Technology, P.O.B. 1125, D89509, Heidenheim, GERMANY

Marine Propulsion Inc., 1505 Corbin Ave., Hammond, LA 70403

The Cincinnati Gear Company, 5657 Wooster Pike, Cincinnati, OH 45227

Renold Hi-Tec, 512 W. Crescentville Rd, Cincinnati, OH 45246

U.S. Rep. Voith Schneider America Inc., 121 Susquehanna Ave., Great Neck, NY 11021

Schottel-Werft, Josef Becker GmbH & Co. KG, HRP, 432 Realy Dr., Dretna, LA 70056

PUMP—Repair—Drives

Alfa-Tec, Inc., 4027 21st Ave. West, Seattle, WA 98199

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

Advanced Environmental Systems, 2 Sutton Rd., Webster, MA 01570

Hamworthy Marine, Inc., 1129 Hospital Dr. Ste 3C, Stockbridge, GA 30281

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

PURIFIERS

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

RADARS —ARPA

Furuno USA, Inc., 271 Harbor Way, S. San Francisco, CA 94080

Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

REFER COMPRESSORS

CMP Corporation, P.O. Box 15199, Oklahoma City, OK 73155

REFRIGERATION COMPRESSOR REPLACEMENT PARTS

CMP Corporation, P.O. Box 15199, Oklahoma City, OK 73155

REGULATORY DATABASES

Solutions Software, 1625 Turtlehill Rd., Enterprise, FL 32725

REPLACEMENT TRENDS

Washington Aluminum, 1330 Knecht Ave., Baltimore, MD 21229

RH PROPULSION

Boli Filter, 15 International Dr., East Granby, Ct., 06206

G o l l e n s, 1 6 0 Van Brunt St., Brooklyn, NY 11231

RIGID INFLATABLE BOATS

Willard Marine, Inc. 1250 N. Grove St., Anaheim, CA 92806

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

RISK MANAGEMENT

BL Trinity Group, 17 State Street 16th Fl., New York, NY 10004

ROPE—Manila—Nylon—Hawser—Fibers

Cortland Cable Co., 44 River St.(PSR), Cortland, NY 13045-0330

Phillystran, Inc., 151 Commerce Drive, Montgomeryville, PA 18936-9628

Puget Sound Rope, 1012 Second St., Anacortes, WA 98221

Pelican Rope Works, 4001 W.Carriage Way,Santa Ana,CA 92704

Rasmussen Equipment Co., P.O. Box 81206, Seattle, WA 98108

ROTATING EQUIPMENT

FCS, Inc., 22 Main Street, Centerbrook, CT 06409

RUDDER BEARINGS & BUSHES

Duramax Marine, 16025 Johnson St., P.O. Box 67, Middlefield, OH 44062-0067

Thorcon Bearings, Inc., 3225 Mainway, Burlington, Ontario Canada L7M 1A6

SAFETY PRODUCTS

Brookdale International, 1-8755 Ash St., Vancouver BC, V6P6T3

MGI International, Ste. 113-980 West 1st Street

N Vancouver, BC CANADA V7P 3n4

Viking Life Saving, 1625 N. Miami Ave., Miami, FL 33136

New England Marine & Industrial, 200 Spaulding Turnpike, Portsmouth, NH 03801

Nautical Safety Products, P.O. Box 590462, Houston, TX 77259

Norwegian Maritime Equip. AS, Box 244, NO 5460 Husnes, Norway

SANITATION DEVICE—Pollution Control

Alfa-Tec, Inc., 4027 21st Ave. West, Seattle, WA 98199

Byrne, Rice & Turner, Inc., 1172 Camp Street, New Orleans, LA 70130

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

Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111

Fast Systems, 3240 North Broadway, St. Louis, MO 63147

AlfaTec, Inc., 4027 21st Ave. West, Seattle, WA 98199

Microphor, 452 E. Hill Rd., Willis, CA 95490

Owens Mfg., Hwy 92, Youngsville, LA 70592

SATCOM

Moleroia, 1500 Dundee Dr., Arlington Heights, IL

SATELLITE COMMUNICATIONS

Batracos, Inc., 10675 Sorrento Valley Rd., Ste. 200, San Diego, CA 92121-1609

Furuno USA, Inc., 4400 N.W. Pacific Rim Blvd, Carnas WA 98607

KVH Industries, Inc., 110 Enterprise Center, Middletown, R.I. 02842-5268

ICG Satellite Communications, 8400 NW 52nd St., Suite 110, Miami, FL 33166

Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27604-1851

Irdium N.A., 8449 S.River Pkwy, Tempe, AZ 85284

Norwegian Telecom, Postboks 6701 St. Olavs Plass, N-0130, Oslo, Norway

PTT Telecom, Station 12, P.O. Box 30150-2500 JD The Hague, NETHERLANDS

Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

Raytheon Marine Co., 676 Island Pond Rd., Manchester, NH 03109

Singapore Telecom, 15 Hill Street, Telephone House, 2nd Storey, Singapore 0617

Telstra Mobile Satellite & Radio Services, 79 St. Hilliers Rd., Auburn NSW 2144, AUSTRALIA

Magellan Systems, 960 Overland Court, San Dimas, CA 91773

Stratos, 150 Melville St., Suite 1900, Ottawa, Ontario K2P 1P1 Canada

Comsat Maritime Services, 6560 Rock Spring Drive, Bethesda, MD 20817-1146

Station 12, P.O. Box 30150, NL-2500 JD Den Haag, Netherlands

SCARIFIERS

Desmond-Stephan, P.O.B. 30, Urbana, OH 43078

SEALS

Bohm & Voss Industries GmbH,P.O. B. 112289, D-2042 Hamburg 1, GERMANY

U.S.A. Reps: Simplex-Turmar Inc., P.O. B. 675, Tonawanda, NY 14151

Duramax Marine, 16025 Johnson St., Middlefield, OH 44062

Circle Seal Controls Inc., 2301 Wardlow Circle, P.O. Box 3300 Corona, CA

Orkol Inc., 2535 Prairie Rd., Unit D, Eugene, OR 97402

SEATING

H.O. Bostrom Co. Inc., Proques Ave., Waukesha, WI

SEPARATORS—LUBE OIL/FUEL OIL

SOTECO, 276-16010 Ceranesi Genova, Italy

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

Westfalia Separator, 100 Fairway Ct., Northvale, NJ 07647

SHAFT HORSEPOWER MEASURING SYSTEM

FCS, Inc., 22 Main Street, Centerbrook, CT 06409

Instruments Computers & Controls, 78 Londonderry Tpke, Suite E 12 Hooksett, NH 03106

SHAFT SEALS

Duramax Marine, 16025 Johnson St., Middlefield, OH 44062

Bohm & Voss Industries GmbH,P.O. B. 112289, D-2042 Hamburg 1, GERMANY

U.S.A. Reps: Simplex-Turmar Inc., P.O. B. 675, Tonawanda, NY 14151

SHAFTS

American Vulkan, 2525 Dundee Rd., Winter Haven, FL 33884

SHIP LIFTS

Synchrolift Inc., Two Datan Center, 9130 S. Dadeland Blvd., Miami, FL 33156-7850

SHIPBOARD MANAGEMENT SYSTEMS

Spar Associates, 927 West St., Annapolis, MD 21401

SHIPBOARD TESTING

Dayton T. Brown, 555 Church St., Bohemia, NY 11716

SHIPBUILDING—Repairs, Maintenance, Drydocking

Amfels, Inc., P.O. Box 3107, Brownsville, TX 78523

Astilleros Espanoles, S.A. Ochandiano, 14-16 28023 El Planico SPAIN

Atlantic Marine, Inc., P.O. Box 3202, Mobile, AL 36652

Atlantic Marine, Inc., 8500 Heckscher Dr., Jacksonville, FL 32226

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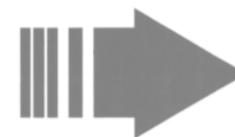
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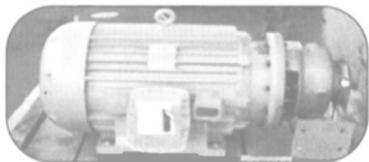
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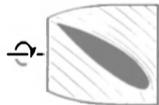
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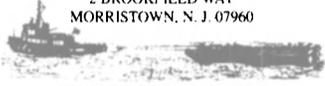
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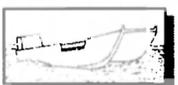
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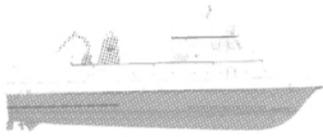
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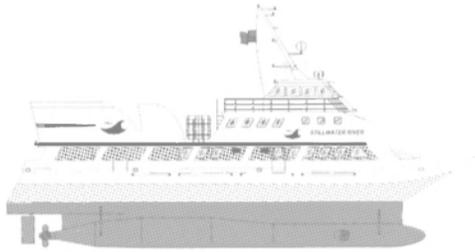
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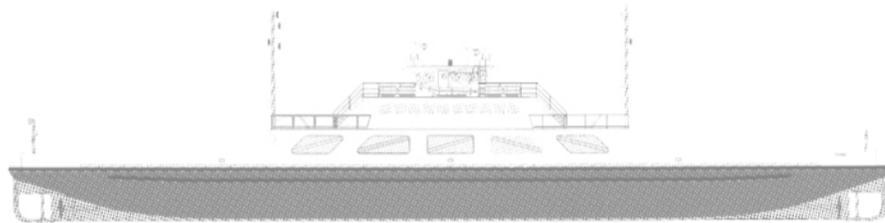
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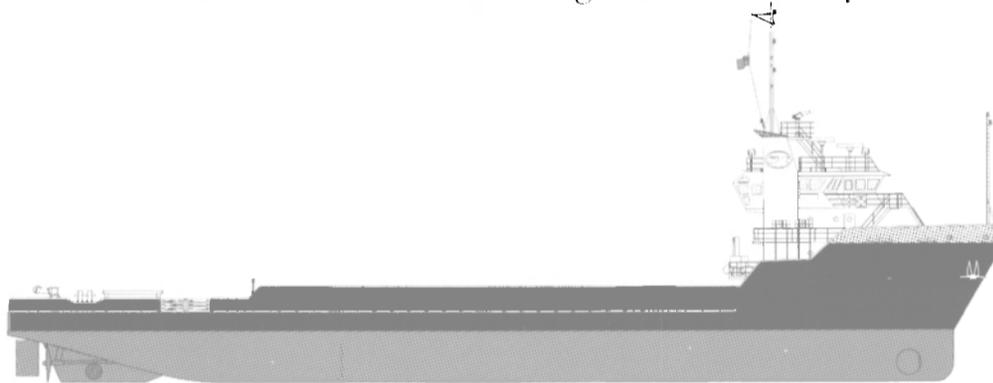
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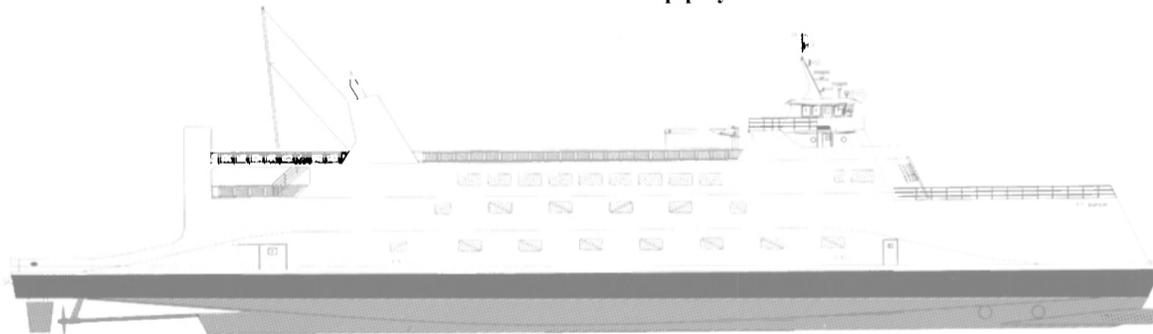
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