

August, 1998

MARITIME REPORTER AND ENGINEERING NEWS

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Propylene Oxide?

Astilleros Españoles redefines chem tanker
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Coatings and corrosion control issues surge to the
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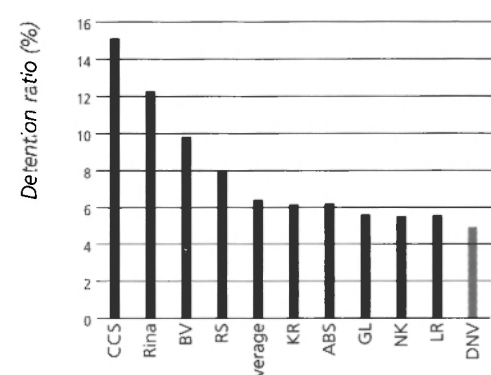
When will the time be right to plunge into the
secondhand ship market?

Country Focus: Germany • Ferry Boat Report • Engine Performance Equipment
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Don't risk detention

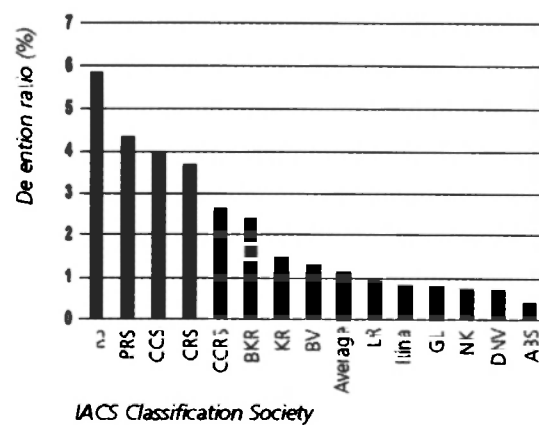
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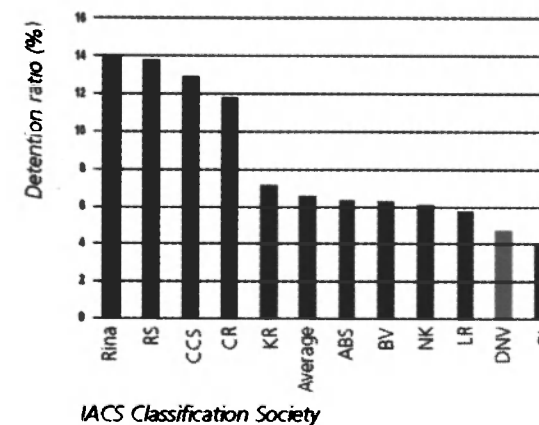
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Detention ratio in Tokyo MOU by class, rolling period 1995-97. Detention ratio = detention percentage of inspections. Source: Tokyo MOU Annual Reports 1995-97.



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Detention ratio in USA by class, rolling period 1996-98. Detention ratio = class filtered detention percentage of arrivals. Source: USCG Internet Homepage



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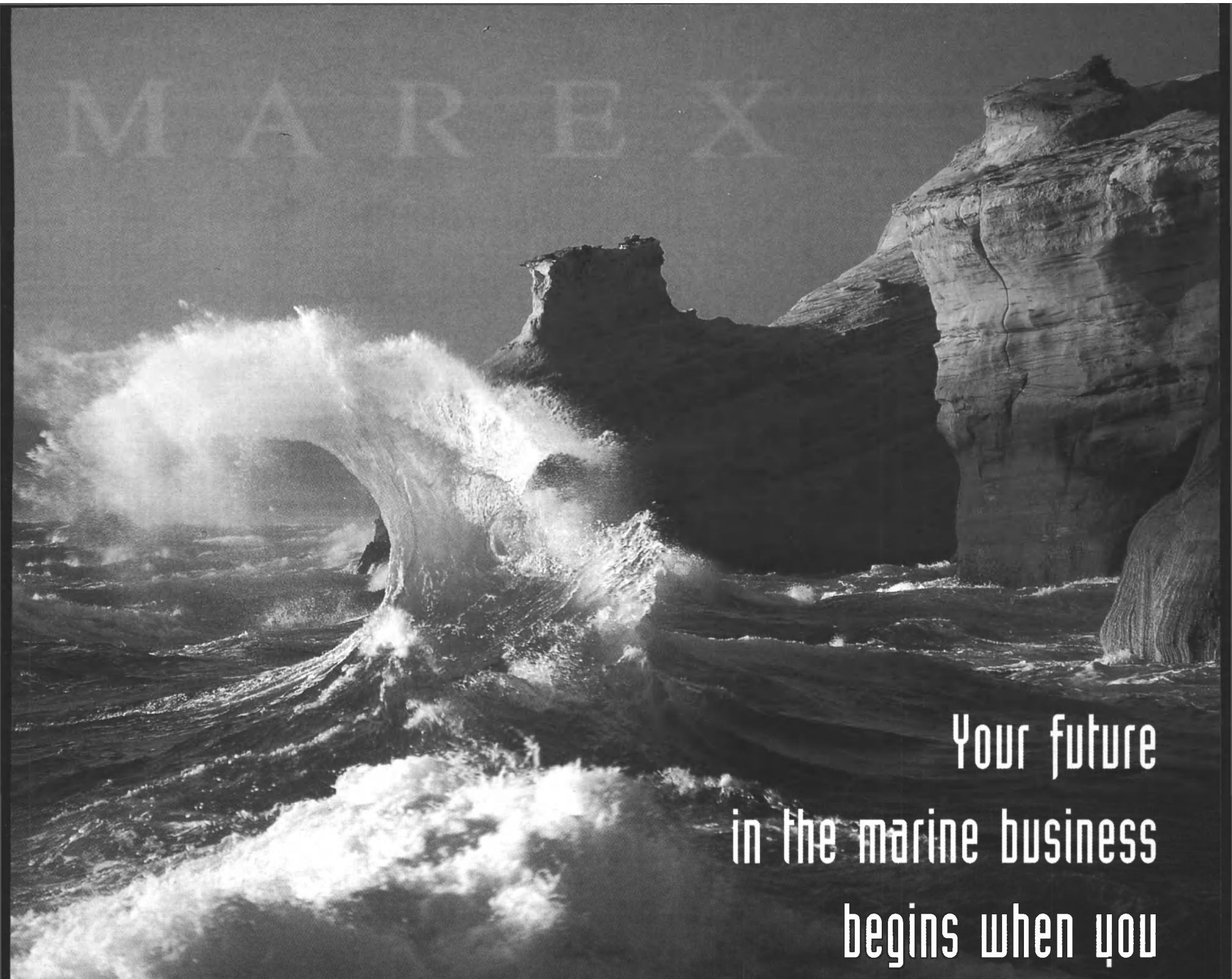
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Sincerely,
John C. O'Malley
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On the Cover: Pictured is 897-ft. (273.4-m) Overseas Ohio at Cascade General Drydock. The ship was in for its biennial drydocking, which was a contract in excess of \$5 million and included steel repairs, blasting and coating. Photo is copyright 1999 Cascade General Inc.

8 Melding of cultures

Wartsila NSD has taken its latest step toward long-term prosperity via Italy, specifically re-titling and re-engineering Grandi Motori Trieste as Wartsila NSD Italia. — by David Tinsley

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Battling through adversity is the hallmark of the U.S. industry, which is firmly embarked on the road to consolidation.

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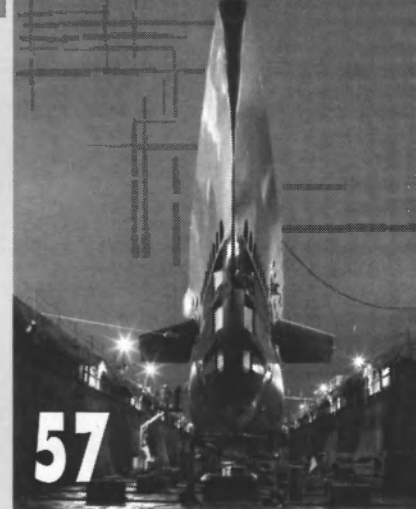
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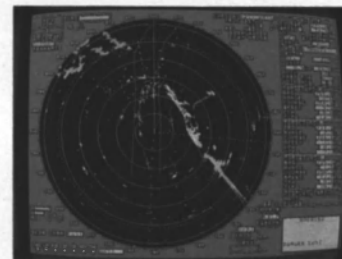
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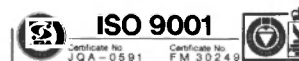


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EDITOR'S NOTE

Using the "turn of the century" is a very visible but virtually meaningless turning point when discussing the positioning of products, systems and companies for long-term prosperity. The Y2K computer problem and its unknown effects notwithstanding, when the clock strikes midnight on December 31, 1999 it can reasonably be assumed that: the sun will rise again; marketers of the "Ultimate Millennium New Year's Eve Party" will be much richer; and U.S. shipyards will continue to wage uphill fights in the battle to win commercial business and to win political support for increasing the number of naval ships being built.



I recently had the opportunity to visit with Cynthia L. Brown, president of the American Shipbuilding Association (ASA), and speak with many members of the U.S. ship and boatbuilding community at the 1999 SNAME Ship Production Symposium to discuss the issues that will define success in years to come. Many of the qualities of a successful long term company in this era of mass corporate consolidation and true global competition are, of course, not particular to the maritime industry. The ability to create, produce, market and deliver increasingly sophisticated and reliable products and services is central to a company's ability to prosper, while enduring market turmoil. However, even the most efficient and well-defined organizations can sputter and falter in an environment where unnatural market forces exist.

When viewing some of the colorful bar and line charts produced by ASA, it is a wonder that there haven't been more consolidations and defections from the U.S. maritime market. The numbers are, at best, bleak, showing that shipyard production and employment have consistently fallen for the better part of 20 years. For example, the number of new construction and ship repair workers has steadily declined since 1980, from more than 170,000 workers that year to less than 90,000 workers today. Similarly, annual naval ship acquisition has been on a roller coaster as well, (although primarily pointed down for much of the past decade.) ASA figures show naval ship acquisition at 18 ships in 1980, ascending to 26 ships by 1990, and plummeting to six ships this year. ASA calculations reveal that the current level of ship procurement and acquisition could leave the U.S. Navy severely (an estimated 41 ships) short of the 300-ship goal.

Numbers on the commercial side of the business have not been encouraging either, dropping from more than 70 ships in 1976, to less than 10 in 1998 (including zero ships in 1987, 1988 and 1989.)

While numbers do speak volumes, they don't tell the whole story.

Optimists within the market see the current level of underproduction as a "time to buy," and are gearing up for the inevitable upturn in business that will come. Ed Ewing and his work with the revitalization of the U.S. ship repair industry is a prime example of this attitude, as last month marked the official ribbon-cutting and dedication of the new NORSHIPCO.

Also, before shipbuilders', repairers' and outfitters' eyes is an aging fleet, (particularly on the commercial side) that is going to need replacing. For example, starting next year and running through 2015, there are an estimated 66 vessels in the 15,000 to 40,000-grt range phased out by OPA 90 alone. The facts of the matter are relatively simple and straight-forward, in that the construction and maintenance of a viable and strong U.S. merchant and naval fleet is critical to ensuring that the country's commercial and defense objectives are met.

Gregory R. Franthman

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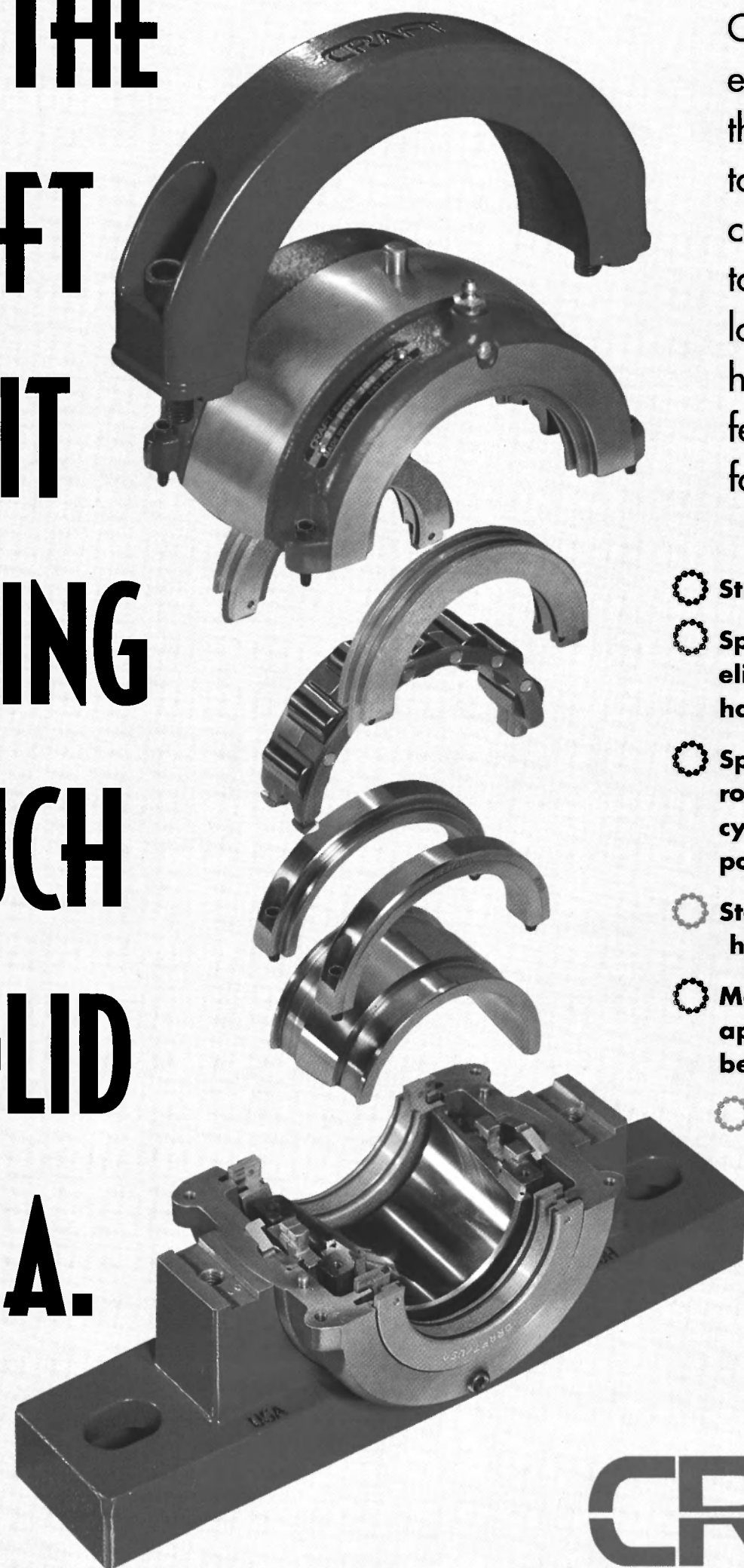
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Investment in Design



by David Tinsley,
technical editor

Blending Finnish and Italian Flair

It is testament to the Finnish spirit that diesel engineering force Wartsila NSD, having suffered bruising financial results in 1998, has staged an effective fightback based in part on tactical change and in part on increased control of every theater of its operations.

As the latest expression of the corporation's growing influence on the industry in Europe, the famous Grandi Motori Trieste name and its vast engine manufacturing complex on Italy's northeastern border with Slovenia, have been subsumed into the Finnish-controlled group and retitled Wartsila NSD Italia.

Occupying a total area of 550,000-sq.-m., including 150,000-sq.-m. under cover, the Trieste plant is one of the

most extensive in the world. But last year's total engine deliveries of 303-MW paled by comparison with its latent capacity. The new Finnish-headed management has wasted no time in setting about measures to raise productivity and boost net returns from what surely ranks as one of the jewels in Europe's heavy engineering crown.

As a frontline objective, integration of the plant into the group's international manufacturing network has seen the application of Wartsila NSD's 'focused factory' philosophy. This is most graphically expressed in its selection for the manufacture of the potent, Finnish-designed Wartsila 64 engine, the world's most powerful medium-speed diesel. At

the same time, certain merits have been perceived in blending the concept of

product concentration with an involvement in distinct categories and markets.

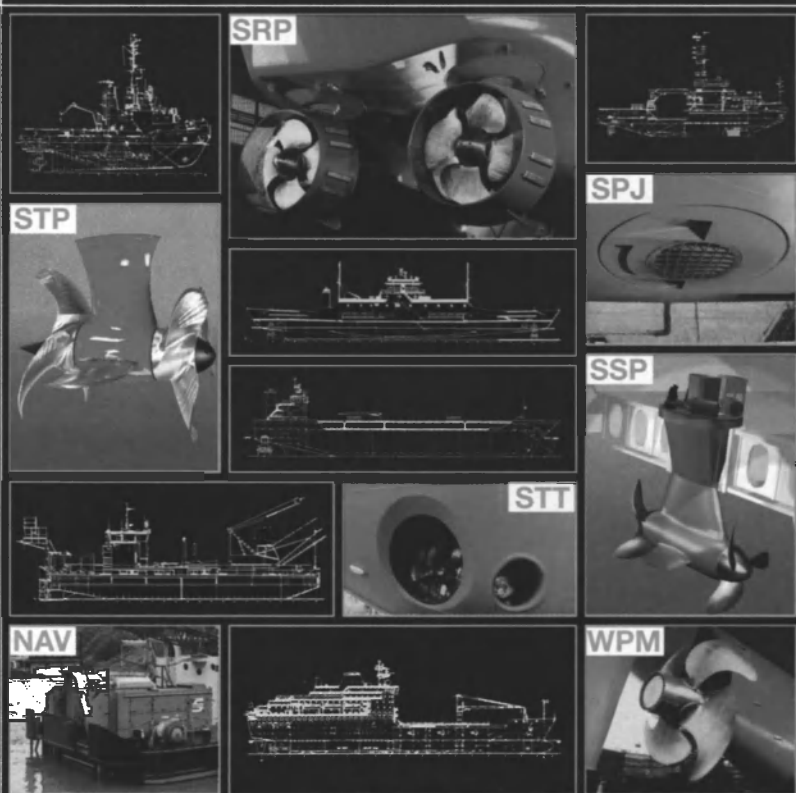
Drawing on the skills base, capacity and an indigenous, in-depth technological capability, reflected in the earlier GMT engine range and the now-absorbed Diesel Ricerche development company, Wartsila NSD Italia will pursue a well-rounded business approach. The production remit covers Sulzer RTA two-stroke types, Wartsila 64 and Sulzer ZA40S four-stroke medium-speed



Quotable:

Johan Stoor and his colleagues at Wartsila NSD Italia are intent on reducing lead times for two-stroke models to 20 weeks from the 32 weeks typical right now.

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designs, and also high power-density engines intended for fast ferry transportation and naval applications.

During this writer's recent visit to the establishment, steps taken by the management team led by **Johan Stoor** to put the plant on a sounder footing were clearly in evidence in aspects of the work organization and manufacturing arrangements.

In addition, the strengthening of the product platform for the future was apparent in the production of blocks for the first of the compact new Wartsila 26X type, and in the readying of the first Wartsila 64 engines for shipment. It was also evident in the endurance trials of an X-type engine and in the Orimulsion fuel trials with a Wartsila 46 in the test cells.

Furthermore, continuity was expressed in the lineout of Sulzer ZA40S machines and two-stroke models such as the Sulzer RTA62U, and in the production of Wartsila 46 engine blocks for the Turku plant in Finland. The fact that the Italian factory's program this year also includes newbuild GMT-series machinery for Venezuelan frigates and overseas power stations demonstrates responsiveness to the client markets, although the longer-term aim must be to widen the reach of the Wartsila NSD-grown products.

Although the workforce has been cut, the commitment to the Italian plant is patent in the investments made to support efficient manufacturing of the Wartsila 64 engine, for which serial production has been implemented on the basis of the initial tranche of 11 contracts, and in the bolstering of Trieste's role in the naval and high-speed commercial vessel propulsion sectors. It is also geared-up to produce the RTA60C low-speed engine, unveiled at the recent NorShipping event in Oslo, and especially significant as a launchpad for the future-oriented RTA-flex system and 'intelligent engine' concept. Building on the august Diesel Ricerche team, Wartsila NSD Italia will also play an important role in the group's technology activities.

Wartsila NSD had secured an initial 40-percent stake in GMT in 1997 in conjunction with the merger of Wartsila Diesel and New Sulzer Diesel, the latter having been previously owned by Fincantieri. Earlier this year, the state-owned shipbuilding organization signed-over its 60-percent shareholding in the engine building operation to Wartsila NSD, giving the Finnish-owned group outright control of the business and the huge complex at Bagnoli della Rosandra.

The fact that a companion element in the agreement raised Fincantieri's holding in Wartsila NSD from 12.2-percent to 15.4-percent should help ensure that the Italian yard group remains a key cus-

tomor of the Trieste plant and the wider Wartsila portfolio.

Goals for the future relate not simply to output and productivity, but also to cutting delivery times for all engine types. Johan Stoor and his colleagues at Wartsila NSD Italia are intent on reducing lead times for two-stroke models to 20 weeks from the 32 weeks typical right now, under the aegis of the strategic plan for the 1999-2004 period. He is

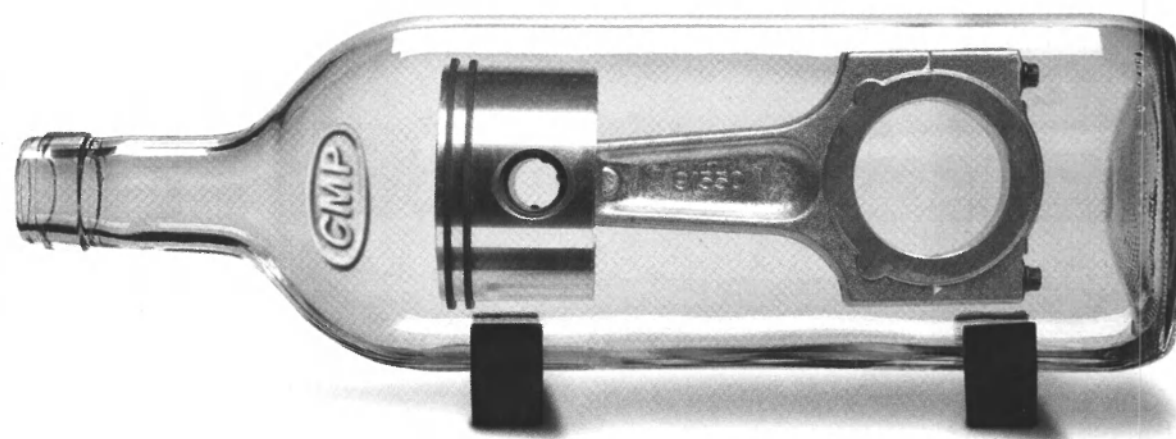
also set on getting lead times for in-line models of the Wartsila 64 down to just eight weeks, and to be able to offer 10 weeks for vee-form engines.

When Stoor arrived at the factory two years ago, the unit shipment size was 200 tons, constrained by the nature of the road access over the short distance to Trieste harbor. The limit has since been upped to 300-tons, but further improvements should enable pieceweights of

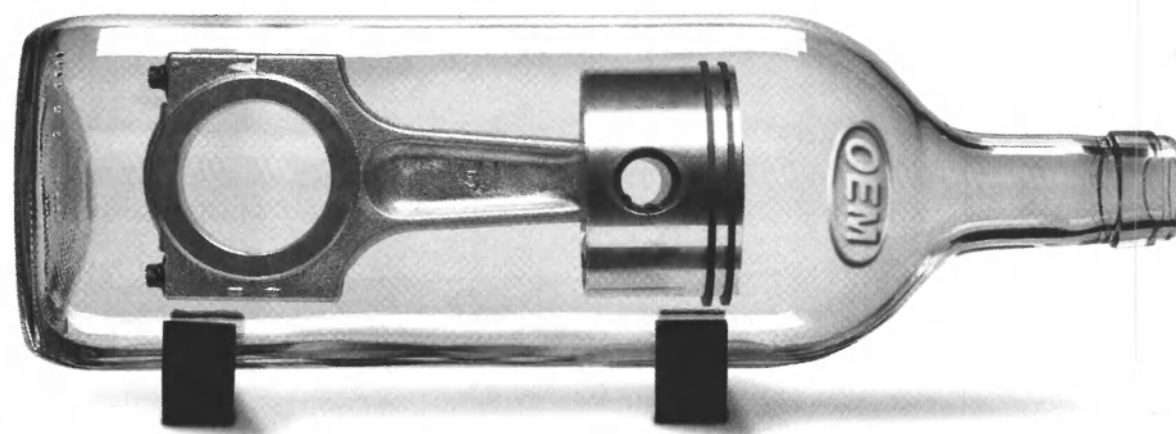
500-tons to be rolled-out of the plant and transferred direct to the waterfront by November this year.

Not only will this better match the pure assembly capacity of the works, it will better suit the lead time requirements and man-hour economics of recipient shipyards able to handle engines in complete form. Closely following the wholesale purchase of GMT, the Finnish corporation bought out the

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Stork group's 40-percent holding in Wartsila NSD Nederland, giving it 100-percent control of the Dutch company and one of Europe's most extensively modernized medium-speed diesel manufacturing facilities.

The Finnish organization had originally obtained a 60-percent interest in Stork-Werkspoor Diesel in 1989, renaming it Stork-Wartsila Diesel. The subsequent styling of the company as

Wartsila NSD Nederland was a mark of the strengthened Wartsila brand identity and the absorption of New Sulzer Diesel. Given a solid foundation to the long-term manufacturing program at the Zwolle plant in the Netherlands, a new Wartsila 38B design has been developed as the group's future standard-bearer in the 380-mm bore category. The B-engine offers a substantial advance in power rating, to 725-kW per cylinder

from the 660-kW/cyl of the original Wartsila 38 type, but with enhanced environmental and production features.

Far-reaching restructure implemented in the wake of last year's heavy losses had a positive impact on Wartsila NSD Corporation's results for the opening four months of 1999. The operating loss was trimmed to \$210,000, from the \$37 million deficit of the corresponding period of 1998.

Maritime shares make a comeback

Share prices in Oslo continued to rise during June and in the first six months of 1999, the Shipping Index rocketed 30.6 percent. The All Share Index is not far behind with an increase of 23.7 percent during the same period. Trading at the Oslo Stock Exchange has never been more active than in 1999 so far with the daily average turnover for the first half of the year at \$208,600,000. This is 27.1 percent higher than the average for the whole of 1998. On average 4,775 transactions were carried out each day during June. This is 42 percent higher than the average for last year. The Italian company Navigazione Montanari has offered \$8 per share in I.M. Skaugen (SKA), sending the stock up almost 40 percent and to the top of the winner list for June. The Hong Kong based company Jinhui Shipping and Transport (JIN) enjoyed a good month as its share price soared 36.6 percent. This has been attributed to increased levels of activity in the Asian region. Northern Offshore (NOF) rose all of 45.5 percent in June, making it the best performer among offshore shares. Also Brøvig Offshore (BRO) and Polar Holding (POL) rose in double digits. Det Søndenfjeldske (SFJ) and Smedvig (SME & SMEB) remain among the five stocks with the poorest share price development from last month. Navis (NIS) tops the list with a fall of 23.8 percent, following the company's announcement on the long term financing of Navis Explorer I. Ocean Rig (OCR) dropped 18.3 percent as it became known that the completion of its first two rigs has been delayed until next year.



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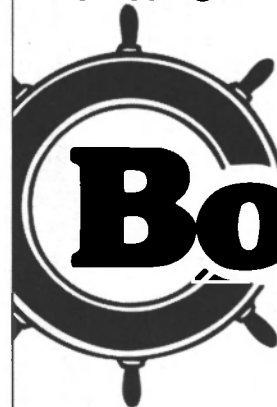
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Winners of the month

Shipping	List	Change
I.M. Skaugen	Main	+39.5%
Jinhui Shipping and Tr.	Main	+36.6%
Solvang	Main	+22.7%
Stolt-Nielsen B	Main	+21.7%
Western Bulk Shipping	Main	+20.0%
Offshore	List	Change
Northern Offshore	SMB	+45.5%
Brøvig Offshore	SMB	+30.0%
Polar Holding	SMB	+12.5%
Havila	SMB	+9.3%
Petrolia Drilling	SMB	+8.0%

Losers of the month

Shipping	List	Change
Team Shipping	SMB	-20.0%
Bona Shipholding	Main	-9.3%
Mosvold Shipping	Main	-8.6%
Leif Hoegh & Co	Main	-8.3%
First Olsen Tankers	Main	-6.0%
Offshore	List	Change
Navis	SMB	-23.8%
Det Søndenfjeldske	Main	-18.5%
Ocean Rig	SMB	-18.3%
Smedvig A	Main	-18.0%
Smedvig B	Main	-16.1%

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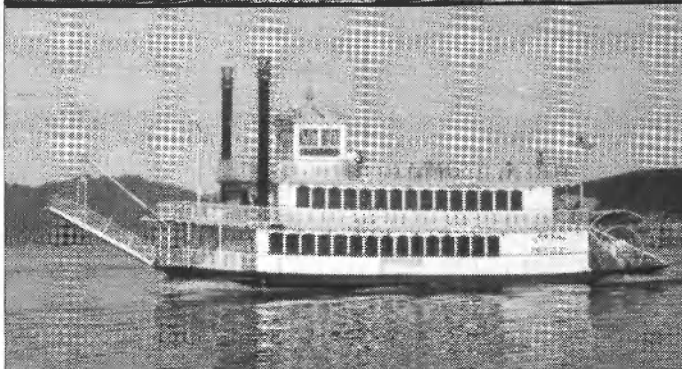
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Marine Finance

Leaders Convene At Ship Finance Forum

The fact that it is a down market did not discourage head executives of the world's top shipping companies from meeting to discuss marine finance options.

By Regina P. Ciardiello, assistant editor

It was an international display of knowledge and know-how at the 10th Annual Ship Finance Forum that took place in June at Manhattan's New York Palace Hotel.

Sponsored by the Institute for Interna-

tional Research and Chase Securities, the event kicked off on June 23 with an introductory presentation.

Discussions began the following day with an introduction by **Peter Evensen**, head of global shipping at Chase Securities, who was not at all hesitant to comment on the industry's obvious decline.

"This is the worst shipping market,

since the mid-80's," Evensen declared. "High-debt servicing costs remain, while earning prospects continue to weaken."

Throughout his presentation Evensen pointed out that the market's less-than-stellar showing is attributed to factors such as poor global economy, a slow-down in world trade, as well as a weak capital structure. Although these observations would most likely shy away any potential investors from entering into the shipping industry, the end is not near, according to **James E. Glassman**, senior economist & managing director U.S. Economic & Policy Research, Chase Securities.

"There are many reasons to be optimistic," Glassman said. "It's a good sign that the Asian market is rebounding and we'll see a period of solid growth when the economy catches up to where the U.S. has been."

Recent developments in the market were also discussed throughout the conference's proceedings. **Jarle Hammer**, director, Fearnsearch, Fearnleys A/S, commented that the drybulk market has experienced a four-year long decline, but should gain muscle by the end of the year. Hammer also mentioned that the Biffex market is on the rise, and interestingly, this summer will be one of great interest for those wanting to first enter into the market.

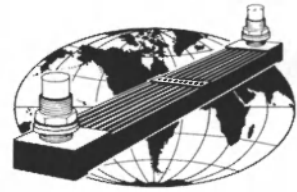
"A key issue for shipping market analysts and all others interested in world economy trade," according to Hammer is whether the crisis in Asia is already over and how soon we shall again see sustained economic growth."

Perhaps the most innovative assumption proclaimed at the conference was the question of why the industry in general is not more closely followed by institutional investors. The reasoning behind this query, raised by **Bjorn Moller**, president and CEO of Teekay Shipping, quite simply stems from the fact that the bulk shipping business, which has failed to develop into a large, industrial business is unprofitable. This, along with poor returns throughout the 90's, provides an unappealing mix.

Moller, whose presentation focused on, "Maintaining Shareholder Value in A Company That Has Reached Critical Mass," explained how executives can determine what exactly it is that shareholders want. The answer — share price maximization.

"Ultimately, what all shareholders want is maximization of their share price," Moller said. "For this to happen requires the creation of Shareholder Value. As the company's management, everything we do should be the long term interest of our shareholders, with the ultimate aim of raising that stock price."

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Buy Secondhand Ships Now?

Drewry's reasons the time is soon to invest in used ships for profit

To be trite, every cloud has a silver lining, and the stormy shipping market crisis' shining beacon appears to be strong investment opportunities in secondhand ships. In its latest report, "Secondhand Ships: Investment Potential and Value for Money," Drewry's argues that "adversity provides opportunity... therefore, acquisitions made now could prove to be bargains." Drewry believes that 1999 and 2000 should be interesting and active years for the secondhand ship market.

Drewry's analysis of market potential through to 2003 in the mainstream markets concludes that the highest investment returns could come from Panamax and Handymax bulk carriers but most classes of bulk carriers and tankers could cross a 10 percent IRR "hurdle rate" at some point over the period — the crucial factor being timing.

Although newbuild prices have remained in check for years, the shipping industry maxim that there is no money to be made in newbuilds still seems pervasive. Money is often made, however, in the use of secondhand ships, and the secondhand market has become volatile and, currently, there seems to be no shortage of potential buyers when a vessel on offer is regarded as "quality tonnage."

The ability to realize the potential of these acquisitions will depend on the pace and extent of market recovery over the next two to four years. For the moment, however, Drewry feels that the key views are those of potential sellers — do they want to/are they able to tough it out? Will banks put pressure on owners to liquidate assets? Another maxim in shipping circles is that the decision to sell is often far harder to take than the decision to buy. Another key aspect taxing minds in the marketplace — and especially potential buyers — is, what is a ship worth? As "Secondhand Ships" points out, a lot depends on who is asking the question and why.

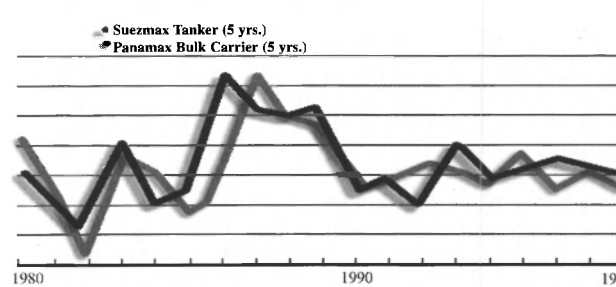
"Secondhand Ships," sees other issues that are changing the marketplace. While much of the practicality of buying and selling ships follows established, "tried and trusted" methods and procedures, the world is changing and new generations may want to embrace new methods — even if the old and arcane retain many merits.

The changing balance in fleet owner nationalities may force the adoption of

local practices and require centers of broking to relocate. Equally, the advancements, opportunities and challenges posed by the IT revolution could

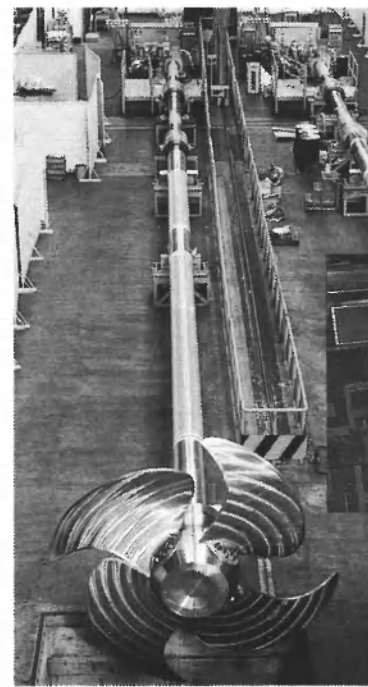
also see the conduct of S&P transactions undergoing reform in the new

Secondhand Value Fluctuations for Selected Bulk Carriers and Tankers (% change from the previous year; Source: Drewry)



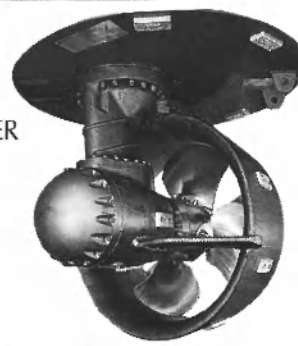
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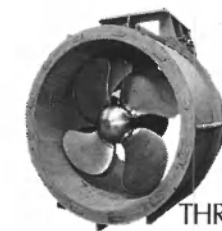


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Marine Finance

millennium.

Most observers of the secondhand market have cognitive impressions of buyer and seller trends, particularly by nationality. However, this is not always borne out by the facts. Drewry's research has found that, although buyer patterns in the mainstream dry bulk and tanker sectors show an expected Greek

dominance, seller patterns do not present a particularly clear cut picture. The mainstream markets are consolidating and Drewry asks the question whether a mixed selling pattern alongside a better-defined buying pattern is a sign of this.

For more information on obtaining a copy of this report:

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Coflexip Stena Orders Ship

Coflexip Stena Offshore awarded Hyundai Mipo Dockyard with a contract for the construction of its newbuild ultra deepwater pipelay and construction vessel. Delivery is scheduled for January 2001, with operations scheduled to commence during the second quarter 2001.

The vessel features a storage capacity of at least 8,000 tons of products, transit speed of 13 knots and a heavy lift capability of 400 tons. The newbuild is noted as the only one in its class to have the ability of laying flexible as well as rigid lines in ultra deepwaters.

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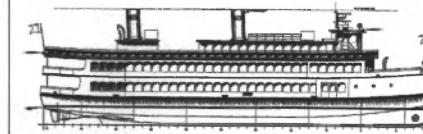
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Nichols To Construct 800-Passenger Dinner Boat



Nichols Boat Builders is currently building a new \$8 million dinner boat for Argosy Cruises, designed to resemble the bluff-bowed steamboats of the Mosquito Fleet that plied Puget Sound before the turn of the century. The 180 ft. (54.8 m) vessel is expected to enter service along the Seattle waterfront in June 2000 carrying 800 passengers on three decks, according to **John Blackman**, Argosy board chairman; and **Matt Nichols**, president of the Whidbey Island, Wash. boat building company.

The vessel is Powered by a pair of 7,000-hp Luger engines from Alaska Diesel Electric, with power plants employing Twin Disc deep case reduction gears driving the vessel to a top speed of 11 knots.

Port Weller Awarded \$500,000 Contract


Port Weller Dry Docks was awarded a \$500,000 contract to conduct a five-year survey on the U.S. flag tug, M.V. Presque Isle, as well as for the undertaking of any necessary repairs to the vessel as needed. The 155 ft. (47.2 m) vessel was built in the early 1970's, and is owned by U.S.S. Great Lakes Fleet Inc. of Duluth, Minn. All Great lakes vessels must undergo a survey every five years.

Circle 43 on Reader Service Card

R&B Falcon Lands Drilling Contracts For Semisubmersibles

R&B Falcon Inc. has been granted a contract by Petro-Canada, utilizing the fourth-generation semisubmersible, Henry Goodrich for the development of the Terra Nova field offshore eastern Canada. The agreement with Petro-Canada provides for a firm two-year period commencing during the first quarter of 2000, following the unit's completion of its current drilling program with BP Amoco in the U.K. The total contract value amounts to an estimated figure of \$74 million with Petro-

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Canada having the option to extend the primary term of the contract for up to an additional three years with rates to be determined.

Finnish Yard To Build Cruise Ship for Carnival

Kvaerner Masa-Yards Helsinki New Shipyard is expected to construct a 2,112-passenger vessel for Carnival Cruise Lines. The vessel, Carnival Pride, will cost approximately \$375 million and will be the sister ship to Carnival Spirit, which is currently under construction.

OMI Completes Sale/Leaseback To Repay Debt

OMI Corporation completed a sale/leaseback of its 1999-built Suezmax, Columbia, reportedly to repay existing debt. In addition, the company also sold Czantoria for demolition. Proceeds from both sales will also be used for general corporate purposes.

Recent Ship Sales

June 11 to July 5, 1999

Name	Type	DWT	Yr. Build	Price (\$M)
Renda	Tanker	6,269	1984	3
Kasira	Tanker	6,269	1984	3
Ventspils	Tanker	6,269	1984	3
Harriet Maru	Bulker	177,754	1982	7
Stamford Trader	Bulker	70,119	1995	6.8
North Marchioness	Bulker	64,442	1984	7.4
Malaya	Bulker	41,545	1984	8.0
Pink Sands	Bulker	37,687	1984	6.9
Unamonte	Bulker	21,939	1980	2.3
Fordham	Bulker	22,260	1980	2.0
Rubin Rose	Bulker	22,273	1990	7.8
Luna Verde	Bulker	26,706	1986	6.5
Crown Rose	Bulker	29,099	1984	5.3
Verner	Bulker	37,662	1984	6.7
Pink Sands	Bulker	37,663	1984	6.8
Erasmus	Bulker	38,250	1979	2.1
Pacific Sky	Bulker	40,461	1985	7.6
Bandak	Bulker	62,027	1980	3.5
Litrotis	Bulker	64,120	1981	3.5
Success Bulker	Bulker	64,120	1981	4.8
Heliopolis	Bulker	64,464	1977	2.3
Tomis Future	Bulker	64,982	1989	4.5
Lionsgate	Bulker	69,000	1996	18.5
Lake Avery	Bulker	71,411	1977	1.7
Global Faith	Bulker	73,500	1998	20.6
Red Tulip	Bulker	75,720	1979	3.5
Red Rose	Bulker	75,724	1978	2.3
Aberous	Bulker	149,532	1992	20.0
Port Hedland Maru	Bulker	251,191	1986	14.7
Jag Prabhat	Tanker	27,402	1985	11.7
Ebura	Tanker	31,375	1979	3.2
Prestige	Tanker	68,337	1989	15.7
Hakuyou Maru	Tanker	89,960	1987	15.2
Yubsei Maru	Tanker	96,101	1994	22.0
Al Bizzia	Tanker	105,000	1999	33.5
Sentinel	Tanker	106,650	1986	14.4
New Prosperity	Tanker	271,967	1981	7.1

Information courtesy of Shipping Intelligence and Reuters. Shipping Intelligence can be reached at 25 W. 43rd St., New York, NY 10036; Tel: 212-997-0966; Fax: 212-997-1105; e-mail: SPL@PANIX.com

Inacom And Crowley Maritime Close Services Contract Deal

Inacom Corporation announced that it has signed a three-year, \$6 million contract with Crowley Maritime Corporation for the purpose of providing a full line of desktop-based information technology (IT) procurement services for the marine transportation services company. Inacom, which designs, imple-

ments and manages distributed technology infrastructure solutions that optimize clients' return on IT investments, will use Compaq hardware and peripherals for Crowley's 2,000 desktops across 50 domestic sites and 14 international locations. The deal with Inacom is in conjunction with Crowley's ongoing technology improvement process, which began last summer — most recently, its newly-built state-of-the-art

data center in Jacksonville, Fla.

Circle 12 on Reader Service Card

Friede Goldman And Ocean Rig Reschedule Rig Deliveries

Friede Goldman International announced that Ocean Rig ASA's Bingo 9000-1 and 9000-2 deepwater semisubmersibles, currently under construction at Friede Goldman Offshore in



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Pascagoula, Miss., have been rescheduled for delivery in the second quarter of next year.

Raytheon Integrated Bridge System Approved In Norway

Raytheon Marine has installed its first DNV-W1 approved Integrated Navigation System Bridge Control® on Norway's latest newbuilding Doris, built by

Aukura shipyard for shipowner Anders Utkilen's Rederi. The vessel is the first of a series of modern product tankers that are designed for One Man Bridge Operation. Designed and produced by Raytheon Marine, the new system offers an optimized operator interface with common design for all units from radar to gyro repeaters.

Raytheon Marine integrated bridge systems have now been fitted to 35 ves-

sels and Raytheon has been awarded orders to outfit 27 newbuildings in Europe, the U.S., Korea and China.

Circle 1 on Reader Service Card

Vickers Ulstein Marine Systems To Provide Equipment Packages

In a contract worth more than \$6.3 million, Vickers Ulstein Marine Systems is to supply winches, steering gear, rudd-

ers, stern rollers, bulk handling systems and switchboards for two anchor handling tug supply vessels (AHTS) under construction at Dalian Shipyard in China. The vessels are being built for Taubakompaniet of Trondheim in Norway. Each ship will have a Brattvaag anchor handling and towing winch, rated for 400 tons pull and 500 tons brake holding load. The bulk handling system will comprise four tanks and two compressors per vessel. Two Ulstein high lift rudders will also be fitted to AHTS, operated by Tenfjord steering gear. In addition, Ulstein Automation are supplying two sets of electrical switchboards.

Circle 15 on Reader Service Card

MAAG Closes Navy Deal

MAAG Gear AG, Zurich, Switzerland, supplier of high performance marine technology gear, has won an order from the South Korean Navy. The order consists of six gear units for three destroyers based on CODOG system arrangement. The gears will be installed between LM 2500 gas turbines with a power of 24,220 kW each at a speed ratio change of 3,600/190 rpm, and between a diesel engine with a power of 3,830 kW with a speed ratio change of 1,455/107 rpm. MAAG is also a supplier of quality gears for the cement and turbo industries.

Circle 19 on Reader Service Card

Aker Finnyards Wins Navy, Ferry Contracts

In a joint venture with FY-Industries Ltd., Aker Finnyards signed a contract with the Finnish Navy to build a fast hovercraft vessel, which will be the prototype for a future series of fast combat vessels. The price of the vessel is reported to be worth more than \$12 million. It will be constructed from welded panels of thin marine aluminum sheets and extrusions connected with lightweight composite constructions. The vessel is expected to be approximately 90 ft. (27.4 m) in length with a 50.5 ft. (15.4 m) beam. The 4,500 kW engines provide the vessel with a maximum speed of 50 knots.

Along with this venture, Aker Finnyards recently signed a \$102 million-contract with Irish Continental Group (Irish Ferries) to build what is reported to be the world's largest Ropax ferry. The 682 ft. (208 m) vessel with a 102 ft. (31 m) beam, will replace the Irish Ferries "Isle of Inishmore," which currently runs from Dublin to the North Wales port of Holyhead. The 1,800-passenger ferry will be designed to operate on short-sea international routes transporting passengers, private cars, semi-trailers, articulated vehicles, and other wheeled cargoes. The vessel will have 157 passenger cabins and 80 crew cabins and will travel at a service speed of 22 knots.

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Circle 221 on Reader Service Card

Coatings & Corrosion Control

New Steel-Thickness Measurement Promises Faster Surveys



DNV project manager, Jostein Jacobsen testing the prototype of the surveyor's tool, a handheld device for steel measurements combined with an acoustic navigation system.

Based on half-wave resonance measurements, a new means of quickly and accurately determining steel thickness can speed ship surveys. It is especially valuable in inspecting old and corroded steelwork.

The new DNV system, launched at Nor-Shipping '99 is unique. Present-day methods, based on ultrasonic thickness measurements, are not reliable on heavily corroded plates, and for large vessels are also considered too slow.

The basic technological challenge was to transmit 100 percent of the signal energy through corroded steel plates, and receive and interpret the reflected signal to give an accurate thickness measurement.

The basic principles of the new measuring method (half-wave resonance) have been known for 40 years. But their application was not technically feasible until recently due to lack of data power and limited transmitter technology. A novel method for analyzing acoustic frequency spectra has been developed jointly by DNV and the Norwegian industrial group Kongsberg Defense & Aerospace through an exclusive cooperation agreement.

The measuring method has extreme accuracy in both air and water. The mean strength thickness is processed over a chosen area, providing for further analysis and planning. No removal of scaling and other corrosion products is required, nor of marine growth. On-line digital registration and processing of inspection data is incorporated. Patents for the method have been applied for.

Wet-Surface Hull Scanning

The Resonance Thickness Measurement unit has been field tested and mounted on a carrier. This is a Remote Operated Vehicle (ROV), on which it is lowered into the water to scan the bottom and sides of a vessel up to the waterline. The ROV requires no diver assistance, and will scan 100 percent of the steel thickness over the whole hull area at a speed of one sq. m per second. An easy to operate positioning system gives a navigational accuracy closer than 10mm. The

same ROV can be lowered into any water-filled tank for scanning the tank internals. The ROV performance is outstanding with respect to speed, size, and weight.

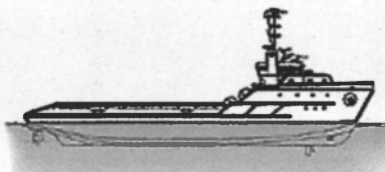
Shorter Inspection Times

All digital data from the measurements can be fed on-line into the DNV Nauticus SiO product model. Nauticus is a database in which class-related information regarding the hull, equipment and operation is accumulated over a vessel's lifetime. In this application, thickness measurements can also be fed into any database for non-DNV classed vessels. Advantages of the new system include: Less need for drydocking, reduced inspection time during surveys, greater inspection efficiency, stripping and cleaning of tanks not required.

The new technology in part, is designed to revolutionize steel-thickness measurements of corroded surfaces. Shipowners, insurers, builders and maritime authorities will know the true status of vessels. Says **Per Labom**, technical manager of Stena Bulk: "If you send down 10 surveyors to measure steel thickness, the traditional ultrasonic way, you will get ten different results. With DNV's new system we can quickly get reliable measurements in a single operation."

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IMO: TBT Ban Could Have Adverse Effects

The International Maritime Organization (IMO) held its 43rd session of the Marine Environmental Protection Committee (MEPC) from June 28th through July 1st. Delegates to the MEPC were expected to consider a proposal to ban the application of tributyltin (TBT) self-polishing copolymer paints by the year 2003.

At the previous MEPC session in November 1998, delegates prepared a draft resolution that calls for a ban on the application of TBT by 2003 and a ban on its use by 2008. These dates were designated based on the assumption that viable alternatives would be available on the market. However, since November, serious questions have been raised concerning the possible adverse environmental effects and the availability of suitable alternative paints.

Unfortunately, it is highly unlikely that any product equal in effectiveness or longevity (with a 60-month guaranteed painting interval) to TBT-based paints will be available for use by January 1, 2003. At the last meeting of the U.S. delegation to the MEPC in May, several ship companies produced evidence that existing alternatives yield poor results, and environmental data on alternative biocides is very limited, with the potential environmental risks still unknown.

In the U.S. existing alternative paints do not meet Volatile Organic Compounds (VOC) emissions restrictions, and notably reformulation of those paints to meet existing regulation would take-up to five additional years of field-

testing in order to demonstrate effectiveness.

In contrast, TBT is VOC-compliant, and numerous long-term studies confirm that levels of TBT in water, sediments, and aquatic life continue to decline. Current data indicates that reg-

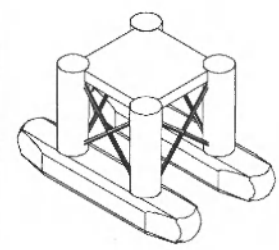
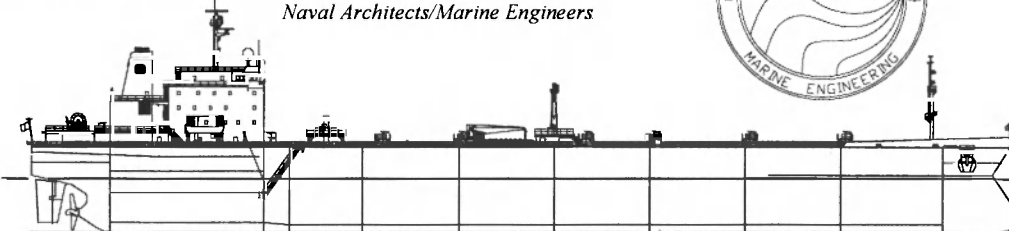
ulations have been successful in limiting the levels of TBT.

The Executive summary provided at the conference states, "In addressing the proposal to ban the use of all TBT-based paints in 2003, the IMO must consider the potential adverse effects of a premature ban. An increase in the usage of unproven alternative anti-fouling systems could lead to the following:

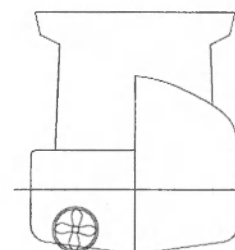
Increase in invasive species, which lead to serious environmental and economic damage, higher fuel consumption leading to an increase in air pollution, accelerated levels of blasting ship hulls in order to comply with the 2003 date, higher emission levels of Volatile Organic Compounds (Voices) released into the air and higher levels of copper released into the environment.

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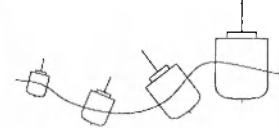
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system
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Circle 261 on Reader Service Card

New Checklists To Offer Reduced Coating Damage

New checklists outlining the proper use of tank coatings are currently being issued by German shipbuilder, Aker MTW Werft to purchasers of its chemical tankers. The checklists, which are the first of their kind, will aid in the reduction of damage to tanker coatings through improper use.

The three A4-sized checklists outline proper procedures for cleaning and ventilating tanks, and loading and discharging cargoes.

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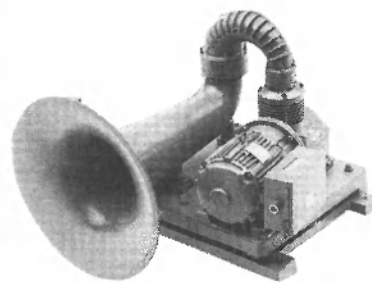
NACE International Announces New Dates And Locations

NACE International, The Corrosion Society, announces new dates and expanded seaboard locations for its well-known Marine Coating Inspection Course.

The three-day program, which is intended to assist ship owners and oper-

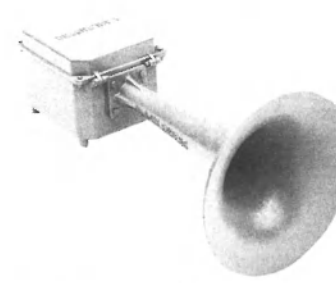
August, 1999

HEAVY-DUTY SIGNALS by Kahlenberg



Model S-120 Piston Horn

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



Model S-203C S-203 CHT

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

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

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Coatings & Corrosion Control

ators in meeting and exceeding the expected service life of their marine coatings, covers topics such as surface preparation, coating types and properties and inspection standards and specifications.

Courses will be held in San Francisco, Calif. From Nov. 4-6, 1999; Houston, Texas from Dec. 11-13, 1999; Norfolk,

Va., Feb. 26-28, 2000; New Orleans, La., April 15-17, 2000; and Milan, Italy, April 26-28, 2000.

Tremco Launches Vulkem 931 and 911

Tremco Inc. launched a new fast-curing, premium-grade polyurethane joint

sealant, Vulkem 931, for the construction industry. The product is a one-part, moisture-curing, fast-skinning sealant, which provides flexible, durable and weathertight seals for many types of building joints in both renovation and new construction projects, and offers quick-curing adhesion with a satin sheen finish. Vulkem is available in 11 stan-

dard colors, easily seals moving joints, and requires no primer on most construction materials.

Circle 55 on Reader Service Card

Discovery Adds To Line

Discovery Chemical Inc. announced its new PCM-345 METAL PREP FLUID for treating pressure-washed or sandblasted surfaces before priming and painting. The product is ideally suited for new cylinder and tank manufacturing, or refurbishing of previously used exchange units, which also significantly extends paint life.

Circle 56 on Reader Service Card

Ameron Offers

Revolutionary Topcoat

Ameron International Corporation's Protective Coatings Group offers PSX 1001, a revolutionary one-pack topcoat that reportedly saves time and labor costs. Ameron has been a pioneer not only in coatings performance, but also in environmental compliance. The PSX 1001 is a single component, high-gloss topcoat with gloss retention, an extensive recoat window, low VOC's and no isocyanates.

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Wheelabrator Expands

Wheelabrator Abrasives Inc. of Bedford Va., producer and marketer of premium shot and grit abrasives, expanded production with a new facility located in the north of Mexico.

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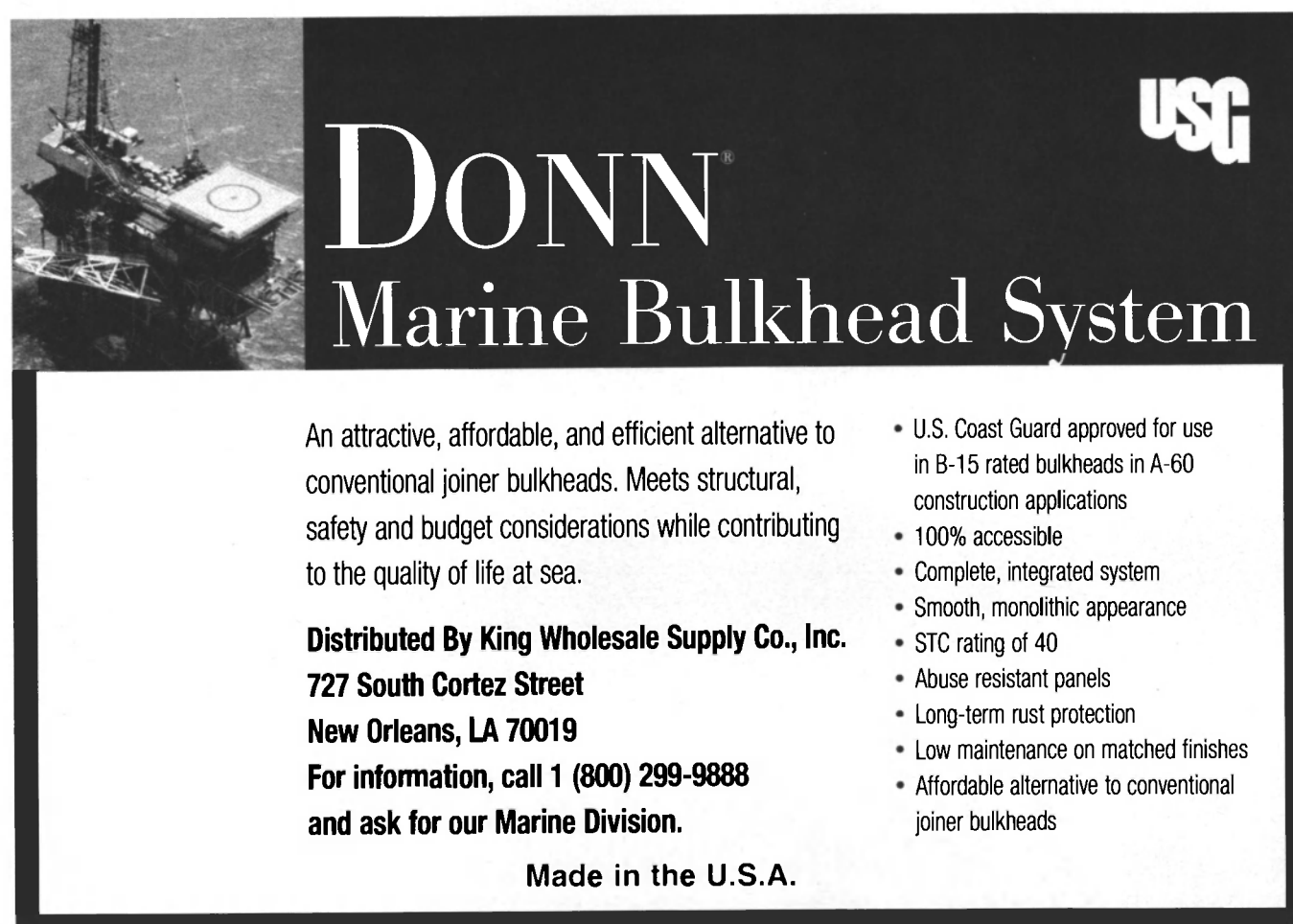
EBC Completes First North American Project

EBC Gulf Coast completed its first North American project using the EBE 500 UB Bottom Blaster. USF EBE, a manufacturer of machines for horizontal, vertical, and bottom steel surfaces, designed the EBE 500 UB.

The EBE 500 UB is designed to blast clean the underside of ships. It is a completely self-contained unit with its own power plant, hydraulic and electrical systems, even its own on-board dust collection unit, which allows the machine to work independently without interfering with other trades working nearby.

The EBC Gulf Coast-project was completed at the San Francisco Dry Dock in San Francisco on the "Maersk Constellation." Two technicians were sent from the Netherlands to train workers. The thickness of the paint was measured and it ranged from 55 to 90 mil, with an average over 70 mil. The EBE 500 was able to remove all the materials to an SP10 on a single pass.

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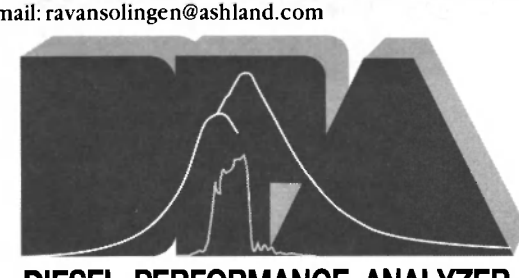
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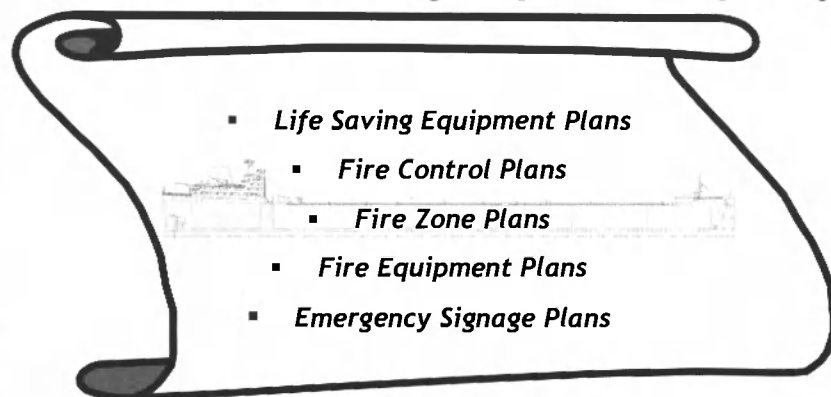
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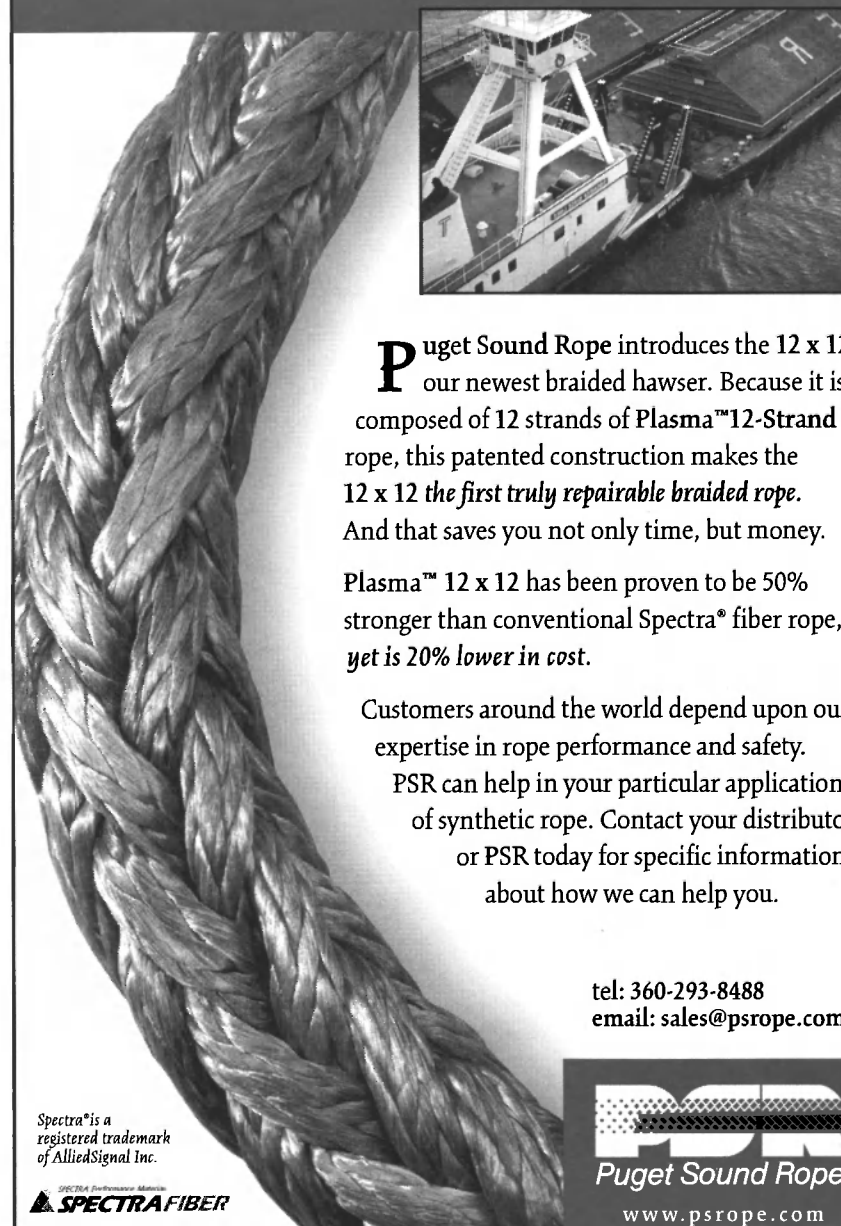
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Coatings & Corrosion Control

The Fate of the Iron: More Lessons From The Titanic Tragedy

Tragedies in the maritime industry are often revered, particularly when a large loss of life occurs, as was the case when RMS Titanic sank on April 14, 1912. The industry is also noted for its ability to learn from mishaps, incorporating changes in design, procedures and oper-

ations that are designed to avert future mishaps.

Lessons learned and positive results occurring in the aftermath of Titanic are numerous and still growing, as a team exploring the formation of rusticles on Titanic's hull are drawing some interest-

ing conclusions regarding the natural removal of iron from steel, and the potential compromise in safety and performance this may have, particularly on double-hulled vessels.

The fascination with, and examination of Titanic has been thorough, to put it

mildly. Explorers have combed the sunken ship for reasons both scientific, historic and commercial ever since its final resting place was located. Forensic experts have pieced together many of the parts of the puzzle that caused the torn and broken ship to lie where she now rests. With that discovery 14 years ago, one feature that stood out in those first images of the ship was that the ship was festooned with rust-like growths, called rusticles, hanging down all over the hull and spreading out across the ocean floor in a slow moving rippling wave of growth. Regular visits to the site of the RMS Titanic reveal an ongoing deterioration coupled to larger masses of rusticles. Learning from the tragedy involves the forensic exercise and now the nature, form, function and consequences of the infestations of rusticles now coating much of the steel hull. Basic questions are: How long does the ship have left as a recognizable structure? What are the rusticles? Where is the iron going? Why involve a microbiologist in the investigation?

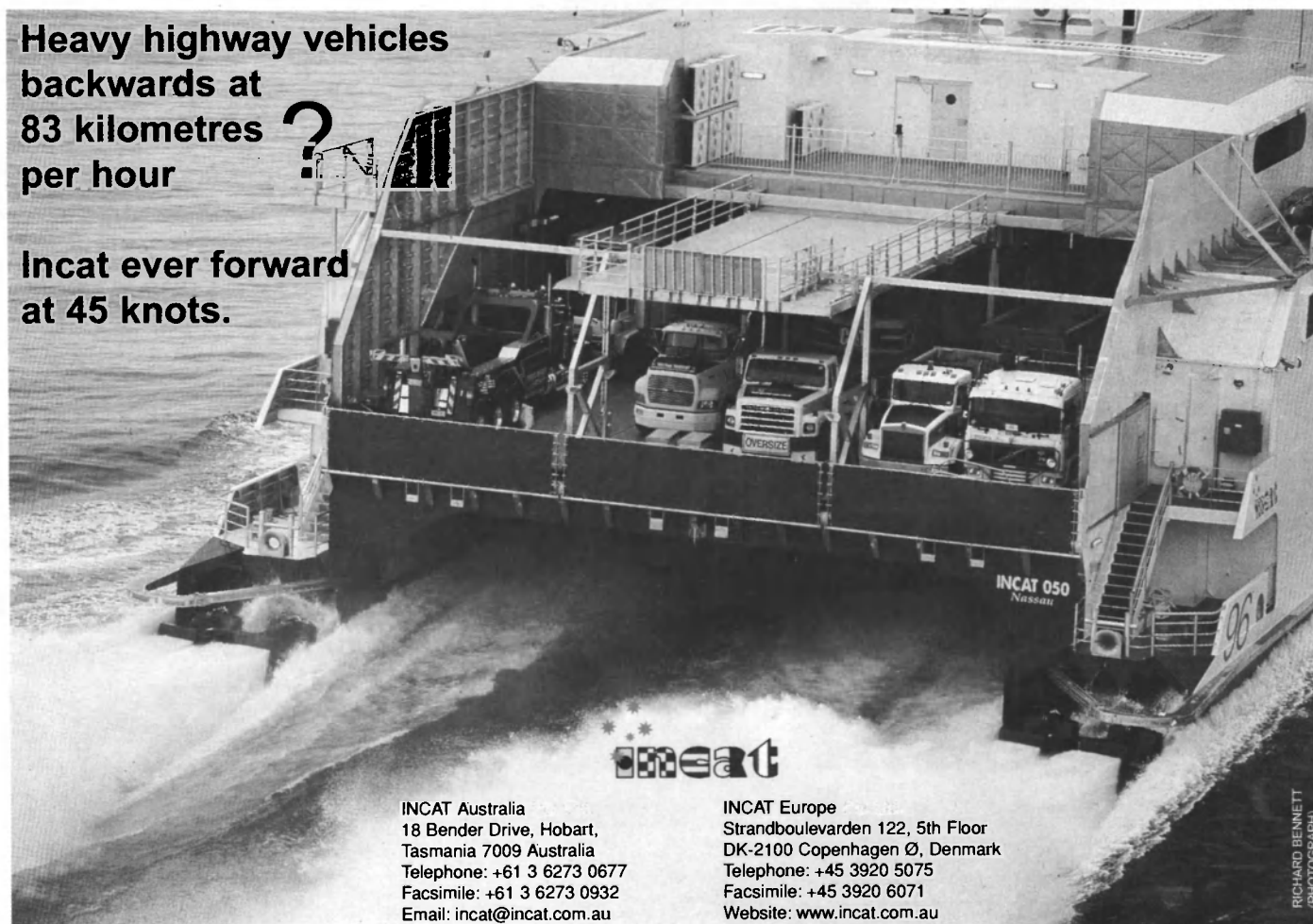
As a part of a team that has worked on water wells for three decades, one of the first observations is that the rusticles look very much like the iron bacterial growths often found down water wells. This was particularly true of iron cased water wells suffering from biological plugging. The technologies and experiences were transferred to the RMS Titanic site in the 1990's with the IMAX expedition followed by the 1996 and 1998 expeditions. Of particular concern was the rate at which the deterioration of the ship was occurring and what was the rusticles role in this event. In both 1996 and 1998, rusticles were recovered both directly from the hull and also from steel recovered from the site. Using images from these and other expeditions, it became very evident that the rusticles are growing faster, covering more of the steel, while at the same time, the ship's structures are beginning to collapse in a form of biological implosion. The questions therefore relate to what are the rusticles, why are they there, and where is the iron going?

In 1996, a preliminary survey was made of the bow on the wreck site and the size and mass of the rusticles projected. Subsequent analysis found the iron content ranged from 20 to 36 percent (average, 27 percent) with densities ranging from 1.2 to 1.8 (average, 1.4). All of the rusticles were very porous and retained 25 to 60 percent of the water when subjected to passive drainage. This was due to a sorptive capacity of 25 to 95 (average, 40) sq. m./g, a quarter, to a third of that of granulated activated carbon. Scanning electron microscopy performed by Dr. **Henrietta Mann**

(Continued on page 66)

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Coatings & Corrosion Control

Sherwin-Williams Introduces New High-Performance Waterborne Acrylic

Sherwin-Williams Industrial and Marine Coatings group, introduced a high-performance waterborne acrylic,

SHER-CRYL HPA, that reportedly saves owners and applicators time and money.

The self crosslinking single component, SHER-CRYL, protects



steel structures with superior exterior performance in harsh service environments. It has exterior durability comparable to that of solvent-based urethanes and provides resistance to early moisture contact, corrosion and chemicals.

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Fuel Mag Certified By BV

The Fuel Mag NSA diesel fuel conditioner was officially certified from Bureau Veritas. Manufactured in New Zealand, the product is distributed exclusively by Fuel Dynamics to North and South America, and comes in seven standard sizes from .25 in. to two in., depending on the fuel line. Fuel Mag has been available to the boating industry for about two years solving the problem of organic decontamination in diesel fuel systems.

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Maritime Reporter/Engineering News

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Marine Engineering

Astilleros Espanoles Delivers Innovative Chem Carriers

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This flexible cargo section is divided into 36 integral tanks and four deck tanks, designed to carry IMO type 1 and 2 chemicals, plus hazardous and corrosive cargoes by means of two longitudinal bulkheads vertically corrugated.

An exception to this would lie in cargo tanks numbered one, two and 13, where the longitudinal bulkhead is arranged in the centerline.

Cargo tank capacity amounts to 25,220 cu. m. with payload cargo reaching a 24,720 cu. m. total at 98 percent cargo tank capacity. Reflecting the vessels' high standards, each tank is served by its own submerged hydraulically driven cargo pump and associated piping made of 316L stainless steel.

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Maritime Reporter/Engineering News

systems according to each tank specification, as well as cargo line pressure sensors in each cargo pump. Additionally, each cargo tank is fitted with three, two or one multistage fixed tank cleaning machine.

Fully equipped with an integrated navigation bridge, fulfilling the one man bridge notation, the vessels also feature a set of systems that include one voyage

data recorder system and one rate of turn indicator (ROTI) system with three repeaters.

The bridge system integrates a variety of functions such as digital radars, adaptive track pilot and position sensors to be carried out either manually or automatically from a single workplace.

Able to apply a service speed of 15.2 knots, the vessels' structure includes a

double skin design and double bottom running the entire length of the cargo section plus the engine room, with the double sides offering cargo protection.

The fuel oil tanks are located above the double bottom in the engine room and forward of the cargo section, while 11 ballast tanks are arranged in double bottom-double side spaces.

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Main Particulars	
Classification	DNV
Length, o.a.	533 ft. (162.6 m)
Length, b.p.	505 ft. (154.1 m)
Breadth (molded)	78 ft. (23.7 m)
Depth (molded)	44 ft. (13.3 m)
Draft	10.1 m
Deadweight	22,460
Propulsion power	6,500 kW
Service Speed	15.2 knots
Capacity	25,220 cu. m
Crew	28

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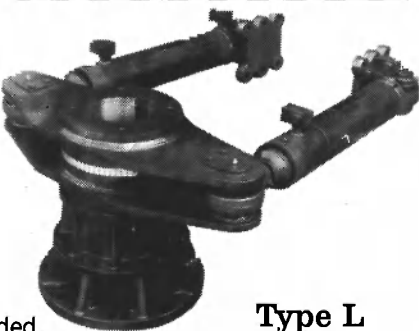
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27

Automated Combustion Analysis: Taking The Measure of Peak Performance

Monitoring diesel engine performance by traditional, manual methods can be time-consuming and imprecise. The limitations of those methods make it difficult to identify and pinpoint performance problems reliably. In addition, preventive maintenance routines adopted to compensate for lack of adequate data inevitably incur unnecessary costs—while the engine can still suffer from problems and imbalances that occur and remain undetected between scheduled overhauls.

Ship owners and operators in fast-growing numbers are turning to automated combustion analysis to eliminate the costs of reliance on manual monitoring. In the span of a few minutes, an automated system can provide a com-

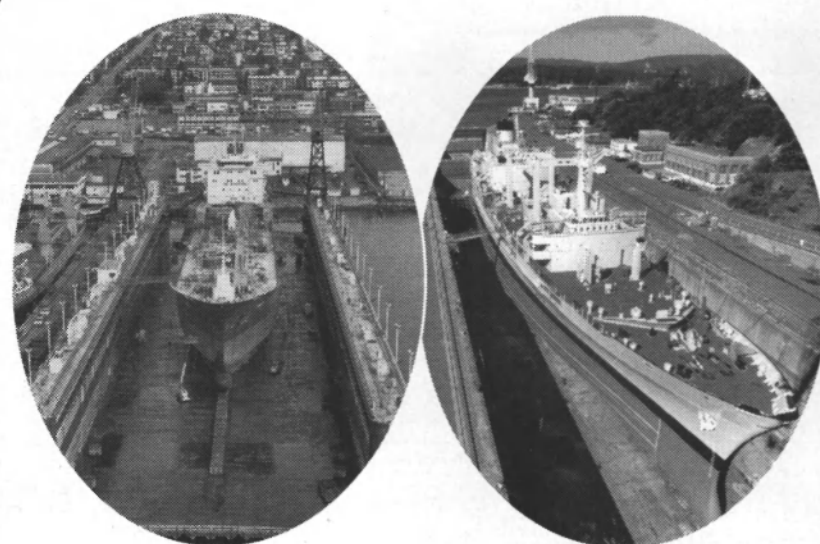
plete, accurate picture of what is actually happening during the combustion process in each cylinder. Advanced systems operate on personal or notebook computers, capturing combustion process and fuel injection data in real time using sophisticated electronic sensors. Easily accessible in familiar formats, the data they provide can be used to optimize both the mechanical operation and ignition timing of each cylinder. The savings from the resulting improvement in fuel consumption and combustion performance are obvious benefits of a well-tuned engine.

Automated monitoring also allows accurate, detailed diagnosis of indicated power across all cylinders for efficient correction of thermal stress and

load imbalances. Proper balancing reduces the stress and wear on engine parts for longer service life and lower operating and maintenance costs.

To illustrate the unique contribution that automated monitoring makes to achieving maximum efficiency and savings, we will look at two recent shipboard applications utilizing the DPA Diesel Performance Analyzer from Ashland Specialty Chemical Company's Drew Marine Division. We will also examine more closely the impact of automated analysis on the

Using Drew Marine's DPA Repeater unit, the operator can read out key cylinder measurements as they are taken and make timing adjustments on the spot. In addition, the unit allows operation of the entire system by a single operator.



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28

EMPLOYMENT OPPORTUNITIES



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R&B FALCON DRILLING COMPANY is currently expanding its fleet of deepwater drillships and semi-submersibles. Several of these vessels are initially outfitted to drill in 7,500 feet of water and designed for 10,000 feet which represents state of the art dynamically positioned (DP) design. Focusing on safety, reliability, and efficiency, these vessels incorporate significant technological advances in their design, water depth, and drilling capacities.

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CHIEF OFFICER

Chief Officer Unlimited license issued by a major maritime nation is required. Candidates with a minimum of three years experience as a Chief Officer on large, ocean-going vessels are encouraged to apply. Great tonnage tanker experience is preferred.

2ND MATE/DP OPERATOR

2nd Mate Unlimited license issued by a major maritime nation is required. Candidates with experience working on dynamically-positioned vessels are desired. Persons trained on Simrad or Nautronix DP systems are preferred.

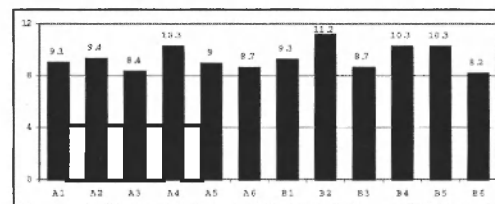
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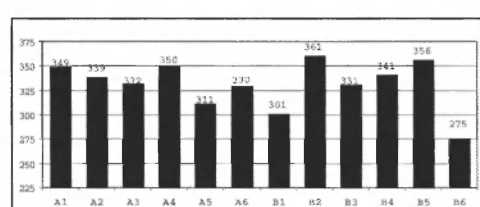
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Mean indicated pressure p(ind) [bar]



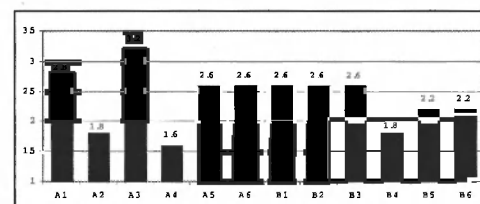
It is not possible to properly balance the engine indicated in the charts to the right using only Exhaust Gas Temperature (EGT) and Maximum Cylinder Pressure. All performance parameters must be analyzed in aggregate to ensure that individual load adjustments are beneficial—and that any mechanical issues involved are corrected.

Exhaust Gas Temperature t(gas) [C]



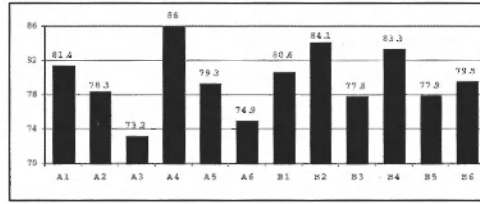
Load Balance – Although there are two high-load and two low-load cylinders, EGT reflects only the high load on B2 and the low load on B6. A4 is overloaded, but has early ignition reducing the EGT—and A3 has low load, but late ignition increases the EGT.

Angle at fuel ignition a(ign) [deg]



Maximum Pressure Balance – The combined influences of ignition timing and load problems in A4 and A3 must also be considered to understand fully the maximum cylinder pressure variances for both. Low compression pressure for A6, which explains the low maximum cylinder pressure, would be confirmed by the DPA system's Compression Pressure charts (not shown).

Max. cylinder pressure p(max) [bar]



Source: Drew Marine's DPA DIESEL PERFORMANCE ANALYZE

typical engine maintenance profile.

Added parameters for precise diagnosis

In our first case, a training exercise using a portable unit onboard a Mediterranean cruise ship paid an extra dividend by documenting and diagnosing a pair of previously unsuspected engine problems. Bar charts generated by the automated system immediately identified low Compression Pressure in one cylinder of the vessel's four-stroke, medium-speed engine. Typical of many similarly powered vessels, ship engineers previously relied on exhaust gas temperature (EGT) and peak cylinder pressure readings for periodic assessments of the engine. However, compression pressure anomalies on four-stroke, medium-speed engines are almost impossible to detect and confirm based only on those measurements.

The system's additional measurement of Angle at Fuel Ignition made it easy to pinpoint the compression problem by ruling out ignition timing as a factor. The engineer was then able to focus the investigation on possible mechanical causes, such as worn piston rings, damaged liner or leaking valves. The solution was likely to be relatively inexpensive, while the cumulative costs of high-

er fuel consumption and escalating damage due to the undetected problem could have been substantial.

In addition, the Mean Indicated Pressure chart generated by the system showed an unbalanced engine with two high-load and two low-load cylinders. An analysis of all available parameters showed ignition timing issues with possible mechanical causes for two cylinders, which needed to be investigated before adjusting fuel pump timing. The pieces of the picture provided by EGT and peak cylinder pressure data alone were not sufficient to tune the engine effectively in this case. A supplemental report provided to the ship engineer highlighted the importance of analyzing all factors in aggregate to avoid actions that could worsen the thermal load, instead of improving it.

The report also documented the resonance effect on the indicator line of a four-stroke, medium-speed engine. Pressure pulses reflecting the length and shape of the indicator tube mounted on the valve can increase maximum pressure by 2 to 5 bar. Correction for the distortion, which the DPA system calculates using a unique digital method, is a requirement for reliable accuracy in automated systems. Accuracy to within 0.1 bar on the pressure diagram, as well

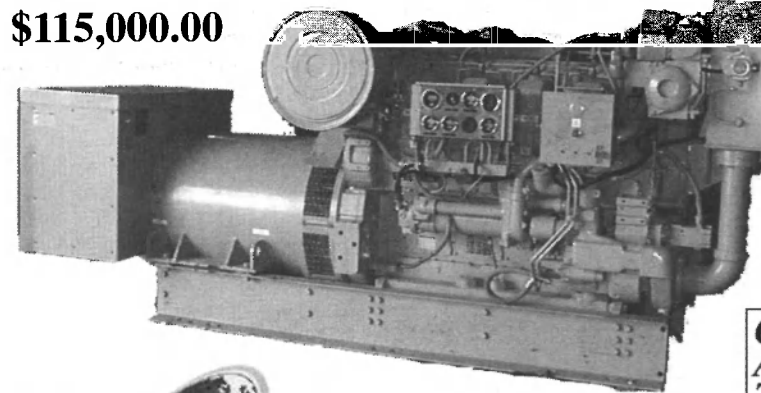
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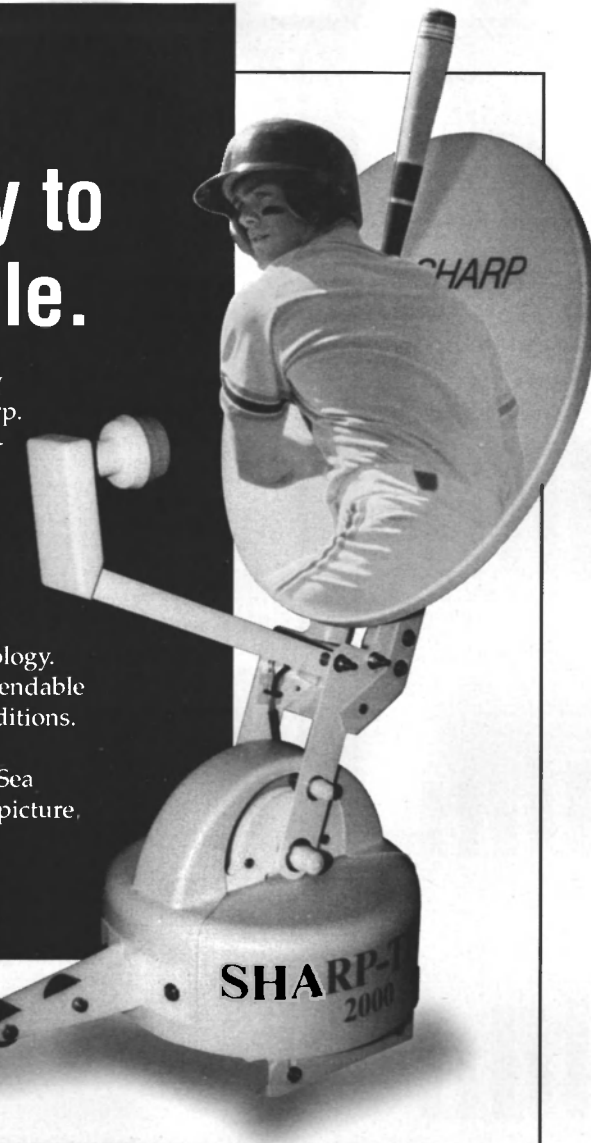
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Marine Engineering • Engine Performance

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Injecting the fuel side into the picture

An additional sensor for the high-pressure fuel line, available as an option with some automated systems, can provide data for monitoring injecting pressure, greatly simplifying the analysis and correction of fuel-side problems. After installation of a DPA system onboard a container vessel calling in the Pacific Rim, the option easily paid for itself with a fast diagnosis of a leaking fuel pump. Although relatively common, it is difficult to detect leaking fuel pumps using common, manual tools, including the draw cards used previously to indicate this vessel's main engine. And like most circumstances where deterioration in mechanical parts starts to impact performance, failure to identify the problem and act promptly can easily result in more costly breakdowns and repairs in the future.

In this case, the Mean Indicated Pressure bar charts following a routine measurement showed an anomaly in one cylinder. A quick review of the data showed no difficulties with compression pressure, and the Injection Pressure charts immediately confirmed the most likely problem, allowing timely replacement of the leaking pump.

Maintenance by the facts—instead of by the book

Because of its ease and convenience, many ship engineers are using automated combustion analysis to look at their engines periodically—some even take weekly measurements. As demonstrated by both cases discussed above, this kind of monitoring can catch problems early and simplifies tuning the engine for peak efficiency. Two-stroke engines monitored with the DPA system can even be adjusted while running, allowing immediate correction without disrupting operating schedules.

With reliable data, operators can do maintenance and make repairs when they are needed, based on the documented condition of the engine. As a result, automated analysis is also revolutionizing engine maintenance practices. It is no longer necessary to open up the engine and replace components at regular intervals based on the calendar or running hours. Instead, the intervals between maintenance or overhauls can be extended with confidence, provided the monitoring system confirms that the engine is balanced and all combustion parameters are within normal limits.

Acceptance of the concept of condition-based engine maintenance is growing, as manufacturers continue to build more "intelligence" into the engines themselves using electronics and sensors. There are also signs of official endorsement. At least one classification society is preparing guidelines for its use and possible exemptions from requirements for periodic inspections.

As owners and users attest, automated combustion analysis pays back its cost very quickly in manpower, equipment and operating savings. And more reliable engine performance also means safer ships. With more data and better data for monitoring that performance, everybody gains.

Circle 197 on Reader Service Card

Article courtesy of Rob Van Solingen, Product Manager, Engineered Systems & Products, Ashland Specialty Chemical Company, Drew Marine Division.

Maritime Reporter/Engineering News

Orient Lines Doubles Capacity With Crown Odyssey



Specializing in destination cruises, Orient Lines will increase its passenger capacity by 131 percent, when the 1,050-passenger Crown Odyssey, (formerly Norwegian Cruise Line's Norwegian Crown) enters Orient's fleet in the Spring of 2000.

Plans call for the new vessel to be deployed on the line's popular Greek Isles and Mediterranean itineraries from May through October, and will feature new destinations — such as Tahiti and Hawaii, during the winter months. The addition of the Crown Odyssey will also expand Orient's presence in the Indian Ocean, Southeast Asia and the South Pacific.

The stately Crown Odyssey, which sailed for three years as Norwegian Cruise Line's Norwegian Crown, was christened Crown Odyssey in 1988 by its original owners, the former Royal Cruise Line.

Boasting 527 staterooms, the 34,250-ton vessel will receive a multitude of onboard enhancements prior to sailing as part of the Orient Lines fleet.

Main Particulars	
Length	614 ft. (187.1 m)
Breadth	92 ft. (28 m)
Draft	24 ft. (7.3 m)
Tonnage	34,250-GRT
Speed	20 knots
Passengers	1,050 (double occupancy)
Personnel	470

World's Largest Drillship Departs Ingalls

Discoverer Enterprise, the world's largest and most advanced drillship, sails from Ingalls Shipbuilding division of Litton Industries, Pascagoula, Miss., into the Gulf of Mexico proceeding a major outfitting effort by Ingalls.

Owned by Transocean Offshore, based in Houston, Texas, the Spanish-built drillship is leased to BP Amoco for drilling duty off the Louisiana Coast. The 420 ft. (128 m) tall ship can drill in waters up to 10,000 ft. (3,048 m) deep and put down wells to 35,000 ft. Discoverer Enterprise displaces more than 100,000 tons when fully loaded.

Circle 199 on Reader Service Card

August, 1999

Hual Takes Delivery Of Carolita And Transporter

Hual AS, one of the largest operators within international car transportation, has accepted delivery of the second and third ships in a series of six; the first, Hual Trader was sent by Daewoo Heavy Industries this past December.

The second and third ships, Hual Carolita and Hual Transporter, were deliv-

ered by Tsuneishi Shipbuilding, Japan; and Gdynia Shipyard, Poland, respectively, last May.

Boasting almost identical specifications, the series of 21,400-dwt ships features a length of 656 ft. (200m), and a speed of about 20 knots.

Each of the vessels include room for 6,200 standard sized cars or a mix of lorries, cars and construction machinery.

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31

NAVIGATIONAL PILE

Plastic Pilings Inc. 

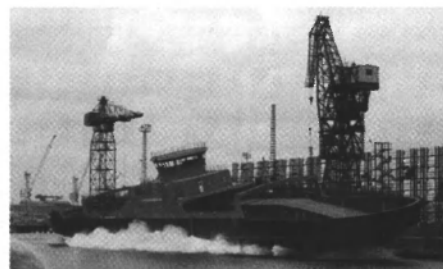
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Circle 27 on Reader Service Card

Cenal Launches Second Of Twin-Hulls



Since launching the first out of two hulls of the fjord ferries last April, Cenal Shipyard has sent out yet another vessel of the same kind, completing the twin hull shuttle ferries. Since signing a contract in March 1998 for the building of the two twin hulls for Fiskestrand Verft AS, Cenal began steel cutting and pre-fabrication of the first section for the second ferry in January 1999, followed by the installation of the sections on the slipway last April. Built according to Det Norske Veritas rules and under its survey to comply with all regulations of its class, the hull is designed to operate in Norwegian fjords carrying passengers and vehicles.

Main Particulars	
Flag	Norway
Classification	DNV
Length, o.a.	367 ft. (112 m)
Breadth (molded)	52 ft. (15.9 m)
Design draft	10 ft. (3.1 m)
Gross tonnage	1,875 GRT (approx.)
Passengers	350

CSL Niagara Christened



The largest-ever Canadian ship built for the Great Lakes-St. Lawrence was blessed at a ceremony last June at the Lake Ontario entrance to the Welland Canal at Port Weller Drydocks.

The vessel is the newest member of the Canada Steamship Lines (CSL) fleet, and the first of a trio of ships to be constructed by Port Weller as part of a \$100 million fleet reinvestment program by CSL. Measuring 740 x 78 x 48, the newbuild required more than 6,000 tons of steel. This grand project also included the construction of a new hull, which was joined to the engine room portion of the J.W. McGiffin. Featuring the most advanced self-unloading system available, the Niagara is the premiere ship to be built to the St. Lawrence Seaway's new maximum-size allowances.

Rieber Shipping Readies For Polar Prince's Arrival

The new multi-purpose subsea support/ROV vessel, Polar Prince, was

delivered last July to Rieber Shipping A/S as managing owners for the owning company Polar Holding ASA.

Constructed by Flekkefjord Slipp & Maskinfabrikk, Flekkefjord, Norway, who has an additional order by Rieber for a sistership to be delivered later this year, the price for each vessel is \$44 million.

Chartered by Sonsub International, Polar Prince exemplifies the latest tech-

nology in the market for specialized subsea support vessels. In addition to Sonsub installations onboard, the vessel's size, design and capabilities allow it to operate under severe North Sea conditions and worldwide deepwater tasks.

Main Particulars	
Flag	Norwegian
Classification	DNV
Length, o.a.	309 ft. (94.1 m)
Beam (molded)	72 ft. (22 m)



Depth (molded)	31 ft. (9.6 m)
Draft	23 ft. (7.1 m)
Gross tonnage	7,000
Main engines	2x 4,320 kW @ 600 rpm
Total power	9,800 kW
Main propulsion	8,640



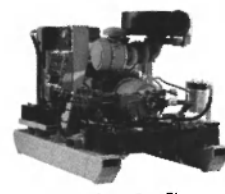
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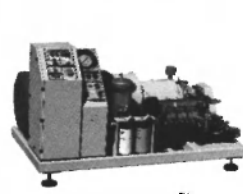


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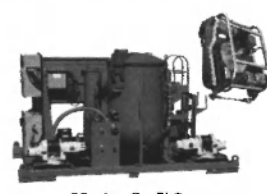
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Ferries Report

Designing A Record Breaker

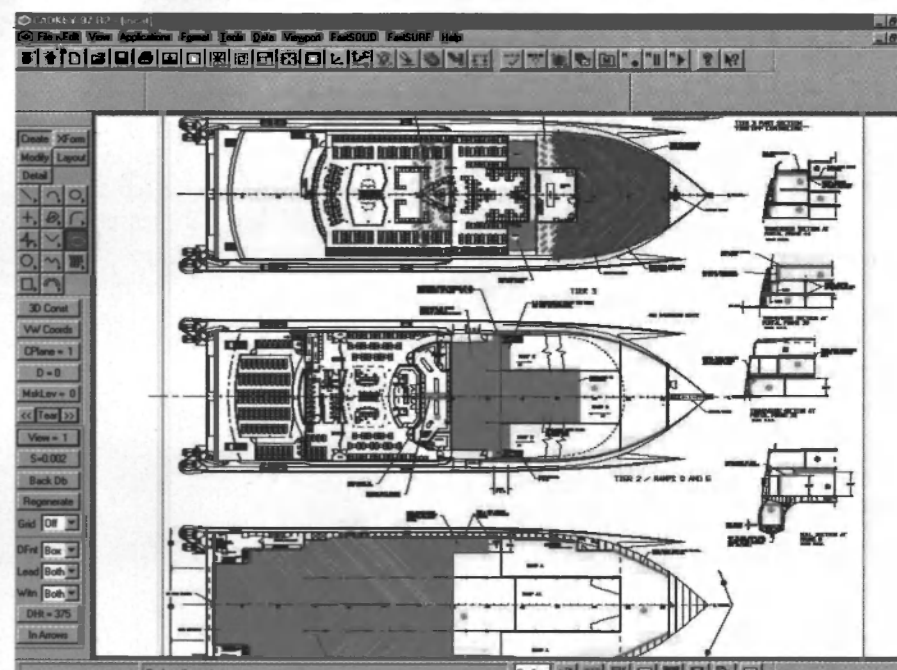
Incat Australia Pty. Ltd. is widely regarded as a premier builder of high-speed ferries, and that reputation was enhanced with the production of three wave-piercer catamarans, which hold the distinction of being the fastest ships ever to cross the Atlantic. The two latest, the Catalonia and the Cat-link V are from Incat's line of 299 ft. (91 m) wave-piercer class of fast-ferry vessels. They made their individual record-breaking journeys across the Atlantic within weeks of each other, at the average speeds of 39 knots and 41 knots, respectively.

The wave-piercer fast-ferry vessels have been launched from Incat docks in Hobart, Tasmania, Australia, since September 1997. The high-tech ferry evolved from the successful computer-

aided-design (CAD) development of a series of car ferries including 243, 256, 266 and 282 ft. (74, 78, 81, and 86 m) vessel ranges. An efficient assembly line, and a reputation for speed and great safety, has given Incat a sizable piece of the world's ferry market — almost 40 percent of the world's high-speed car ferries have been built by Incat over the last eight years.

A Deal With The Devil (Cat)

TT-Line introduced the 299 ft. (91m) wave-piercing class of ferry catamarans by initiating a four-month charter of the Devil Cat across Australia's Bass Strait, between George Town, Tasmania and Port Melbourne, Victoria. This route is 227 nm, the longest non-stop open-sea fast ferry route in the world. Devil Cat



crossed the route regularly in less than six hours. The 315 ft. (96 m) class ships carry 900 passengers and crew, as well as up to 240 cars.

In April, the Devil Cat sailed to Canada to operate 14 hours a day during summers between Bar Harbor, Maine and Yarmouth, Nova Scotia, and its name has been changed to "The Cat." It has been very successful on its new route. TT-Line secured a larger 315 ft. (96-m) wave-piercer in its place to run the Bass Strait route in the 1998-1999 season.

Design Evolution With CADKEY

The wave-piercing Incat catamaran design was first developed in the early 1980s, and has undergone 15 years of refinement. Each of the slender, twin hulls is divided into eight watertight compartments, and the shape allows the hulls to pierce the waves rather than ride over them, giving the vessel exceptional rough sea performance.

The hulls are typically 10 percent

(Continued on page 38)



SLV's Carve Lucrative Niche



Stern Landing Vessels (SLV's) are a uniquely designed vessel from Sea Transport Solutions — vessels which incorporate a number of outstanding features to adequately answer problems inherent in conventional craft. The vessels offer not only a breadth of opportunity and operational flexibility for owners, but provide significant benefits for builders wishing to capture a unique passenger/utility/container/RoRo niche.

The SLV was conceived as a relatively easy-to-build vessel, able to address many operational challenges facing traditional craft. For example, problems such as:

- Head seas: which can cause slamming, jarring and result in significant speed reduction;
- Poor visibility: as the bow ramp of some vessels, in the stow position, can create blind spots from the wheelhouse;
- Machinery placement: the wheelhouse on top of the machinery can cause breakdowns in concentration and fatigue due to noise and vibration; and
- Beaching/de-beaching: traditional vessels can frequently encounter difficulty, particularly when the bow has grounded.
- Lack of deadweight: limited by the relatively low profile of the GZ curve, or a relatively small righting lever, the small freeboard and the free surface of numerous below deck flat bottom tanks.

Positioned as the "solution" is the SLV, a product that ASDMAR claims is a better alternative with several working case studies as examples. The SLV incorporates a shallow V hull with two side pods. The pods house the engines, helping to improve the vessel's



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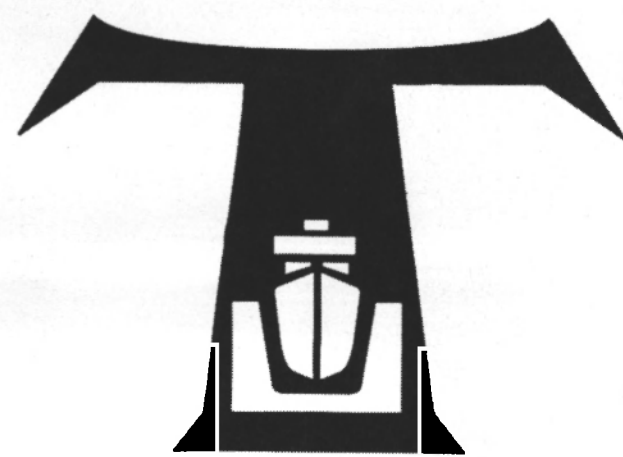


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Circle 29 on Reader Service Card

Ferries Report

righting ability. Together, with off center shafts and a beaching/protection/aft skeg arrangement, the design is positioned as an unbeatable landing craft design.

Maneuverability

When working across a current to a beach landing, the SLV can be beached in two ways:

- Anchoring upstream of the ramp and simultaneously paying out the cable while steering the vessel into the ramp;
- Fitting a bowthruster, and approaching the ramp and landing the ramp in a similar manner to a conventional landing craft, but using the bowthruster to keep the head up into the current or wind.

With the propellers being at the outside extremities of the vessel, the steering is very easy both ahead and astern. The steering is enhanced by using Shilling Rudders or, alternatively, azimuth drives can be used. Skegs protect the stern gear from beach landings.

Vessel maneuverability proved to be one of the trickier developments with the SLV. In initial designs, when the propeller and rudder were moved slightly forward, the team encountered steering difficulties in constant helm over correction. After more model testing, the problem was rectified with fixed rudder plates aft, which were incorporated into the beaching skegs. This had the dual advantage of rectifying the steering problem and strengthening the beaching skeg.

Another problem encountered in the initial stages revolved around the propellers, which were so far outboard that

small angles of roll would bring them close to the surface, resulting in the propellers "sucking" air from above and forward, causing them to cavitate freely with rpm's going over the top. This problem did not appear until the fourth vessel, as the first three were working exclusively in smooth waters. The prob-

lem was fixed with a series of cavitation plates.

It is little secret that the maritime industry is often conservative in the acceptance of new designs, particularly when it's a beaching design, which places the stern gear towards a shoaling beach. However, there is a long refer-

ence list of successful vessels in operation — including SLV Lana, which demonstrates the SLV design five times daily — which prove that an SLV can rapidly approach a concrete ramp stern first, without endangering the stern gear of the vessel.

Circle 42 on Reader Service Card



Riding
the seas

SLV Design Options

Size (m)	Speed	Cargo Capacity
20	9	38 tons on deck or 45 tons fuel below deck
25	10	95 tons on deck or 100 tons fuel below deck
35	10	470 tons (sheltered water) 350 tons (coastal) - TEU
50	11	110 tons (sheltered water) 950 tons (coastal) - 48 TEU
70	12	1,550 tons coastal - 130 TEU
80	13	3,000 tons coastal - 160 TEU
110	11	5,300 tons coastal - 270 TEU

August, 1999

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Ferries Report

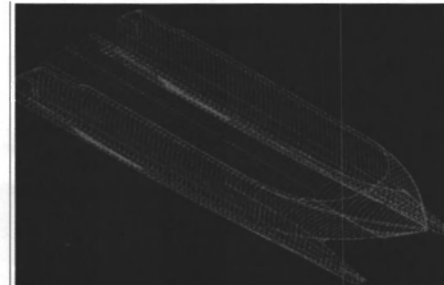
(Continued from page 34)

immersed at the bow, with 10 percent reserve buoyancy. The remaining 80 percent reserve buoyancy is held in the forward central hull, located above the loaded water line. These ratios maintain the vessels' stability in all types of

weather conditions and sea angles.

The hull form for the 299 ft. (91-m) ferries is a full redesign of the Incat catamaran design in CADKEY mechanical CAD software (Baystate Technologies, Inc., Marlborough, Mass.) "CADKEY is used here alongside AutoSHIP and MaxSurf by the naval architects to

develop the hull shape," said Lee Hedd, Incat Naval Architect and CAD Administrator. "This combination enables the designers to use the specialized buoyancy distributions and weight balance control of the traditional hull-design packages, and through FastSURF, bring that shape into CADKEY for detailed com-



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parisons and design checks. The simplicity and flexibility of 3D modeling in CADKEY makes designing the required Incat hull shape much easier."

The 91-m class of ships had interesting and challenging design parameters that required generous use of the software's 3-D modeling features.

Four massive water jets speed the ferry along the waves — each one pumping 19.8 tons of water per second. To meet with new regulations requiring the bridge to have a 360-degree view, the full-width wheelhouse has been moved forward from the smaller-class ferry designs. The wheelhouse is fitted with central and wing control positions for docking facilitation.

Passenger comfort is, naturally, paramount to a vessel of this nature's success, and according to the builders, these ships are built for speed and comfort. According to Hedd, "The anti-vibration mounts are placed on the 3-D superstructure model and checked for required clearances and tolerances before the final installation details were decided." Incat then enhanced the "total passenger experience" by including two sheltered sundeck areas behind the wheelhouse. These offer an expansive view of the horizon and a good look inside the wheelhouse.

The interior design of the 91-meter ships is provided by Incat's In-house Design Group (IDG), and their mandate is to maximize onboard revenue potential while still retaining the unique style and comfort for passengers, keeping in mind that the ships will be used on long open-seas routes.

Seating for the 877 paying passengers is accommodated with aircraft-style seats. The upper passenger level has a bar with banquet style chairs. "We even used CADKEY to arrange and detail the interior of the passenger cabin. The IDG can quickly provide and modify layout proposals for customers, including 3-D conceptual models, and then once the interior layout is finalized, IDG provides all of the required 2-D construction drawings for the interior. The very plans that the customer agrees on become the plans used to build the vessel. The ability to use one CAD package for all of this has proven to be very cost-effective," Hedd said.

Circle 2 on Reader Service Card

Project Pecan: A tough nut to top



An innovative high speed car and passenger ferry currently under development by Nigel Gee & Associates and sponsored by Norasia Services is dubbed Project Pecan, and is based on the patented Pentamaran hull form (Int. Pat App PCT/GB96/02313).

The vessel design, much like others in its classification, is designed for the best possible combination of low resistance and good seakeeping capabilities. Project Pecan deviates from traditional designs with its stability enhanced by the use of two pairs of slender sponsons, which are designed to provide the vessel the required stability with very little effect on resistance and powering. The result, according to the designer: a design able to be propelled at high speed using significantly less power than other vessel forms. In fact, the power and resultant fuel savings — which is a major initial and life-cycle cost of the vessel — are quite staggering, based on the designer's calculations. The designers say that a Pecan vessel would require only 75 percent of the installed power (using aluminum construction and high speed diesels) than that of an equivalent new generation fast monohull and catamaran car ferry. Alternatively, if built in steel and using medium speed diesel engines, vessel powering is roughly equivalent to the current generation of monohull and catamaran vessels.

Playing on owner's perceptions/hesitations regarding the use of lightweight materials and high power to weight prime movers, the Pecan concept uses steel construction throughout the hulls and car decks, with only a limited amount of aluminum in the passenger and control spaces, powered by a pair of Wartsila 20V380 medium speed diesel engines. The designer reasons that this combination provides a potential new customer with the benefits of a high-speed vessel combined with a similar maintenance approach as existing fleet.

The first Pecan ferry designed measures 436 x 92 ft. (133 x 28 m), able to carry 1,000 passengers and 200 cars at 40 knots utilizing Kamewa steerable waterjets.

Circle 3 on Reader Service Card

Fullers Group Orders High-Speed Catamaran Ferry

A fourth vessel was ordered by the Fullers Group in March to be delivered in November 1999 by WaveMaster. This latest vessel follows the 135-ft. (41 m) high-speed Catamaran ferry Superflyte delivered by WaveMaster in November 1996. The new vessel's main

deck will accommodate 186 passenger seats, while the main passenger lounge is equipped with all the usual facilities including ducted air conditioning, ceiling mounted TV/Video monitors and aircraft type seating. The upper deck has external seating equipped for 114. With a service speed of 27 knots, the vessel will be fitted with MWM TBD620V8 engines and will operate on

Auckland Harbor including a new route to Half Moon Bay.

Circle 4 on Reader Service Card Main Particulars

Registration New Zealand
Length, o.a. 105 ft. (32 m)
Length, (on waterline) 95 ft. (29 m)
Beam (molded) 29 ft. (8.8 m)
Hull depth (molded) 10 ft. (3 m)
Deadweight (300 passengers @ 75 kg) 22.5
Engine Deutz



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Minoan Flying Dolphins Buys Three New Ferries

Minoan Flying Dolphins invested an estimated \$89.3 million in ordering three new highspeed ferries from Austal. Each of the vessels will be deployed in the routes servicing the Cyclades and Sporades islands in the Aegean Sea. The ferries are scheduled for delivery in June 2000. At a cruising speed of 42 knots, the new ferry are designed to cut

the travel time to the island of Santorini by 66 percent. It will have a capacity for 1,050 passengers and 200 cars.

Jonathan Swift Features Nucleus2 Nav Equipment

Irish Ferries first fast ferry, a 282-ft. (86-m) vessel built by Austal Ships and dubbed Jonathan Swift, recently entered service on the Dublin-Holyhead route. The ferry is outfitted with many

advanced products and systems designed to ensure its operational efficiency and safety, including a pair of Nucleus2 6000 ARPA radar system, with S and X band antenna and a Nucleus2 5000 ECDIS with "duel fuel" ENC and faster chart display capability.

Circle 6 on Reader Service Card


PRS Orders LMS Equipment

Litton Marine Systems received an

order for an AMIRIS infrared imaging system and other electronics to be placed onboard a new 148 ft. (45 m), 300-passenger catamaran ferry under construction at the Pequot River Shipworks. The contract for Litton entails the supply of a C. Plath Navigat X MK 1 gyrocompass, navipilot HSC autopilot, as well as the AMIRIS infrared imaging system.

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Couplings For Demanding Fast Vessel Service

Vulkan Rato-couplings are designed to offer the widest range of flexibilities to meet the requirements of different drivelines, from diesel-mechanical main and secondary drives for ship's propulsion and power-take-off or power-take-in. The company has found success with its Rato-R line in many high-speed applications, both monohull and catamaran configurations. Center to the couplings success is its flexibility in terms of application, as customized designs form a big part of couplings delivered from Vulkan.

Circle 8 on Reader Service Card

Austal Sells Ships

Aluminum shipbuilder, Austal Ships has confirmed the sale of three Auto Express high speed, vehicle-passenger catamarans to Greek company, Minoan Flying Dolphins Maritime.

Hamilton Jet Garners Array of New Orders


Alabama-based offshore operator, P.G. Charter Boats have ordered a new 164 ft. (50 m), high speed survey vessel driven by Hamilton water jets. The aluminum craft, which resembles Gulf of Mexico crewboats, will be driven by triple Hamilton waterjets powered by MTU diesel engines through ZF gearboxes. The propulsion system will be controlled by a dual station HamiltonJet MECS software configurable electronic control system.

Designed by de Jong and Lebet of Jacksonville, Fla, the vessel will be constructed at Freeport Shipbuilding.

HamiltonJet will also supply a new six boat series of powered Inshore Patrol Launches to the Hong Kong Marine Police. Currently being built at the Cheoy Lee Shipyard in Hong Kong, each of the 42 ft. (12.8 m) craft will be driven by a twin shipset of Hamilton waterjets with an expected speed of 35 knots.

This project extends HamiltonJet's long association with the Hong Kong Marine Police that began in 1982 when the company began installing waterjets in various series of Patrol Craft, which are still currently running.

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Marine Literature Review

Southeastern Connecticut Enterprise Region

Learn about Southeastern Connecticut — the ideal location for marine-related businesses. We offer a great location (only a two-hour drive from both Boston and New York), a deep water port, enterprise and foreign trade zones, targeted tax breaks, resourceful incentive programs and a special marine loan fund. 1-888-6 SECTER. Web address: www.secter.org. **Circle No. 106**

Signs For Safety

Maritime Associates Inc. manufactures and supplies a complete range of IMO/SOLAS safety signs and posters as well as LLL pathway systems. The company uses a number of materials in manufacturing, including the internationally certified American Permalight substance used to make the photoluminescent signs. **Circle No. 107**

PREDICT/DLI

For more than 30 years, PREDICT/DLI has implemented the world's largest and most successful predictive maintenance programs. This experience is a key element of our condition monitoring programs, expert diagnostic software and advanced vibration and oil laboratory instruments. Our new generation of PdM products provide answers, not just data. These products range from vibration and oil analysis screening tools to advanced diagnostic data collectors and oil laboratory instruments. **Circle No. 108**

Schaefer, Inc.

Schaefer specializes in developing and building switchmode converters and inverters as well as thyristor-controlled power supplies and battery chargers. Schaefer designs modification of standard modules to meet requirements and production at a high quality level. Manufactured according to DIN EN ISO 9001. **Circle No. 109**

MMC International Corp.

MMC International Corp. manufactures portable restricted gauging tapes designed for speed, simplicity and accuracy. A Restricted Trimode (UTI) measures ullage, temperature and interface with a single penetration through an MMC vapor control valve. Ideal for shipboard tanks. U/I, oxygen-sensing and temperature-only models are also available. **Circle No. 110**

MAN B&W.

MAN B&W is one of the world's leading ship propulsion specialists, and state-of-the-art propeller and control system technology

forms a crucial cornerstone of the complete propulsion package. From Main Engines to CP Propellers and Control Systems, to Generating Sets, to CAPA and CoCo Software... MAN B&W has it all! **Circle No. 111**

Papua New Guinea Dockyard Ltd.

Papua New Guinea Dockyard Limited is the largest dockyard east of Singapore. Its facilities include ship construction, ship repair — aluminum and steel — Marine and general engineering, State-of-the-art spray painting, propeller and shaft repairs, marine electronics and more. **Circle No. 112**

Holland Roerpropeller (HRP)

With the background of the impressive Dutch Maritime market, specific knowledge and over 25 years of experience, HRP has become a well known name, recognized both nationally and internationally. The constant care for quality of products, as well as the service rendered all over the world, is the sturdy foundation for the continuing expansion of users and the key to an excellent reputation. **Circle No. 113**

Superior-Lidgerwood-Mundy Corp.

Superior-Lidgerwood-Mundy (SLM) has been a designer and builder of Capstans, Hoists and Winches since 1869, and is one of the oldest manufacturers of this type of equipment in the world today! The longevity of SLM is attributed to its dedication in manufacturing quality into each and every unit SLM builds. **Circle No. 114**

Thordon's Proven Bearing Systems

Thordon's R & D continuously evaluates new product ideas to provide innovative marine bearing and shaft system designs. Recent Thordon product developments include Sealion Mechanical Seals featuring a rotary carbon-graphite face design, Thordon automatic stuffing box, lightweight polymer Thor-Screen sea suction screens, Thordon's self-positioning intermediate lineshaft bearing and Thor-Coat, a toughened, modified epoxy shaft coating. Today, with over 25 years of trouble-free installations documented, Thordon marine bearing systems are the proven reliable pollution free solution for ship owners, managers and yards who demand the best. **Circle No. 115**

Peto Services Ltd.

Peto Services has just opened a new Peto Services Repair Facility in Southampton, England. This new facility offers a full Marine Elec-

trical Repair, Refit & Call out service. This provides additional support to its existing Fast Ferry and Boat building clients while enhancing its position within the area. **Circle No. 116**

North American Cutting Systems Forms New Partnership

North American Cutting Systems offers sales and services of custom cutting machinery. We can provide new systems, remanufactured systems, used systems or rebuild and retrofit customers existing systems. Cutting Machines can be manufactured for Plasma, Oxyfuel, Routing Laser or Waterjet cutting. North American cutting systems is now in a new partnership with Profile Cutting Systems of Australia. **Circle No. 117**

Grinnell Fire Protection

Grinnell designs, engineers, manufactures, installs, inspects and services fire alarm and detection equipment, sprinkler and special hazards equipment and systems, integrated facility management systems, security, life safety, and access control systems worldwide. **Circle No. 119**

Northeast Industrial & Marine Equipment Supply

Specializing in hard-to-find parts, Northeast offers a variety of hydraulic motors, control valves, hydraulic hoses and fittings, pumps, winches, industrial hardware, electric motors, hydraulic power units, aluminum deck hatches, and other useful items from its Cape May, N.J. location. **Circle No. 144**

Hornblower Marine Services

Hornblower Marine Services is a privately held company serving the high-speed ferry, car ferry and riverboat casino industry. It provides professional, effective management solutions through comprehensive marine management programs to vessel owners and operators. We help clients meet changing market conditions with high-technology resources and sophisticated management programs. **Circle No. 160**

Custom Nozzle Fabrication

Custom Nozzle Fabrication (CNF) features Kort Nozzles, all sizes, with ABS Certification upon request. Products are "Manufactured in the USA," with quick delivery and are built to customer specifications. **Circle No. 161**

The Ultimate Protector

Today's modern vessels require superior performance and protection from a Fendering

system. Urethane Products Corporation has a proven system for today's demanding marine operations. Marine Guard fenders are designed to safely absorb the immense amount of energy generated by a ship as it approaches a dock, pier or another ship. **Circle No. 162**

MEBA Calhoon

Calhoon MEBA Engineering School offers a curriculum of over 25 different courses, all of which meet or exceed STCW requirements. **Circle No. 165**

Thermax

Thermax non-combustible, non-toxic, marine construction boards are used worldwide for joiner bulkheads, 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 size in North America by PSI. **Circle No. 163**

Owens Kleen Tank

Marine Wastewater Treatment Systems — The Owens Kleen Tank uses aeration and operates as an extended biological aeration system. It is self-contained and delivered to 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. **Circle No. 164**

W.L. Gore

High-performance shaft packing — GFO marine shaft packing is a proven, long-lasting, high-tech packing that's virtually maintenance-free and hardly ever drips. It installs easily and dissipates frictional heat so that it handles high shaft speeds without being destroyed. (800) 455-2791. **Circle No. 166**

Phillystran, Inc.

Phillystran, Inc. designs and manufactures synthetic fiber ropes & strength members from high tech fibers such as Kevlar, Technora, Twaron, Vectran, Spectra, and polyester. Phillystran ropes are available with break strengths ranging from 100 to over 2,000,000 pounds. **Circle No. 167**

Craft Bearing Co.

Located in Hampton, Virginia, Craft Bearing Company is a leading world supplier of split cylindrical roller bearings. Craft's innovative split design makes replacing a bearing a minor maintenance job instead of a potentially catastrophic event. Craft also offers complete technical support. **Circle No. 170**

Marine Literature Review

Sailor --- When Safety Counts

With Sailor maritime radio equipment you are always on safe ground, even when you are on the open sea. And safety is what counts on every vessel - for the crew as well as for the owner. Ever since Mr. Simon Petersen founded the company S.P.



Radio in 1948, the green Sailor radios have ruled the seven seas. After more than 50 years of innovation and constantly improving our products, we have learned that a good reputation and loyal customers do not just appear on their own accord - they have to be earned.

Circle No. 120



Flexlight --- Remote Controlled Searchlight

Flexlight meets, and exceeds all class requirements thanks to its unique design of reflectors. Its products offer the following: remote controlled searchlight with a unique movement, rotating 360 degrees horizontally and 360 degrees vertically simul-

taneously, non-stop without end position, no risk for cable breakages, and remote control with auto-focusing. Plus, Flexlight provides a wide section of light power!

Circle No. 121

Hellenic Shipyards

Over the years, Hellenic Shipyards Co. has acquired a very solid reputation in the ship repair and conversion markets. It has demonstrated its technical capabilities by tackling complicated and specialized repairs varying from complete bottom hull repairs, to extensive engineering works, to the complete re-tubing of uncommon main boilers, etc. In addition to having carried out repairs on all types of vessels, it has also been involved in repairs of oil rigs and other floating installations.

Circle No. 122

Singapore Technologies Marine

Singapore Technologies Marine has the capacity to undertake extensive ship repair work from jumboization, conversion, refurbishment, reactivation to upgrading of various military and commercial vessels. Its commitment to achieving faster turnover, competitive pricing and quality workmanship, are virtues that position it in the forefront of a competitive market. Supported by excellent facilities and technology, and a highly trained workforce, Singapore Technologies Marine is geared to meet all of its customer's needs.

Circle No. 123

Haley Marine Gears Inc.

Haley's Highly Resilient Couplings (HRC) is a highly flexible, vibration-isolating torsional coupling with important dampening abilities. The HRC Coupling is designed for use between vibration sources and the rest of the powertrain, e.g., the engine may be isolated from the gearbox, generator, pump or propeller. The ease of maintenance and disassembly, are among the features that make the Haley HRC coupling the choice for today's applications. The Haley HRC coupling is offered in three different configurations to meet the customer's unique needs. The Haley HRC coupling is manufactured in ten basic sizes for each series. The basic size of the HRC coupling depends on the mean torque and severity of service.

Circle No. 124

Cooper Power Tools --- Master Power Launches New Line

You can get the most out of this versatile tool whether you are grinding corners, entering grooves or channels, deburring, or strap polishing. The new MasterFile line from Master Power is unique in that it offers you the flexibility of ordering it with only one contact arm that the customer selects or any of three different inter-

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Marine Literature Review

changeable contact arms that are also offered to suit all removal needs. These different arms are available in kit form or each contact arm can be ordered separately to replace, complement or augment existing equipment. To speed up the changes, the new MasterFile tool comes with a unique belt cover designed for quick removal. **Circle No. 125**

Hammelmann Corp.

The new Hammelmann ML 3000 Aquablast Unit is designed to be operated from manlifts or dock arms. The Hammelman ML 3000 Aquablast Unit is capable of operating at 3,000 bar or 43,500 psi. It is complete with direct vacuuming capabilities for removing waste water and solids. Typical applications include hull cleaning and surface preparation, oil and gas storage tank cleaning and surface preparation, as well as concrete surface cleaning and preparation. **Circle No. 126**

ICG Satellite Services

ICG, based in Miami, has two divisions: Maritime Telecommunications Network (MTN), a major provider of C-Band voice, fax and data communications to the cruise industry, the U.S. Navy, and to offshore oil & gas platforms worldwide; the International Voice and Data (IVD) division provides satellite communications to U.S. backbone providers, foreign Internet Service Providers (ISP's) and telephony carriers. **Circle No. 127**

Talleres Navales del Golfo, S.A. del C.V.

Talleres Navales del Golfo, S.A. del C.V. is a subsidiary of J. Ray McDermott, Inc. The marine construction and ship repair yard is located on the Gulf of Mexico at Veracruz, Mexico's largest and busiest port. Situated near offshore oil and gas fields and major shipping lanes, TNG has an infrastructure capable of fabricating offshore platforms, modules, and components, as well as providing full ship repair services. **Circle No. 128**

Sponge-Jet, Inc.

Sponge-Jet, Inc. manufactures, markets and services the Sponge Blasting system, an innovative commercial and industrial surface preparation technology. This dry, low dust process requires minimal containment, reduces downtime and offers a wide range of surface profiling. Reusable, abrasive or non-abrasive, Sponge Media can be used on the toughest to the most sensitive surfaces. **Circle No. 129**

Water Weights Inc.

Water Weights load test bags are a unique product for providing a load in place of traditional dead weight for all forms of load testing. This highly certified system allows safe, practical and economical use of water as a weight for load testing.

August, 1999

Water Weights can be used for: Crane Testing, Davit Testing, Lifeboat Testing, Bridge Testing, Structural Testing and Load Measurement Systems.

Circle No. 130

Maritime Progress Limited

The market leaders in marine signage, have announced in their new 1999 catalogue that in addition to their large range of dedicated marine signage and ISM



Safety Posters, they can now offer their new CAD generated Fire plan service to assist ship owners and ship managers. **Circle No. 139**

Seven Seas Communications, Inc.
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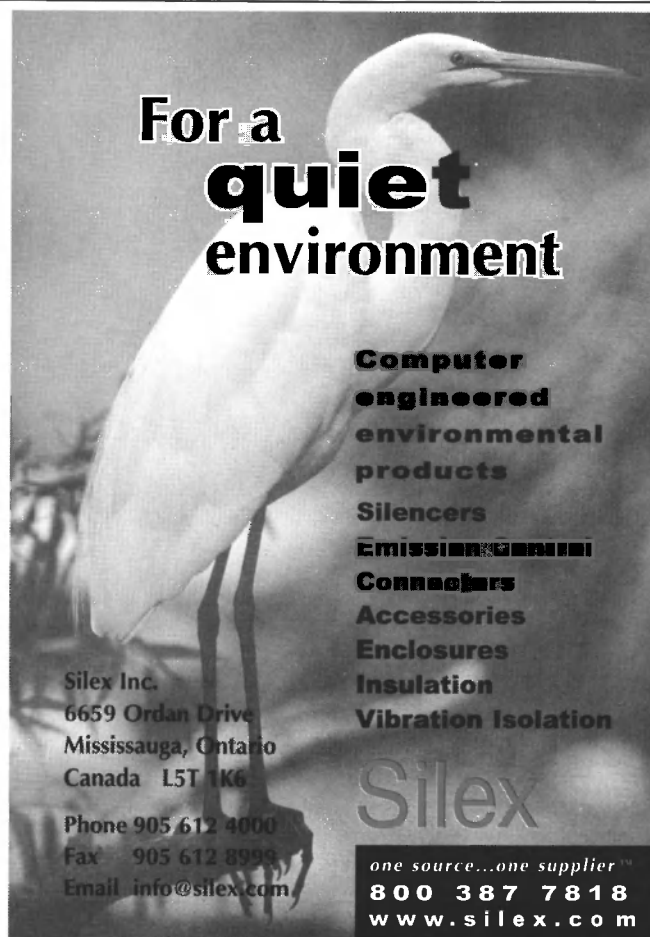
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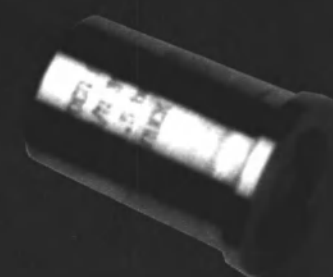
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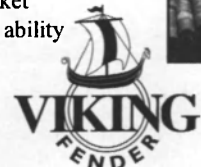
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plete portfolio of land mobile communications equipment and services. Wherever you are, Seven Seas offers solutions to meet your communications needs. **Circle No. 131**

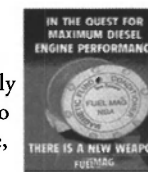
Xtek Incorporated

With a skilled metallurgical staff, whose men and women provide the technological knowledge, Xtek selects the best metal hardening technique for the demands of individual customer applications. Designers and engineers, who employ their experience and individual creativity to provide the gears and gearing systems that power heavy industry. **Circle No. 132**



Decontaminate Your Fuel Quickly

Fuel Dynamics is the exclusive distributor of Fuel Mag diesel fuel decontamination units in North and South America. Fuel Mag NSA, largely reduces costly maintenance and downtime. It also increases fuel efficiency, extends diesel engine life, and cleans the fuel without the use of hazardous toxic biocides. Call 888-825-4239 or **Circle No. 133**



Luber Finer

Luber-Finer's LFF-8000 Series Fuel Filter/Water Separator strips both emulsified and slug water from diesel fuel and dumps it into a built-in sump. It is 97% efficient at removing water, and removes engine damaging particles at the same time. The LFF-8000 is applicable with all Cummins, Mack, Detroit, CAT or IHC engines with OE spin-on fuel filters. **Circle No. 134**



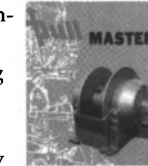
Lapeyre Stairs

Lapeyre manufactures unique fitting stairs. Some of Lapeyre Stair applications are: tanks, mezzanines, roof tops, crossovers, mobile stairs and roof hatches. Benefits are numerous: small items can be easily carried up and down the stair, close fitting handrails give better support, unique alternating tread design permits comfortable, face forward descents. **Circle No. 135**



Pullmaster Winch Corporation

Offshore and inshore planetary hydraulic winches are used in a variety of installations. They are ideal for ship cranes, dock side cranes, unloading equipment, container handling, and a variety of operations on off shore platforms. All of these operations require a high degree of dependability and PULLMASTER provides it. **Circle No. 136**



The Flexaust Company Inc.

Flexaust is proud to announce another new product, Flex-Lok. Flex-Lok is a mechanically constructed fabric hose with an external metal helix. Flexaust now has the ability to make hose out of almost any standard or exotic material due to the fact that no adhesive is used in the process. **Circle No. 168**



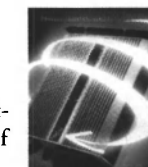
Kaydon — Fluid Power Products Group

Victor Fluid Power, a Kaydon Fluid Power Company, is a custom manufacturer of hydraulic cylinders for marine environments. Specializing in bores to 30", with strokes to 50", Victor Fluid Power also offers complete hydraulic systems and controls capability. With over 60 years of quality manufacturing experience, Victor Fluid Power is approved and qualified for ABS and DNV certifications. Call (800) 733-7021 or **Circle No. 171**



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inverter/charger products that provide superior AC output from the inverter, and couple it with superior DC output from the battery charger, creating the perfect balance of power. **Circle No. 137**

CSD Sealing Systems - North America

BEELE Engineering and CSD International have been involved with fire, water and gas tight sealing for 25 years. They have developed and tested products proven to provide the utmost in sealing protection around the world. **Circle No. 138**

Spectrum Trading

Spectrum Trading represents a complete line of water-borne rust and corrosion control chemicals and coatings. Included in this line are the TRACC BLAST high pressure, low volume pressure washing/slurry-blasting unit, Rust Deoxidizing Primer (RDP), a water-borne iron phosphating compound, and the AGP Prima-Coat and Protec-Proxy water-borne epoxy/urethane coatings system. Call: (888) 659-2653, e-mail: spectrumtrading@mindspring.com, or **Circle No. 172**

Sabine Universal Products, Inc.

Sabine Universal Products is a manufacturer of high back and trim line pilot house chairs. They have the following features: Comfort-engineering seat, fire-resistant upholstery material, high back-load capacity, full foam bolsters and lumbar support contours 7" fore/aft adjustment, high or low back rest Deluxe 46 oz. Vinyl upholstery and much more! Plus, Sabine Universal Products has a marine grade aluminum pedestal. **Circle No. 140**

C&G Boat Works, Inc.

From repairs and conversions, to drydocks, to new construction C & G Boat Works has it all. It's the complete place for fabrication, construction, repairs, and conversions for the inland and offshore marine industry. **Circle No. 141**

Specialty Coatings Group

Produced by Specialty Coatings Group, ISOTROL 2000 has an extremely low surface tension. This allows ISOTROL 2000 to penetrate under rust and into small pores in the surface metals. This enables it to bond firmly to the substrate. ISOTROL 2000 and ISO-GUARD will also flow under moisture, forcing it to the surface, isolating it from the metal substrate. ISO-GUARD is engineered to meld into ISOTROL 2000 to form a single coat that will not peel or separate. This tough, elastic coat lasts in excess of 10 years. **Circle No. 142**

August, 1999

Nishiyama Corporation

Nishiyama Corporation produces FN Tape, which is used to prevent fires caused



by a splash of flammable oil in a ship's engine room. The tape consists of aluminum foil and noncombustible woven fabric that will not burn even if brought into contact with fire. No special tools are needed to apply the

tape because it has a natural adhesive that sets automatically after taping. **Circle No. 143**

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Marine Literature Review

Dry Air Technology

Dry Air Technology designs, engineers and manufactures custom fans, ventilation equipment and dehumidifiers. We offer a full line of high performance, portable, lightweight ventilators and dehumidifiers. Made of high-density polyethyl-



ene, these durable, maintenance-free, corrosion-resistant products are perfect for heavy industrial needs. Circle No. 145

Loeffler

Loeffler Corporation, a premier supplier of ship valves to the U.S. Navy since 1926 has, free for the asking, a catalog



of angle hose valves in 1-1/2 and 2-1/2 inches sizes in 250 lb. Navy as well as 150 lb. and 300 lb. Commercial ratings. Hose threads can be modified to meet specific requirements. Circle No. 146

Kiene Diesel Accessories

Kiene Diesel Accessories manufactures a complete line of Cylinder Pressure Indicators



for measuring diesel engine firing pressures, along with indicator valves and accessories for most of the diesel engines manufactured. Kiene can provide stock as well as solutions for obsolete or discontinued products. Circle No. 147

WNI Oceanroutes

WNI's unrivaled marine weather forecasting experience was first applied to the rapidly expanding field of exploration offshore for oil and gas in the early 1970's. Today the group has a network of offices at strategic locations around the world, providing the very highest level of service which takes into account both oil industry demands and local climate. The portfolio of services for offshore activities includes early seismic surveys, exploration drilling, construction and long term production. Circle No. 148



Fjord, Inc.

Chafe-Pro, manufactured by Fjord, Inc., protects marine-lines from chafe. This unique patented device binds to the line thereby preventing it from slipping. Chafe-Pro is in use by the U.S. Navy and Canadian Coast Guards, MARAD, and the towing industry. Call 407-777-4185 or Circle No. 149

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Sudmash Ftc.

Sudmash Ftc. is a shipbuilding machinery enterprise, carrying out all stages of design, manufacture, supply and service for: deck equipment, including cargo cranes, steering gears, winches and thrusters; power engineering, including gas/steam turbo generators, pumps, and motors; and general machinery. Mail to: sudmash@neva.spb.ru. Web site: <http://www.bestrussia.com/nct/proletareng>. Circle No. 151

Det Norske Veritas

Det Norske Veritas (DNV) is an independent, autonomous foundation established in 1864 with the objective of safeguarding life, property and the environment. DNV has 5,600 employees and 300 offices in 100 countries. As a leading Classification Society, DNV establishes rules for the construction of ships and carries out inspection of ships. Circle No. 169



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Marine Literature Review

PRIMAR

The PRIMAR Service consists of the supply of official Electronics Navigation Charts (ENCs), which includes weekly updates, and is sold through a number of authorized distributors. The ENCs delivered by the PRIMAR Service is fully compliant with IMO and IHO standards, so that they may be used legally to navigate any ship, including those subject to the IMO SOLAS convention when used within an approved ECDIS.

Circle No. 152

SLICKBAR

This eight-page brochure describes all of the various oil spill response products manufactured by SLICKBAR. Sections are dedicated to Oil Booms, Oil Skimmers & Skimmer Systems, Vacuum Systems, Dispersant Spray Systems, Floating Lagoon Baffles and more.

Circle No. 158

Anglo Belgian Corporation USA

Anglo Belgian Corporation's (ABC) team of engineers, assisted by a CAD-CAM computer, is at the disposition of its customers. They can assure the engineering and the conception of complete propulsion systems, diesel power station, pumping station and re-engineering problems.

Circle No. 155

Climax Portable Machine Tools

This 8-page color brochure describes features and benefits of Climax's line of portable boring, milling, turning, flang facing, pipe end prep and valve remachining tools. Climax tools reduce downtime and dismantling costs for repairs by machining equipment right in place.

Circle No. 156

New England Marine and Industrial

New England Marine and Industrial has three convenient locations in the Northeast: Portsmouth, NH; Brant Rock, MA; and Stonington, ME. Since 1976 they have carried "from anchors to zincs and everything in between," including chain and fittings, Hooven Allison ropes, Sterans safety gear, and a full line of tuna gear.

Circle No. 157


Total Corrosion Protection Concept

Jotun Paints is a global manufacturer of coatings and cathodic protection for the marine market. Jotun offers a total corrosion protection concept for the constant battle against corro-

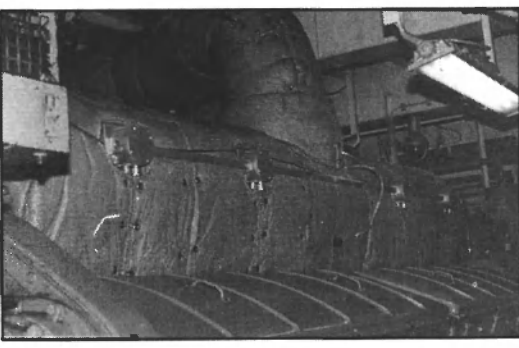
sion at sea. With an emphasis on life cycle costs, the new Floating Production and

Transport recommends paint systems for all areas of a vessel.

Circle No. 173



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Circle 228 on Reader Service Card

Software Solutions

BIMCO Revolutionizes Voyage Planning

The Baltic and International Maritime Council (BIMCO) has set the stage for a new generation in voyage planning with its latest — the new BIMCO Voyage Estimator.

Applying the most recent functions in information technology, the upgraded product pledges the ability to undertake voyage calculations within a relatively short time period. Incorporating various features, the Voyage Estimator is more versatile and user friendly than former versions. Premier functions of the fully Y2K compliant product include chang-

ing and storing of screen layouts based on the amount of information required, estimation of fuel consumption in port based on the number of shifts, direct access to continually updated World Ports by BIMCO on the Web and logging of estimate creation and updates.

Circle 71 on Reader Service Card

Bass Provides Information and Management Tools

Known as one of the largest maritime service companies worldwide, Barber Software Solutions (BASS), a division of Barber International, is providing the latest management and information tools for ship operations. According to BASS, the amount of information handled on board vessels has increased substantially over the past few years, and is expected to continue growing. In order to manage this information more effectively, the company says, its clients are demanding systems that extract key data faster for more effective decision making and reporting. Some of the services Bass provides ship operators are: Customized IT solutions for clients, software installation at customer sites and vessels, training at customer sites, consultant services and software support.

Circle 50 on Reader Service Card

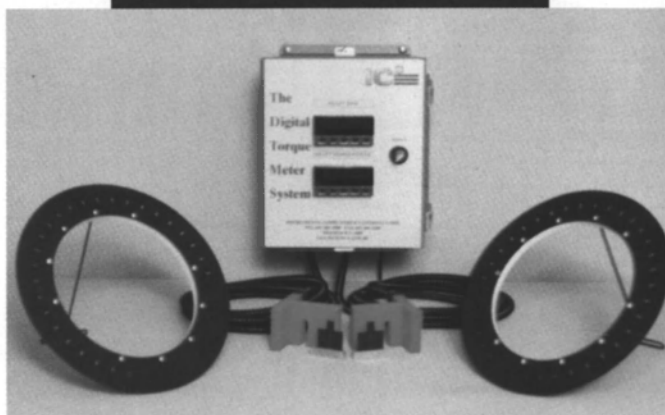


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The Digital Torque Meter (DTM) System measures shaft horsepower and RPM by employing fiber optics to detect the twist in a rotation shaft. Real time measurement at all speeds is accomplished without signal conversion by processing the digital outputs from two stationary sensors and interrupters, mounted on the shaft, pass through a beam of visible light. No drilling, welding, or machining is normally required for installation. Calibration is accomplished at start-up by programmable means, without the need for any additional test equipment and can be easily verified by operating personnel. The DTM System consists of an electronic display/enclosure, fiber optic cables, stationary sensors (orange) and interrupters as shown.

Circle 313 on Reader Service Card

Leaders in Marine Design Software

IMSA

FlagShip

from Proteus Engineering

FlagShip is a complete ship design system, including hull-form design (*FastShip*), structural design and optimization (*MAESTRO*), stability, powering, maneuvering, seakeeping, shipyard cost estimating and interfaces to CAD and ship production programs. *FlagShip* is based on time-tested, best-in-class applications, which are in use by more than 1,000 designers in over 30 countries around the world.

NavCad

from HydroComp, Inc.

NavCad offers an integrated platform to predict resistance and power, and to determine optimum propeller parameters. With *NavCad* each aspect of a ship's performance can be evaluated for virtually every type of displacement hull, semi-displacement and planing craft, river barge train, catamaran and auxiliary-powered sailboat.

General HydroStatics (GHS)

from Creative Systems, Inc.

Widely recognized as the most advanced and productive trim/stability/strength software. Specialized versions are available for ship operators, for salvage engineers and for small craft designers. Includes efficient modeling for all types of complex vessels, and the ability to analyze them both afloat and aground.

ShipCAM / CAD-Link / NC-Pyros

from Albacore Research Ltd.

Integrated ship production for Win95/NT. *ShipCAM*: Pairing and lofting including frames with cutouts, plate expansion, shell expansion and inv. bending. *CAD-Link*: AutoCAD13 based 3D structural modeling as easy as 2D drafting plus weight & CG. *NC-Pyros*: NC-code generation from CAD drawings.

We welcome our newest member, SPAR Associates

Circle 236 on Reader Service Card

CAPS Logistics Launches BidPro

CAPS Logistics, a unit of Dutch business software company BAAN.AS has introduced its newest innovation into the software market, the BidPro Carrier Bid Analysis. Aimed at shipping companies, the product is a strategic planning tool for shippers and third parties who must analyze and negotiate pricing bids from carriers. BidPro inputs are shipping requirements and carrier bid responses that handle selected lanes of freight. The program then selects the least expensive set of carriers that will in turn, fulfill shipping volumes. Highly integrated with Microsoft Excel, BidPro is therefore relatively simple to transfer from the spreadsheet program for accurate examination and optimization.

Circle 72 on Reader Service Card

Boston Whaler Installs Autohydro

Boston Whaler has installed Autohydro from Autoship Systems Corp. The company has been using the Autoship hull design program for more than eight years. Autohydro is a Windows-based 'floating simulator' that reports the reac-

Oceanroutes Helps Steer Vessels To Safety In Inclement Weather

Provisions for the routing of container ships servicing the Trans-Atlantic and Trans-Pacific trades — specifically Orient Overseas Container Line (OOCL), have been implemented by WNI Oceanroutes. A leading transportation company, OOCL utilizes all that WNI offers within its services and products hub: Optimum Weather Routing, ORION for onboard guidance and the POLARIS fleet management system.

"Together, Optimum Weather Routing and ORION help us maintain schedule and integrity and minimize weather risks," said **Alfred H.Y. Cheung**, manager Nautical Advisory & Safety Audit Section for OOCL's Ship Management Department. Proven as an imperative tool for schedule and safety management, POLARIS has helped OOCL by furthering its already effective management style and high-tech image. POLARIS grants an overview of a vessel's revised position in addition to its weather patterns.

In addressing the needs of ship operators based in the choppy North Sea, Oceanroutes meets their concerns with the development of its first PC-based Offshore Weather System. Established in 1985, the program is touted as greatly improving in the presentation of offshore weather. Oceanroutes newest project in this field is SATURN — building on the positive feedback of its first satellite system. Powered by any new-generation PC, SATURN height-

ens both the presentation of offshore forecasts as well as the convenience of user interaction. User functions consist of chart animation, zoom and parameters. With the click of a computer mouse, SATURN's ability to sample the main offshore forecast parameters — particularly wind and wave, is activated.

Each map background is specifically tailored to each client's offshore forecast sites with data that can be printed out or saved to a file. SATURN can also be transferred to a corporate Intranet giving international operators the ability to access forecast data. The useful information is applied to rigs and/or platforms spread out from South America, up to Arctic Norway and the Tropical Far East. SATURN is Y2K ready and expected to carry the presentation of offshore weather forecasts into the next millennium.

tion of the model to various conditions, such as a loading configuration, a damage situation, conditions involving outside forces, wind or high speed turning momentum. The program can be used to obtain hull form characteristics and capacities.

New features for Autohydro 5 include a fixed weight dialog with ability to define distributed weights; user-definable report format; capability to evaluate dynamic criteria; and user control over position of section displayed in body view.

Circle 70 on Reader Service Card

EPA Refrigerant Reg Software Released

In an attempt to raise awareness of EPA regulations and enforcements, Environmental Support Solutions of Mesa, Ariz., has released the latest version of its refrigerant regulations compliance and management program, Refrigerant Compliance Manager 99.

Circle 68 on Reader Service Card

August, 1999

Circle 65 on Reader Service Card

Total CAD / CAM Solutions



Autoship Systems Corporation

Look to Autoship Systems Corporation for setting the industry standard in innovative marine design and construction software.

Autohydro



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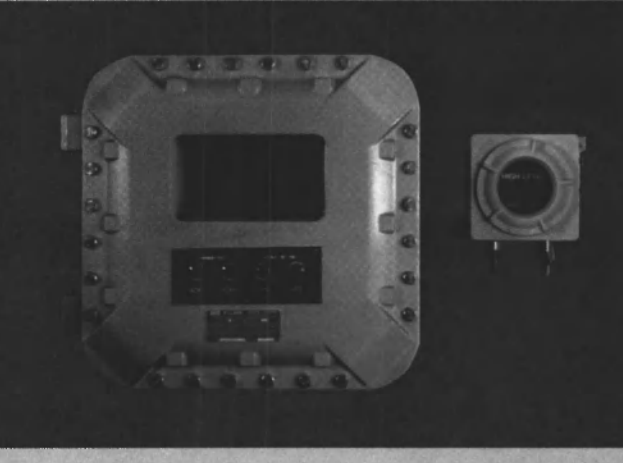
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Circle 225 on Reader Service Card

MARINE ENGINEERING TRAINING



The United States Merchant Marine Academy (USMMA) at Kings Point, New York is one of the five federal service academies and the America's premier maritime institution. Along with the undergraduate program, USMMA offers the most extensive maritime and transportation continuing education program in the United States. Most courses are one to two-weeks in duration.

We teach over 35 Marine Engineering courses and over 100 other courses in Nautical Science, Maritime Business, and Intermodal Transportation. Our instructor staff includes outstanding USMMA faculty, guest lecturers, and industrial experts. "Hands-on" lab exercises compliment classroom lecture where we use the Academy's 22 magnificent engineering laboratories and waterfront vessels. In addition to regularly scheduled courses, we can also tailor programs to meet specific company or organization needs.

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Sulzer Control Systems

Fundamentals of Diesel Engines

Pump Operation, Maintenance and Troubleshooting

Marine Diesel Surveyor

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Certified under the new Environmental Protection Agency

Marine Engineering Economics

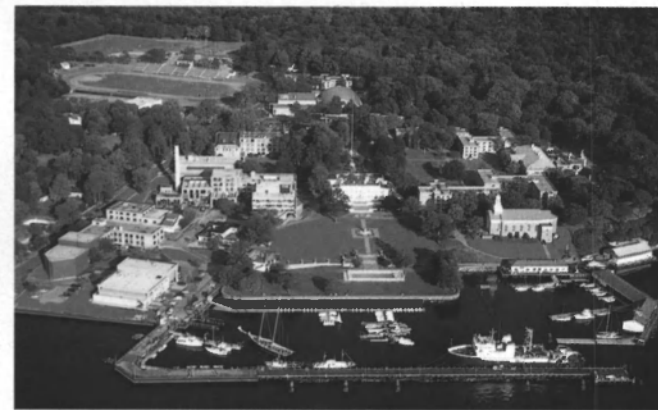
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Software Solutions

BP Software Helps Plan Voyages Costs

BP Marine offers a new software package, Net Price Calculator, which enables ship operators to set budgets and plan voyage costs by comparing pricing across a range of ports and removes the need for direct price quotes from BP Marine.

Circle 45 on Reader Service Card

Maersk Data AS Presents New Software

Maersk Data AS, headquartered in Denmark, recently introduced a new Crew Manager software, which is designed to help management efficiently carry out administrative tasks, ranging from crew management to port administration and ship accounting. The software can be installed onboard a PC to run either independently of the shipping company's land-based computers, or communicate with the other systems, for example payroll, via satellite, so that data only has to be entered once.

Circle 47 on Reader Service Card

BT, Dataworks Introduce Cost-Effective System

BT Aeronautical and Maritime (BT A&M), a U.K.-based telecommunications company, and international shipping software specialist, Dataworks Ltd., have launched SureSat, a new satellite communications system. The premiere telex messaging service operates via C-Sat and the Internet, and according to Dataworks, offers cost savings of up to 50 percent compared to conventional telex transmission. SureSat uses standard Inmarsat C terminals.

Circle 51 on Reader Service Card

Seaworthy Offers Y2K Compliance Verification

Seaworthy Systems, Inc. is currently assisting shipowners, operators and managers address Y2K implications for their vessels. The company provides services ranging from shipboard system Y2K problem consultation and guidance through complete, fleetwide Y2K program development, execution and oversight. Seaworthy Systems offers shipboard surveys to identify Y2K sensitive components and provides access to a Y2K sensitive equipment manufacturer database.

Circle 196 on Reader Service Card

Autoship Delivers Software System To OHT.

Autoship Systems Corporation (ASC), of Vancouver, Canada, has completed and delivered a software system to Off-shore Heavy Transport Management AS (OHT), of Oslo, Norway. OHT is a new

player in the heavy lift business, and is reportedly in the process of building two of the world's largest heavy lift ships. With this new customized system, the user has full control over the geometrical layout of the deck load and view and load the ship in 3-D.

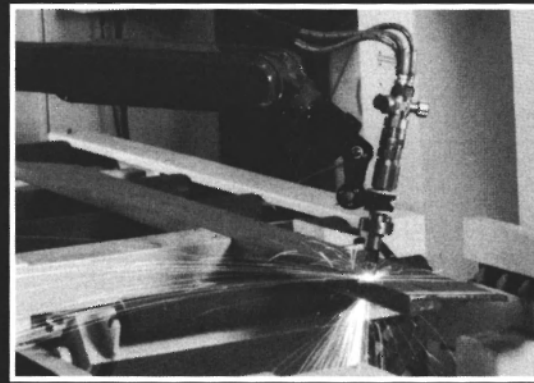
The system can be used to conduct

stability analysis, including the calculation of the fundamental ship motion parameters of natural pitch using its Det Norske Veritas-approved Autoload, which will also be used by OHT to read its tank and draft sensors.

Circle 54 on Reader Service Card

Robust Robotics!

The Jesse Automatic Profile Cutting System loads, transports, marks, cuts, nests and unloads profiles ... via your CAD system!



Manufacturer of the system developed and proven at **Odense Steel Shipyard** and the Wallace Coast line of pipe fabrication equipment

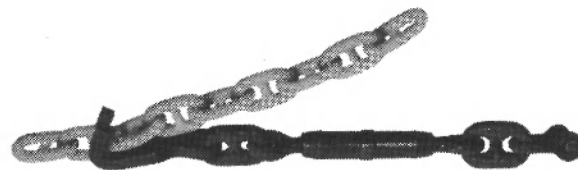
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THE DEVIL'S CLAW



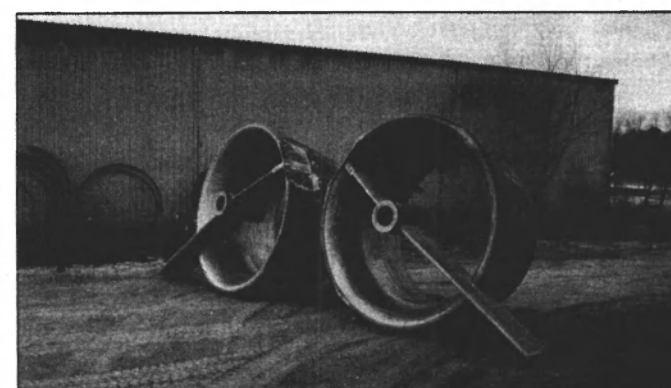
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Chiles Offshore Executes Letter Of Intent

Chiles Offshore LLC has executed a Letter of Intent for use of Chiles Magellan, the second of its Explorer Class jackup drilling units, currently under construction at AMFELS shipyard in Brownsville, Texas.

The Letter calls for the drilling of one well in more

than 300 ft. (91.4 m) of water in the U.S. Gulf of Mexico, which will begin between December 1, 1999 and April 30, 2000, lasting 120 days. The customer also has the option for use of Chiles Magellan, under certain circumstances, to drill additional wells in the same area. The drilling unit will complete final outfitting,

including the extension of the legs from 477 ft. (145.3m) to 544 ft. (165.8 m), for scheduled delivery this September.

Caterpillar To Supply Power For New Rigs

Six diesel-fueled Caterpillar 3616 engines will provide more than 26 MW of safe, reliable electricity to power three technologically-advanced, deepwater semisubmersible drilling rigs from Schlumberger Desco Forex. Two of these rigs are currently being built at French DCN Brest shipyard, with a third under-going construction at Singapore-based PPL.

Compared to usual semis, Sedco Express is designed with a lower center of gravity, providing more stability, increased deck load capacity and less noise. Rated at 4.4 MW of continuous power, each engine has been combined to form a completely redundant power supply and distribution system — a main factor required for DPS3 certification.

Circle 194 on Reader Service Card

EMI Awarded Digital Steering System

Contracts

Engine Monitor, Inc. was granted several new contracts to provide its technologically enhanced digital steering system. The system is designed to eliminate systems shock by sending a controlled ramped hydraulic flow to the cylinders, rather than the conventional rapid release of flow.

Available with a Built-in-Test-Equipment (BITE) option, this innovation is designed to lower life-cycle costs by improving reliability and ease of troubleshooting, while also upgrading the life expectancy of the hoses, cylinders and jockey bar connection pins.

Circle 195 on Reader Service Card

Kamewa Finland To Supply Thrusters

The deepwater drilling rig, Stena Don is to be fitted with underwater mountable Aquamaster azimuth thrusters manufactured by Kamewa Finland Ltd.

The rig will be constructed by Kvaerner Warnow Werft in Germany for delivery to owner Stena Drilling at the beginning of 2001.


Specifically designed for underwater mounting/dismounting for modern offshore applications, each thruster in the six piece delivery will hold an input power of 3,300 kW.

Circle 13 on Reader Service Card

Hughes Global Services To Market ORBCOMM

ORBCOMM, the first commercial provider of global low-Earth orbit (LEO) satellite data and messaging communications services, has signed a reseller agreement with Hughes Global Services to deliver ORBCOMM's satellite-based communications services to U.S. government and military customers. Hughes intends to market the company's two-way communications services under a GSA Federal Technology Service contract.

Circle 11 on Reader Service Card



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GALLEY EQUIPMENT SPECIALISTS

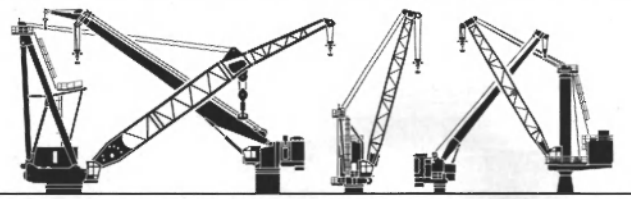
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Despite tough maritime markets, technology remains the glue that binds the German industry.

Despite what could be best termed as difficult operating conditions, the German maritime market has persevered through its collective adherence to the principles which propelled it to the lead of the maritime construction and outfitting markets: a steadfast adherence to producing technologically correct and advanced vessels, products and systems.

The challenges facing the German maritime market are not unlike those facing many of its European colleagues and competitors, or those facing industrial operations in any of the world's leading economies. The proliferation of lower-cost shipbuilding, ship repair and marine equipment supply options outside of Europe, particularly in Asia, has led to a significant drain on business emanating from, and dollars flowing to the German homeland. At the same time, the German industry continues to fiercely clutch the niche of high-quality vessel owners and operators, those that have come to expect and rely upon the technical excellence and operational reliability of maritime products that are made in Germany.

One such niche is the cruise ship industry, which Papenburg-based Meyer Werft has been a competitive force within for years. The cruise ship building process at the company's covered facility is nothing short of amazing, with three ships in various stages able to be built simultaneously in a relatively compact space. The yard is currently building Radiance of the Seas, Superstar Libra, Aurora, and Superstar Scorpio. Apart from its cruise ship building prowess, Meyer Werft has strategically positioned itself for prosperity well beyond 2000 — which is a positive development considering the recent newbuild orders for cruise ships filtering to Asian shipyards.

Recently, the second gas tanker for Norwegian shipowner — a notoriously quality-minded group — Sovang ASA was named Clipper Harald. The 480 x 67 ft. (146.4-m x 20.5 m) gas tanker has a cargo tank volume for 12,660 cu. m. and a speed of 18 knots. In addition to ethylene, the ship is able to carry vinyl chloride monomer, ammonia and propylene oxide in three bilobed tanks.

The capability of carrying different liquefied gases at a temperature of down to minus 104 degrees C makes the tanker one of the most modern of its kind.

Clipper Harald is the result of a cooperation between Thyssen Nordseewerke of Emden and Meyer Werft Shipyard, giving the two companies a very positive reference in a highly competitive market that is controlled by shipyards in the Far East.

Clipper Harald Main Particulars	
Length, o.a.	480 ft. (146.4 m)
Length, b.p.	444 ft. (135.4 m)
Breadth, molded	67 ft. (20.5 m)
Depth to main deck	45.3 ft. (13.8 m)
Draft (ethylene)	25.3 ft. (7.7 m)
DWT	13,500
Tank volume	12,660 cu. m.
Engine output	7,980 kW
Speed	18 knots
Crew cabins	23
Classification	DNV

The cruise market has brought recent good fortune to another German shipyard — Lloyd Werft Bremerhaven —

which was recently awarded a contract by Cunard Line, Ltd. for the refurbishments aboard Queen Elizabeth 2, Vistafjord (to be renamed Caronia) and Royal Viking Sun (to be renamed Seabourn Sun). Specifics of the contract were not disclosed, but it is estimated that the re-design and upgrading of the three ships, including technical work and exterior maintenance and re-painting, will approach \$34 million. "The unusual scope of the work dictated a yard with extraordinary capabilities and focus," said Cunard president and CEO Larry Pimentel. "There are considerable advantages for us, as well as for Lloyd Werft, to have all three of these ships in the same shipyard at roughly the same time. From our position, having all three ships at one yard makes it easier for our marine and technical staff to liaise with Lloyd Werft and monitor the work on a day-to-day basis."

Lloyd Werft is no stranger to Cunard or the Queen Elizabeth 2, as the company has carried out work on the ship in 1983 and 1984, and carried out the complete overhaul and conversion of the vessel during a 179 day period spanning 1986 into 1987.

Another German yard that has maintained success in a technical specialty is the Flender Werft AG yard in Lübeck. The latest in a line of outstanding containerships delivered by the yard is newbuilding no. 671, MV Santa Fabiola, delivered to Hamburg based shipowner Claus-Peter Offen. The vessel will be

Cunard Line president and CEO Larry Pimentel (right) recently announced the awarding of a contract to Lloyd Werft's Werner Luken for the refurbishment of three cruise ships. The estimated cost: \$34 million.



called P&O Nedlloyd Singapore, following a timecharter to P&O Nedlloyd.

The ship is the fifth of the Flender 2100 type (F-class) commissioned by Claus-Peter Offen, and is known for economical and optimized stowage of a large capacity while maintaining low fuel consumption numbers. The 30,200-

Did you know?

- Germany's merchant fleet ranks 14th in the world in terms of ships registered, with a fleet of 1,158 propelled seagoing merchant ships, comprising more than eight million gross tons, with a median age of 16 years.
- In 1998, German shipbuilders completed 70 ships of one million gross tons, including 53 ships for the domestic market, and 17 ships for export. These numbers ranked the country No. 4 in the world based on completed gross tonnage.

Source: Lloyd's Register World Fleet Statistics, 1998

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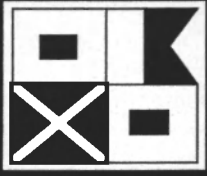
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Country Focus: Germany

dwf vessel, which measures 601 x 97.9 ft. (183.2 x 29.8 m) with a 37.8-ft. (11.5-m) draft is classed by GL. It is outfitted with four cranes, two of which have a 45/50/36-ton lifting capacity each, while the other two have a 35/30-ton lifting capacity each. The holds are fitted with 40-ft. cell guides, and 2,169 containers can be stowed in six tiers on deck and in the cargo holds. The upper deck is equipped with 420 plugs for the reefer containers.

Powered by a longstroke MAN B&W 6S60 MC design, rated 12,240 kW at 105 rpm, the ship has a speed of 20 knots.

Kiel-based Lindenau extends the German province of specialty ship construc-

tion by specializing in the production of specialty double hull oil and chemical tankers up to 40,000 dwt. The medium-sized yard, located at the entrance of the Kiel Canal, has a tradition of forming long-term relationships with high-value clients, working closely with them to deliver vessels that meet exacting specifications. Apart from the oil and chemical tankers, the yard is an able competitor in a wide range of vessel development, design and construction, from orange juice, molten sulfur and phosphoric acid carriers, to RoRo vessels, container-ship and passenger vessels. Although the repair business has largely vacated Northern Europe, the yard is positioned

Despite the shift of much industrial activity away from traditional powers, Germany steadfastly maintains strength in the maritime niche with adherence to high quality products and services. The following charts exhibit new construction activity won by German yards, Jan. to June 1999, as well as new construction activity generated by German shipowners, Jan. to June 1999.

1999: New Ship Orders From German Owners

OWNER OPERATOR	SHIPYARD	COUNTRY SE	TYPE	No	DWT	DELIV	M US\$
BOCKSTIEGEL REEDEREI	GDANSK	POLAND	BULK CARRIER	4	7,000	2000	40
BRIESE SCHIFFAHT GMBH.	GDANSK	POLAND	BULK CARRIER	4	7,000	2000	40
KREY SCHIFFAHT GmbH	GDANSK	POLAND	BULK CARRIER	4	7,000	2000	40
HARMA-LINE	ROLANDWERFT	GERMANY	CAR CARRIER	2	2,500	2001	41.63
NORD CAPITAL	SAMSUNG	KOREA	CONTAINER	1	67,500	2000	60
HAPAG LLOYD	HHI	KOREA	CONTAINER	1	67,000	2000	-
HAPAG LLOYD	HHI	KOREA	CONTAINER	2	54,766	2000	-
FRIEDRICH A DETJEN	HALLA	KOREA	CONTAINER	2	45,000	2000	76
CLAUS-PETER OFFEN	SAMSUNG	KOREA	CONTAINER	5	40,000	2000	165
GEBAB	THYSSEN NORD.	GERMANY	CONTAINER	2	34,600	2000	80
CLAUS-PETER OFFEN	SAMSUNG	KOREA	CONTAINER	1	32,100	2001	35
GERMAN INTERESTS	JIANGYANG	CHINA	CONTAINER	1	5,350	12-1999	-
E. OLDENDORFF	FLENSBURGER	GERMANY	MULTI-PURPOSE	1	20,100	2000	17
AUGUST BOLTEN	JIANGYANG	CHINA	MULTI-PURPOSE	2	8,000	2000	24
GERMAN INTERESTS	ZHONGHUA	CHINA	MULTI-PURPOSE	2	4,900	2000	64
WEHR OSKAR	SZCZECIN	POLAND	RoRo / CARGO	2	7,300	2000	64
UNTERWESER	HITZLER	GERMANY	TUG	1	-	2000	-
GERMAN INTERESTS	DETLEF HEGEMAN	GERMANY	VEH. CARRIER	2	2,250	2001	-
GERMAN INTERESTS	BOHAI SHIPYARD	CHINA	BULK CARRIER	2	28,200	2000	28
TRANSOCEAN	JJ. SIETAS	GERMANY	CHEM TANKER	2	5,000	2000	32
CONTI REEDEREI	HANJIN	KOREA	CONTAINER	4	79,000	2000/2001	240
BERTRAN RICKMERS	HANJIN	KOREA	CONTAINER	4	-	2000	-
R GLUSING	MUTZELFELDT	GERMANY	PROD TANKER	1	1,200	2000	-
GLUSING	CONSTANTZA	ROMANIA	PROD TANKER	1	1,100	2000	6.1
GERMAN GOVERNMENT	THYSSEN	GERMANY	SURVEY	1	-	2001	93
KLAUS OLDENDORFF	SAMHO	KOREA	BULK CARRIER	1	75,000	2001	18.9
KLAUS OLDENDORFF	HALLA	KOREA	BULK CARRIER	2	74,000	2000	39
BUTTNER AND GILS	JIANGYANG	CHINA	CHEM TANKER	2	13,500	2000	-
NORD CAPITAL	SAMSUNG	KOREA	CONTAINER	2	67,500	2000/2001	100
REEDEREI B. RICKMERS	HANJIN	KOREA	CONTAINER	8	0	2000/2001	160
ESSBERGER (RANZAU GROUP)	IJ. SIETAS	GERMANY	CHEM TANKER	2	4,500	2000	96
GEBAB	DAEWOO	KOREA	CONTAINER	4	75,000	2000	260
NORD CAPITAL	SAMSUNG	KOREA	CONTAINER	2	67,500	2001	108.6
SCHONING	GDANSK	POLAND	CONTAINER	1	0	2000	-
OLDENBURG-PORTUGIESIS	MAWEI	CHINA	CONTAINER	4	0	2,001	-
SLOMAN NEPTUN	FERROSTAAL	SINGAPORE	LPG	1	0	-	19

1999: New Ship Orders For German Shipyards

OWNER OPERATOR	SHIPYARD	TYPE	No	DWT	DELIV	M US\$
MAERSK LINE	VOLKSWERFT STRALSUND	ABTS	2	-	1999/2000	-
A. P. MOLLER	VOLKSWERFT STRALSUND	CABLE SHIP	2	7,000	2000	82
HARMA-LINE	ROLANDWERFT	CAR CARRIER	2	2,500	2001	41.63
GEBAB	THYSSEN NORDSEEWERKE	CONTAINER	2	34,600	2000	80
ROYAL CARIBBEAN	MEYER WERFT	CRUISE SHIP	1	8,900	2001	350
E. OLDENDORFF	FLENSBURGER	MULTI-PURPOSE	1	20,100	2000	17
UND	FLENSBERG	RoRo	2	14,200	2000	80
VIKING SUPPLY SHIPS	HUSUMER WERFT	SUPPORT VESSEL	1	-	1999	-
UNTERWESER	HITZLER SCHIFFSWERFT	TUG	1	-	2000	-
GERMAN INTERESTS	DETLEF HEGEMAN	VEHICLE CARRIER	2	2,250	2001	-
TRANSOCEAN	JJ. SIETAS	CHEMICAL TANKER	2	5,000	2000	32
INDIGA	HDW	CRUISE SHIP	1	-	2000	-
ATTICA ENTERPRISES	HDW	FAST FERRY	2	6,420	2001	220
ANEK LINES	HDW	FERRY	1	-	2001	110
MAURITANIAN GOVT	FASSMER	FISHING RESEARCH	1	-	2000	-
CAPE VERDE GOVERNMENT	CASSENS	PASSENGER / CARGO	1	-	2000	-
R GLUSING	MUTZELFELDTWERFT	PRODUCTS TANKER	1	1,200	2000	-
GERMAN GOVERNMENT	THYSSEN NORDSEEWERKE	SURVEY	1	-	2001	93
NCL HOLDING	LLOYD WERFT	CRUISE SHIP	1	0	Jun-2001	351
ESSBERGER (RANZAU GROUP)	JJ. SIETAS	CHEMICAL TANKER	2	4,500	2000	96

Source: Fertiship



Clipper Harald is the culmination of a cooperation between German companies Meyer Werft Shipyard and Thyssen Nordseewerke, which have collaborated to produce two exceptional quality gas tankers that are competitive with dominant niche players in the Far East.

for such work. Two German companies — Krupp Fordertechnik GmbH and Thyssen Nordseewerke — recently completed the first construction phase of the largest trailing hopper dredge, Vasco da Gama. With the first bottom section, the keel of the jumbo dredger was laid on the slipway of Thyssen Nordseewerke yard at Emden the end of last April. The company, along with its partner Krupp Fordertechnik GmbH, has been working on the newbuilding for the past year. Scheduled for delivery at the beginning of 2000 to Jan de Nul group of Belgium, the dredger measures 656 ft. (200 m), with a 118.7 ft. (36.2 m) breadth and 33,000 cu. m hopper capacity. With 36,000 kW installed power for speeds of 16.5 knots, it will be used mainly in land reclamation.

Maintaining The Edge

It is no secret that the German maritime industry has earned the respect of the international maritime community for its high quality of product and service. Earning and maintaining such a reputation, however, comes only through dogged pursuit of devising increasingly innovative and effective solutions to the many challenges presented by the rugged maritime environment. Advanced work in the areas of Research and Development is perhaps best embodied by the continued efforts of classification society Germanischer



Flender Werft recently delivered the fifth of its Flender 2100 type containership to Hamburg owner Claus-Peter Offen.

August, 1999

Lloyd (GL). GL, led by Dr. Hans Payer, continues to make impressive strides in many different areas of the maritime realm, with the goal of each project firmly entrenched in the "real business" side of enhancing maritime efficiency and safety. Most recently, GL launched project WaveLoads, which will be an advanced method for predicting wave induced loads for high speed

ships. In announcing the project, GL said that to ensure their competitive positioning world markets, European shipyards need to be able to produce modern high speed ships that conform to the highest safety standards, while operating in the increasingly congested waters, which have become the hallmark of European short sea shipping routes. GL commented that classifica-

tion society rules provide formulas for safe design loads, but they tend to reflect the service experience of existing ships and will not adequately account for future larger scale ship designs. The three-year WaveLoads project is scheduled to culminate in the establishment of guidelines and recommendations for hull structural improvements and hull developments for high speed ships.



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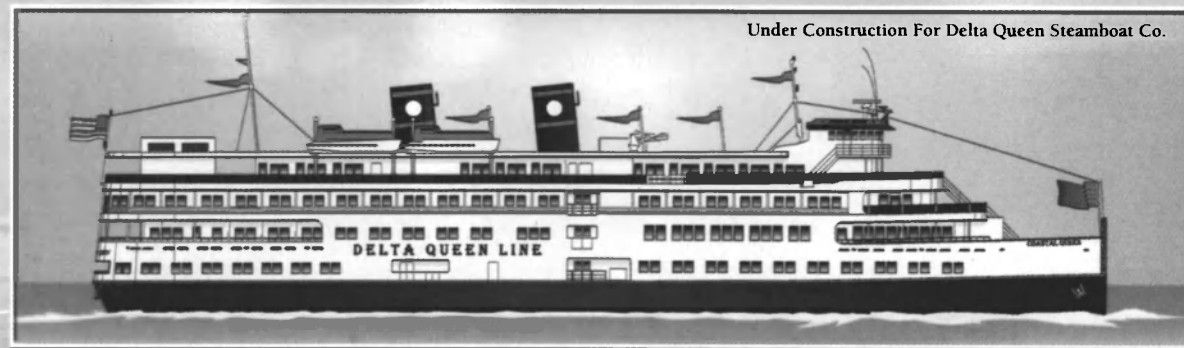
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United States Maritime Report

Ready For Lift Off

The U.S. maritime market has time and again shown a resiliency, primarily derived through product and service diversity and a commitment to providing technologically advanced maritime solutions. The maritime market is as diverse as the country itself, with product offerings ranging from the most technologically advanced and capable naval ships in the world — down to cost effective boats and barges.

The business of building and outfitting boats and ships in the United States has undergone serious transformation during the last few years, the hallmark being a continued consolidation of resources, capabilities and companies. Companies large, medium and small have all taken part in the trend to corporatize, which is of course evident in industries around the globe.

The Big Three?

Although Navy budgets have been on a steady decline for the better part of the decade, the country's Big Six — Avondale, Bath Iron Works, General Dynamics - Electric Boat, Ingalls Shipbuilding, Newport News Shipbuilding (NNS) and NASSCO — continue to garner a lion's share of business and much of the political attention and influence. But activities at and among these six shipyards have rapidly evolved in the last few months, as the latest — and many argue

last — round of consolidation has again altered the U.S. shipbuilding scene. Literally, the Big Six could now be called the Big Three, as that is the number of controlling companies behind the

While U.S. yards cannot offer the bargain base-ment labor rates, they do offer excellent facilities and unsurpassed technological know-how and tools, and has found the cruise market to be an especially lucrative niche. Pictured is Crown Princess undergoing work at Cascade General.

U.S.' major shipyards. General Dynamics was an early participant in the shipyard consolidation swing, and now counts Bath Iron Works, Electric Boat and NASSCO in its stable. Litton Industries has been the latest to make waves, attempting (and failing) to acquire Newport News Shipbuilding earlier this year.

Concerns regarding the concentration of too many U.S. Navy dollars in too few hands had plagued this deal as well as General Dynamics' earlier \$1.4 billion bid to acquire NNS. Regulators did, however, approve Litton's offer to buy Avondale Industries Inc. for \$529 million, which was expected to formally close at press time. Avondale, which offers Litton a diverse portfolio of contracts and capabilities, currently is progressing on the project to build three advanced technology double hull tankers for ARCO — Endeavor, Resolution and Discovery — the first of which is due for delivery in July 2000.

Industry analysts generally applauded the consolidations, seeing advantages of cost efficiency and competition, as Ingalls Shipbuilding — with Avondale folded into a new unit dubbed Litton Ship Systems — is well positioned to compete with General Dynamics for shipbuilding business. NNS, twice jilt-

One Big Company

Sea-Land international liner business — 70 ships — acquired by Maersk for \$800M

The consolidation churn continued last month, as the A.P. Moller Group and CSX announced an agreement for A.P. Moller-Maersk Line to acquire Sea-Land Service, Inc.'s international liner business, including vessels, containers, related terminals and certain lease obligations for \$800 million. Sea-Land currently operates about 70 containerships and about 200,000 containers in its international trade. "Maersk is a terrific company that will become even stronger," said John W. Snow, Chairman and CEO of CSX. "Importantly, the transaction protects national security interests under the U.S. Maritime Security Program." The company's reaffirmed that all vessels currently flying the U.S. flag will continue to do so. After completion of the transaction, Maersk-SeaLand will utilize 19 U.S. flag ships formerly operated by Sea-Land and four Maersk Line, Limited U.S. flag ships in global commerce, making it the largest U.S. flag ocean carriers.

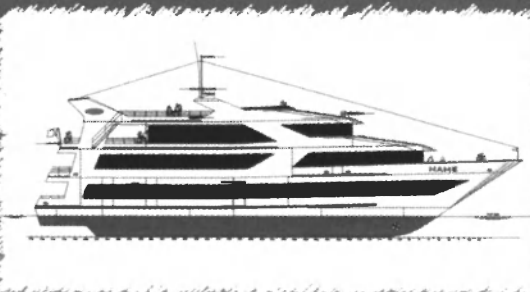
Transaction Snapshot

Cost \$800 Million
Ships 70 (47 owned)
Containers 200
Chassis 50,000
Gensets 3,000

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- Maersk Line made more than 16,500 port calls in 1998.

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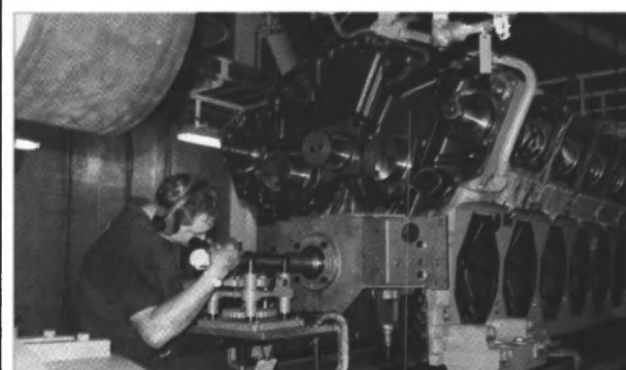
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United States Maritime Report

ed by government concern, remains the loan independent company, but is secure with a solid backlog and as the only builder of the nation's nuclear aircraft carrier fleet.

Naval procurement has changed dramatically in the last several years, and while the procurement of fewer, multi-task ships is the norm rather than the

exception, there have been rumblings from many fronts of late that a new wave of naval construction is needed to achieve the defense objectives of the United States well beyond 2000. There are a myriad of strategic, political and fiscal factors, which help to determine the level of naval shipbuilding at any given time, however it is reasonable to

assume that the projection of U.S. influence around the globe in a continuous and seamless manner will require a fleet well above the current 322-ship navy.

Current projects whetting builder's and supplier's appetite includes Auxiliary Dry Cargo Ship program, also known as ADC(X). The ADC(X), with three ships included in the proposed FY

Munson Delivers High Performance Craft

William E. Munson Company of Edmonds, Wash. delivered a 30 x 10 ft. (9.1 x 3 m) Packcat High Performance Landing Craft to Liquid Engineering Corporation of Billings, Mont. Specifically designed to replace underwater valves, fittings and piping on dams throughout the U.S., the vessel is equipped with an I-beam lifting system incorporating a hydraulic cable winch, allowing divers to recover dam equipment down to 200 ft. (60.9 m). Twin Mercruiser 5.7L gas engines coupled to Mercruiser Brovo II drive legs and pushes the boat to speeds in excess of 50 mph.

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Crowley Marine Services Sets New Quality Standards

Crowley Marine Services has earned certification of more vessels under the American Bureau of Shipping's (ABS) joint ISO/ISM quality and safety management program than any other tug and barge operator in the Americas.

NASSCO Sends Off Third Sealift Ship

NASSCO delivered its third Sealift New Construction ship, USNS Dahl, to the U.S. Navy. Named for Specialist Fourth Class Larry G. Dahl, who received the U.S. Army Medal of Honor for his heroic efforts during the Vietnam War, the vessel was the first to be delivered under NASSCO's single integrated trial concept. This process, which lowered the ship's delivery schedule by five weeks, provided a significant amount of savings for the Navy.

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NORSHIPCO Sets New Standards With Renovations

NORSHIPCO, a subsidiary of United States Marine Repair (USMR) and the largest non-nuclear ship repair, modernization and conversion company recently celebrated the revitalization and renovation of its Norfolk-based shipyard facilities.

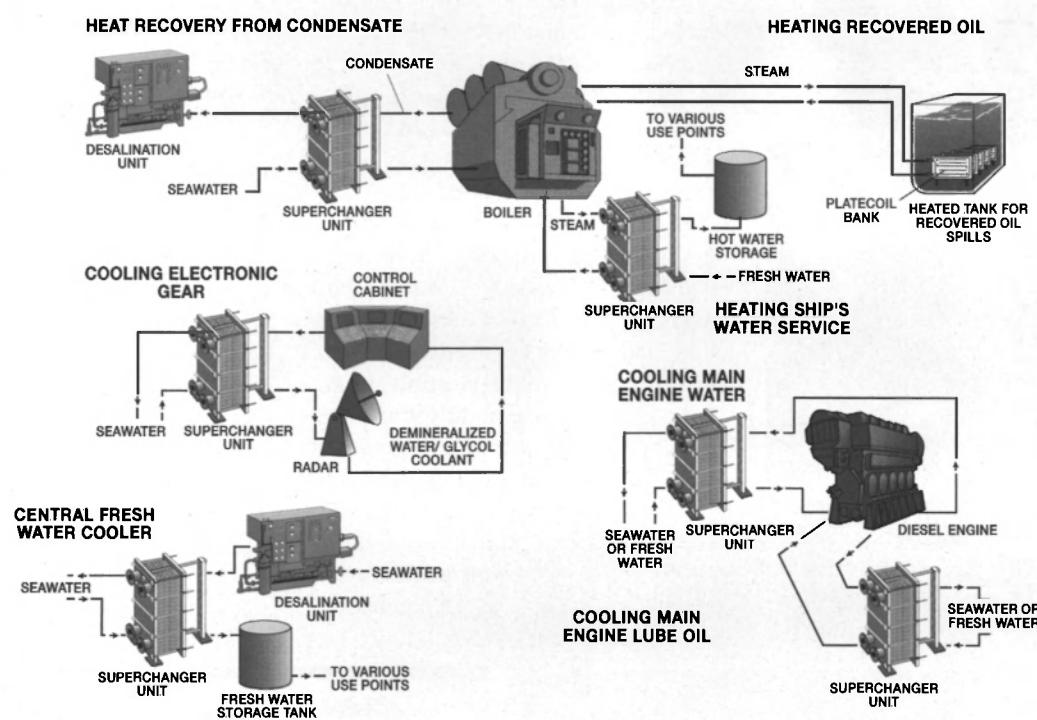
The changes promise to transform the ship repair industry. The refurbishment project, which was implemented as a result of the company's "People Are Important" philosophy, consisted of not only the shipyard, but its interior, parking lots and Administration Building as well.

Landscaping work such as the addition of new trees, shrubs and flowers contribute to the yard's new look, and the exteriors of the shop warehouses have been stripped, siding was replaced and trims painted. The ceremony, which was held on July 19 included U.S. Senator Charles Robb.

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Naval ships, fleet oilers, commercial container-ships, tankers and dredges are successfully finding new ways to operate more efficiently at lower cost, by utilizing Tranter's unsurpassed plate-type heat exchanger technology. Schematics presented here illustrate typical ways they are doing it.

Superchanger® plate and frame heat exchangers are used in a wide variety of shipboard applications—particularly for cooling main engine jacket water and cooling main engine lube oil with fresh water or seawater; cooling the ship's central fresh water; cooling electronic equipment; or recovering heat from condensate. They are far more efficient than tubular systems, and provide heat transfer coefficients from two to five times greater than those achieved by shell and tube units. They also require 10% to 50% less deck space and weigh up to one-sixth less.

Superchanger units can be equipped with titanium plates which offer the best resistance to corrosion and erosion when exposed to seawater. Intermixing or cross-contamination of hot and cold liquids is virtually impossible. Low fouling rates reduce cleaning requirements for Superchanger units, that are designed for easy maintenance. They can be cleaned-in-place by back flushing, or quickly disassembled by hand, cleaned and put back in operation.

Platecoil® prime surface heat exchangers offer optimum temperature control. A Platecoil bank-in-tank unit provides wide interspaces for effectively passing solids while efficiently heating seawater containing oil from spills.

Platecoil bayonet heaters provide a large amount of efficient primary heating surface in a single unit for maintaining desired temperatures in

storage tanks. These heaters help promote convection currents for better heat transfer rates and tank temperature uniformity. Platecoil suction heaters provide immediate heating for pumping oil out of tanks.

Tranter plate-type heat exchangers can be supplied in full compliance with codes and specifications as required by the ABS: the U.S. Coast Guard; shock testing per MIL-S-901C; vibration testing per MIL-STD-167-1; and ASME U stamp per Sec. VIII Div. 1.

With over 65 years of heat transfer problem solving experience, Tranter is uniquely poised to answer your tough questions and solve your precise needs. Call us at (940) 723-7125. Better still, call your local Tranter representative.



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Caterpillar Organizes New Worldwide Marine Business Group

Caterpillar has formed a new Marine Business Unit within the Engine Products Division. The reorganization is designed to strengthen the company's focus on marine customer needs and streamlines communication and response in all aspects of Caterpillar's global marine engine business.



Caterpillar's new global marine engine business team.

Leading the new organization is **Jan Arnold**, a veteran marketing and sales manager with 21 years experience working not only for Caterpillar, Inc. In addition to steering a team of special business managers focused on specific marine market sub-segments, Arnold will coordinate the efforts of five managers.

- **Bill Heimann**, a 27-year Caterpillar engineer with extensive experience in product design, applications and product support, will be marine product group manager.
- **Bob Hallengren**, new product introduction program manager, will put a decade of Cat marine engine experience to use, guiding strategic development, the smooth introduction of new engine designs.
- **Mak Mirhakimi**, who has led the Caterpillar marine engine electronics development effort since its inception in 1989, will be electronics program manager, developing and implementing electronic control system strategies.
- **Paul Mathes**, marketing and customer services manager, will lead worldwide marketing efforts, as well as a team of engineers focused on product improvement and support issues.
- **K. Bruce St. John**, an eight-year Cat Marine veteran, is the strategic planning and commercial support manager.

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2000 DOD budget — is envisioned to be a conventional monohull ship measuring approximately 590 x 98.4 ft. (180 x 30 m).

The ADC(X) will replace aging ammunition ships and dry cargo ships in the Navy's Combat Logistics Force, and its mission will be to transport ammunition and dry cargo to navy battle groups at sea. The ship will also have the capability to remain on station with the battle group if the situation dictates.

Mid-sized Yards

While much attention is paid to the U.S.' largest yards, it could be argued that the most significant maritime business — particularly on the commercial markets — is carried out in the many "second tier" yards. Business in the U.S.' mid-sized yards is as varied as the number and type of vessels that operate the world's inland, coastal and lake waterways. While the U.S. mid-sized yards are often regarded as regional "mom-n-pop" players, this perception could not be further from the truth in many instances.

First, the wave of consolidation has touched second-tier yards as significantly as the larger companies. The last few years have seen a tremendous consolidation of physical and fiscal resources, none so striking as the recent announcement of the merger between Friede Goldman Intl. and Halter Marine Group. Earlier this summer, the companies announced the signing of a definitive agreement to enter a "strategic combination," with the resulting company to be named Friede Goldman Halter, Inc. The combined company would have a backlog of more than \$1 billion, with revenues in excess of \$1.5 billion.

"Friede Goldman Halter will also maintain an Engineered Products division by combining the assets of

Friede Goldman's Brissonneau & Lotz Marine (BLM) European operations with Halter's AmClyde, Fritz Culver and McElroy brands," **John Dane III**, Halter's CEO, said. "BLM's diverse product line will complement the strong franchise that AmClyde and Fritz Culver hold in the offshore energy industry."

Technological Prowess

The proliferation of unique, high value and technologically challenging projects won of late by U.S.

EPA Conference Continues To Add Maritime Topics

Several topics and speakers have been added to the 1999 EPA Region III Chemical Emergency Preparedness and Prevention Conference maritime track. The conference will be held September 20-23 at the Hilton Washington & Towers, Washington, D.C.

Coordinating federal, state, and private sector participation in emergency planning and response can be an overwhelming task. Despite this, **Tom Rayburn** of the Great Lakes

Spill Commission has achieved this feat. Rayburn will be discussing some of the innovative approaches to environmental and economic protection from potential spill impacts achieved by the Great Lakes partnership.

Doug Dillon of the Delaware River and Bay Marine Fire Fighting Task Force and a former Coast Guard Officer, will share his expertise on emergency response in the marine environment. Dillon will

discuss fire fighting techniques for barges and ships, responding to spills and releases that are incidental to fires and explosions, and equipment requirements for effective responses to marine incidents.

For a full list of topics, visit the conference Web Site at www.epacepp.com. For more information or to register, call the conference hotline toll-free at (877) 804-CEPP. The Washington, D.C. Local Emergency Planning Committee is the conference host and has obtained space for up to 150 exhibitors.

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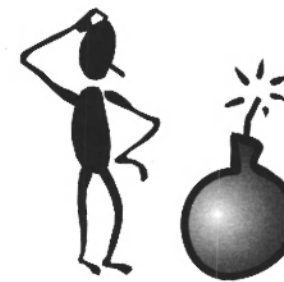
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U.S. Shipyard Orderbook

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Owner	Vessel Name	Type	Dimensions	Engines	Delivery Date	Owner	Vessel Name	Type	Dimensions	Engines	Delivery Date
Amfels, Inc. Brownsville, Texas						Chesapeake Shipbuilding Corp., Salisbury, Md.					
Chiles Offshore	Chiles Magellan	MLT 116C Jack-Up rig	243 x 206 x 26	N/A	9/99	N/A	N/A	Passenger Vessel	160 x 36 x 6.5	N/A	10/99
Atlantic Marine, Inc., Jacksonville, Fla.						Conrad Shipyard, Inc., Morgan City, La.					
Astro Offshore Corp.	N/A	Platform Supply Vessel	233 x 54 x 20	(2) EMD 16-645 E7	12/99	N/A	N/A	Deck Barge	140 x 45 x 8	N/A	3Q-99
Reinauer Transportation	N/A	ATB Tug	124 x 40 x 22	(2) CAT 3612	12/99	N/A	N/A	OSV	190 x 44 x 19	N/A	4Q-99
N/A	N/A					N/A	N/A	OSV	240 x 56 x 21	N/A	2Q-99
N/A	N/A					N/A	N/A	Deck Barge	250 x 72 x 16	N/A	2Q-99
Avondale, Industries, Inc., New Orleans, La.						Crescent Beach Boatbuilders, Snohomish, Wash.					
Arco Marine Inc.	Endeavour	Double-hull Crude Carrier	894 x 151 x 83	(2) Low Speed Diesels	7/00	Crescent Beach Boatbuilders	Crescent Lady	Raised Pilothouse	104 x 24 x 6	(2) 3412 TA CAT	11/99
Arco Marine Inc.	Resolution	Double-hull Crude Carrier	894 x 151 x 83	(2) Low Speed Diesels	8/01	N/A	Escape	Raise Pilothouse Motoryacht	120 x 24 x 6	(2) 16V2000 DDC/MTU	8/99
Arco Marine Inc.	Discovery	Double-hull Crude Carrier	894 x 151 x 83	(2) Low Speed Diesels	7/02	N/A	N/A	Tri-Deck	121 x 25 x 6.5	(2) 16V2000 DDC/MTU	8/00
U.S. Navy	Mendonca	Fast Sealift	950 x 105.8 x 34.5	(4) Med. Speed Diesel	5/00						
U.S. Navy	Piliilau	Fast Sealift	950 x 105.8 x 34.5	(4) Med. Speed Diesel	10/27/00						
U.S. Navy	Britin	Fast Sealift	950 x 105.8 x 34.5	(4) Med. Speed Diesel	4/01						
U.S. Navy	N/A	Fast Sealift	950 x 105.8 x 34.5	(4) Med. Speed Diesel	9/01						
U.S. Navy	San Antonio	LPD-17 Class	684 x 105 x 23	(4) Med. Speed/TC	11/02						
U.S. Navy	New Orleans	Fast Sealift	950 x 105.8 x 34.5	(4) Med. Speed Diesel	11/03						
U.S. Navy	Seay	Fast Sealift	950 x 105.8 x 34.5	(4) Med. Speed Diesel	11/99						
USCG	Healy	Polar Icebreaker	420 x 82 x 29	Diesel Electric	10/29/99						
U.S. Navy	Fisher	Fast Sealift	950 x 105 x 34	Med. Speed Diesel	7/27/99						
Bath Iron Works Corp., Bath, Maine						Derecktor Shipyards, Mamaroneck, N.Y.					
U.S. Navy	N/A	Aegis Destroyer	510 x 66 x 42	gas turbines	2003-2006	Woods Hole Steamship Authority	N/A	High-speed Catamaran Ferry	134.5 x 34.8 x 6.4	Paxman 12VP185	May 2000
U.S. Navy	N/A	Aegis Destroyer	510 x 66 x 42	gas turbines	2003-2006						
U.S. Navy	N/A	Aegis Destroyer	510 x 66 x 42	gas turbines	2003-2006						
U.S. Navy	N/A	Aegis Destroyer	510 x 66 x 42	gas turbines	2003-2006						
U.S. Navy	N/A	Aegis Destroyer	510 x 66 x 42	gas turbines	2003-2006						
U.S. Navy	Oscar Austin	Aegis Destroyer	510 x 66 x 42	gas turbines	2/16/00						
U.S. Navy	Winston Churchill	Aegis Destroyer	510 x 66 x 42	gas turbines	8/11/00						
U.S. Navy	Howard	Aegis Destroyer	510 x 66 x 42	gas turbines	2/9/01						
U.S. Navy	N/A	Aegis Destroyer	510 x 66 x 42	gas turbines	8/3/01						
U.S. Navy	N/A	Aegis Destroyer	510 x 66 x 42	gas turbines	3/1/02						
Bay Shipbuilding Co., Sturgeon Bay, Wis.						Eastern Shipbuilding Group, Panama City, Fla.					
Mobil Oil	N/A	Double Hull Petroleum Barge	504 x 78 x 37	N/A	2000	McIntosh Foundation	N/A	Overnight Passenger Vessel	157 x 32 x 13.5	Cleveland Diesel	8/99
Bender Shipbuilding & Repair, Mobile, Ala.						Freeport Shipbuilding, Freeport, Fla.					
Oto Candies Inc.	Nicki Candies	OSV	220 x 54 x 20	EMD 16-645E6	8/99	Potomac Party Cruises	N/A	Dinner Cruise Vessel	138 x 42 x 9	(2) Cummins	10/99
Tidewater Marine	R.C. Baker	OSV	220 x 54 x 20	CAT 3516TA	8/99	Starship Cruise Lines	Starship	Dinner Cruise Vessel	173 x 42 x 11.5	(2) Detroit Diesel Series	8/99
Blount Marine Corp., Warren, R.I.						Gladling-Hearn Shipbuilding, Somerset, Mass.					
Pegasus Yachts, Inc.	N/A	600-passenger Dinner Vessel	161 x 40 x 10.3	2-Detroit Diesel 16V-92	11/99	New England Aquarium	Voyager III	High Speed Catamaran	114 x 30 x 10	(4) DDEC 2000 Series	6/99
Tallmadge Brothers	N/A	Oyster Suction Dredge	90x 30 x 8	CAT 3408	4/00	New York City Police	N/A	Police Patrol Boat	55 x 15 x 8	(2) DDEC 1271	7/99
Bollinger Shipyards, Inc., Lockport, La.						Halter Marine Group, Inc., New Orleans, La.					
Bisso Offshore, LLC	N/A	Harbor Tug	105 x 40 x 17.3	(2) G.M. (EMD)	9/99	N/A	N/A	Patrol (10)	54 x 16.5 x 8	MTU12V183	12/24/98-9/99
Crosby Marine Transportation	N/A	Tugboat	90 x 28 x 11	(2) Caterpillar 3508 EUJ	4/99	N/A	N/A	Patrol (12)	79.8 x 18 x 10.3	DD12V92	1/30/99-1/15/00
Crosby Marine Transportation	N/A	Tugboat	90 x 28 x 11	(2) Caterpillar 3508 EUJ	7/99	N/A	N/A	Supply (7)	200 x 56 x 18	CAT 3516B	Through 4/13/00
U.S. Army	Springfield (BD-03)	Derrick Barge	200 x 78 x 14.3	Cummins 300 kW	11/00	N/A	N/A	RoRo Ramp (3)	N/A	N/A	1/1/99-8/1/99
U.S. Army	Springfield (BD-02)	Derrick Barge	200 x 78 x 14.3	Cummins 300 kW	8/00	N/A	N/A	Barges (Asphalt & Tank) (4)	404 x 78 x 34	N/A	Through 7/12/99
U.S. Army	Saltillo	Derrick Barge	200 x 78 x 14.3	N/A	8/00	N/A	N/A	Sportfish	126 x 27 x 6.1	Paxman 12V185	N/A
U.S. Navy	Tornado	Patrol Coastal	170 x 30 x 13.5	(4) Paxman Valenta 16RPP200	8/00	N/A	N/A	Yacht	150 x 30	N/A	N/A
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	7/99	N/A	N/A	Supply	210 x 48 x 18	EMD	N/A
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	8/99	N/A	N/A	Supply (2)	205 x 46 x 17	CAT 3516B	1/7/99-3/10/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	9/99	N/A	N/A	Dock Mod. (3)	90 x 50 x 16	Wartsila 9L20	6/11-10/11/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	10/99	N/A	N/A	AHTS (2)	221 x 46 x 19	EMD 16-710	12/9/98-2/5/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	11/99	N/A	N/A	Supply (2)	221 x 46 x 19	EMD 16-710	4/23/99-7/4/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	12/99	N/A	N/A	T-AGS	328 x 58 x 28	EMD12 & 16	1/13/00
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	1/00	N/A	N/A	RoRo Ship	312 x 82 x 20	CAT 3412	5/30/00
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	2/00	N/A	N/A	PSV	267 x 56 x 20	CAT 3516B	7/1/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	3/00	N/A	N/A	Yacht	150 x 28 x 7	CAT 3512B	7/9/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	4/00	N/A	N/A	Tug	127	EMD 16-645	9/1/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	5/00	N/A	N/A	Patrol	198 x 29 x 16	CAT 3516	9/21/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	6/00	N/A	N/A	T-AGOS	218.5 x 95.8 x 55.3	EMD	10/20/99
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	7/00						
USCG	N/A	Patrol Boat	87 x 17.3 x 10	(2) MTU 8V396	8/00						
Broward Marine, Fort Lauderdale, Fla.						Houma Fabricators, Inc., Houma, La.					
N/A	Lady Francis IV	Motor Yacht	103 x 20	N/A	N/A	UDI	N/A	Pushboat	70 x 28 x 10	N/A	8/99
N/A	SPEC	Tri-Deck	155 x 28	N/A	N/A	UDI	N/A	Pushboat	70 x 28 x 10	N/A	10/99
N/A	Cocoa Bean	Motor Yacht	142 x 28	N/A	N/A	UDI	N/A	Inland Towboat	70 x 34 x 10	(3) Luggers Diesels	8/99
N/A	N/A	Motor Yacht	115 x 23	N/A	N/A	UDI	N/A	Inland Towboat	70 x 34 x 10	(3) Luggers Diesels	10/99
N/A	SPEC	Cockpit Motor Yacht	112 x 20	N/A	N/A	UDI	N/A	Inland Towboat	70 x 34 x 10	(3) Luggers Diesels	12/99
N/A	SPEC	Motor Yacht	90 x 20	N/A	N/A						
N/A	SPEC	Sport Fish	93 x 22	N/A	N/A						
N/A	SPEC	Sport Fish	95 x 22	N/A	N/A						

yards has helped to dispel the perception that U.S.-based yards could not be competitive on, for example, the cruise market. While it is safe to assume that European shipbuilders — which continue to hold a commanding dominance on the cruise shipbuilding front — are hardly quaking in their boots, it was a highly significant event when earlier this year American Classic Voyages Co. announced the signing of a contract with Ingalls Shipbuilding to build up to three ships for \$1.4 billion. **Phil Calian**, president and CEO of AMCV, and his companies have single-handedly injected enthusiasm and many dollars into U.S. shipbuilding circles, with the signing of this contract and another lower valued, but highly coveted deal to build historical replication cruise vessels with Atlantic Marine.

Another project which has stoked considerable intrigue is the Fast Ship project, which recently took another step towards reality with the signing of a Memorandum of Understanding with National Steel and Shipbuilding Company (NASSCO), a subsidiary of General Dynamics, to build the first generation high-speed vessels that will make up the FastShip trans-Atlantic transportation fleet.

Under the agreement, NASSCO will construct the first four revolutionary vessels in the FastShip fleet. The agreement establishes a timeline to finalize a construction contract that will include definitive pricing, delivery schedule and performance guarantees. Moreover, NASSCO has agreed to consider a financing commitment to FastShip, Inc.

FastShip will be powered by five marinized aero-derivative gas turbines. Each turbine will drive one Kamewa water jet, delivering in total 250 MW, or 335,000 hp — roughly equivalent to the takeoff power of two 747s. This propulsion package will enable the 860-ft. (262.1 m) vessels, carrying a 10,000-ton payload, to make the passage from Philadelphia to Cherbourg, France, in less than four days, and to attain speeds of up to 40 knots. The hull form, coupled with the propulsion package will enable the ship to maintain those speeds even under adverse weather conditions. Once in port, the ships will be loaded and unloaded in six hours.

Repair & Conversion

While U.S. yards cannot offer the bargain basement labor rates traditionally associated with successful ship repair and conversion operations, primarily in Asia, the U.S. yards do offer excellent facilities and unsurpassed technological know-how and tools. It doesn't hurt, either, that they happen to reside in the country that attracts the most shipping business.

One of the more interesting repair &

conversion projects was the re-activation of LNGC Matthew at Baltimore Marine Industries. The ship — originally El Paso Howard Boyd — was built by Newport News Shipbuilding in 1978. When the decision was made to bring the vessel out of moth balls, owners Cabot LNG Inc. realized that a significant engine room upgrade would be necessary. Enter G. R. BOWLER, Inc., Marine Systems Integrators of Moore

Process Automation Solutions' APACS Systems, which completed an engine room, automation upgrade of all systems aboard the LNG/C Matthew.

Using ABS Type-approved, Moore, APACS systems hardware and Process-Suite HMI software, the G.R. Bowler Inc. configuration includes control, monitoring, alarm and data management functions for the main propulsion machinery and engine room auxiliaries.

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United States Maritime Report

particularly in the lucrative and notoriously particular cruise ship niche. The Alabama facility worked near miracles earlier this year, repairing Royal Caribbean's Monarch of the Seas, as its hull and production departments were able to average more than 7.3 tons of steel renewals per day, in spite of the

requirement to clean and gas-free some 114 compartments/tanks. Making the job more challenging was the compartment flooding, and the more than 18 miles of electrical wiring and numerous motors that required replacement, as well as the mechanical renewals and overhauls that had to be effected. The

task of fixing the severity of damage is made even more impressive considering that the ship remained functional during the entire drydocking to support the crew, which was still stationed aboard Monarch. Also, Royal Caribbean used the opportunity to conduct \$8 million in topside refurbishment that was original-

ly slated for a later date.

Cascade General has forged a solid reputation for technical excellence and on-time delivery, even in the face of the most challenging jobs.

For example, late last year Capitano Giovanni's (a 738-ft. (225-m), 74,500-dwt ship) rudder broke in mid-Pacific. Cascade, which had a signed order in hand as the ship was being towed in, started the process of fabricating the new rudder from the original designs. Cascade consulted with Fincantieri, the ship's builder, to establish an auto-CAD interface and to receive all CAD data for the replacement rudder via e-mail. More than 70,000 pounds of locally supplied ABS Grade A steel were cut on computer-controlled equipment, and assembly was in progress by a team of certified welders within days of the contract signing.

Newport News Shipbuilding (NNS), which has much expertise in both the naval and commercial repair & conversion markets, recently was awarded a U.S. Navy contract modification valued at \$88.5 million for maintenance work on the aircraft carrier USS Enterprise (CVN 65).

The NNS-built ship is expected to arrive at the company in August for several months of maintenance. Work during the ESRA will include enhancements to crew living and dining areas; re-decking of two elevators; repairs and inspections on a variety of ship systems; and maintenance on reactor plants to ensure continued safe operation of the ship.

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Victaulic Acquires Brico

Victaulic Co. of America has acquired Brico Industries Inc., a leading maker of mechanical pipe joining systems, specializing in large diameter connections. Brico will continue to operate under the direction of Donald Bridges, president, and will also continue operations in Atlanta.

Circle 34 on Reader Service Card

MMC Starts FPSO Review

In the spring, the Minerals Management Service (MMS) awarded a contract for preparation of an environmental impact statement on the possible use of floating production, storage and offloading (FPSO) systems in the Gulf of Mexico. FPSO's are increasingly being deployed worldwide for the efficient production of offshore fields, however none are currently in use in the Gulf of Mexico.

While the contract for the study has been issued, U.S. yards should not hold their breath waiting for FPSO contracts to flood in anytime soon, as the nearly

Maritime Reporter/Engineering News

Haley DRV 1711 Hydraulic Gear unit.

Haley Marine Gears realizes that quality of product must be complimented with equal service quality to survive in today's ultra-competitive market. The company was recently involved with a job which allowed it to exhibit its prowess on both ends, resulting in a highly satisfied workboat customer in New York.

One of CR Harbour Towing & Transportation's (Glen Cove, N.Y.) towboats was recently pulled from service so that it could be re-powered with CAT 3512B marine diesel engines.

Chris Roehrig, CR's president, wanted to get the right propulsion gears and have them installed correctly the first time, thus averting more time out of service and lost money.

As an original equipment manufacturer, Haley Marine is the largest exclusive manufacturer (800 to 6,000 hp) of marine propulsion systems in the U.S., engineering top-of-the-line gears, clutches and couplings for marine applications. The company is also known for its good reputation for on-site repair service, which is quick and technically correct.

"Haley Marine made the gears fit the vessel, and offered us a warranty on the customized gears," Roehrig said. "We needed the gears to fit in a certain space. They made the gears fit, and made them work." "It's something we do every day for our customers: get them the right gears in the right place, and as quickly as possible," said Kyle Haley, president, Haley Marine Gears. For the CR Harbour repower, Haley Marine provided two Haley DRV-1711 hydraulic gear units, rated for 1,500 hp at 1,600 rpm at a ratio of 6.02:1. The clutches were externally mounted wet disc clutches and carburized, precision-ground single helical gear elements, which were designed, engineered and manufactured by the company. The couplings were Haley highly resilient torsional couplings.

Circle 32 on Reader Service Card

\$1 million contract stipulates that the report be prepared in 18 months. A draft environmental impact statement will be released in March/April 2000, with public hearings to follow in April/May 2000.

A final report is scheduled for September/October 2000.

Textron Gets \$20M USCG Option

Textron Marine & Land Systems announced the award of the third year option for the construction of 23 47-ft.



(14.3 m) Motor Lifeboats (MLB) for the U.S. Coast Guard, an option valued at approximately \$20 million when associated training, spares and support is included.

The new MLB is designed to significantly enhance the USCG's ability to



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Seay Awarded Contract For Tractor Tugs

Seay Corp. was awarded a contract to supply two tractor tugs for the U.S. Navy operation in Diego Garcia in the Indian Ocean. The new tugs are required to safely dock the Navy's Bob Hope class LMSR ships, and will replace the Navy's older YTB's. The two new construction 95-ft. (29 m) tractor tugs were built in 1998 and are powered by Niigata 6L25HX engines with ZP-21 Kaplan type 360 degree steerable propeller with nozzles, an arrangement which provides 45 metric tons of bollard pull.

Circle 35 on Reader Service Card

Manson Christens New Dredge

Manson Construction Co. recently christened the newest edition to its dredging fleet, a trailing suction hopper dredge dubbed Bayport, at the company's yard on the Duwamish river in Seattle. Bayport is a larger sister ship to Manson's current self-propelled hopper

dredge Newport, with an overall size of 303 x 54 x 26-ft. (92 x 16.5 x 8-m) and 5,000 cu. yard capacity.

Construction of Bayport was a fast track project for the company. The dump barge hull was reconstructed to become this self-propelled, self-contained hopper dredge, and design work began only in November 1998. The barge, which had been working on a USACE project in San Francisco, was brought to Manson's Seattle yard in February 1999, and since that time was completely transformed under the guidance of Manson's Dave Gertsch and Dave Nielsen.

Circle 36 on Reader Service Card

Cascade To Build 120MW Power Barge

Cascade General was awarded the contract for construction of a 120MW power barge for MAN B&W Diesel AG of Augsburg, Germany. The floating diesel power station will be built for operation in Guatemala, and is a self-contained mobile power generation unit comprised of seven MAN B&W type 18V 48/60 diesel generators mounted on a deck barge which measures 279 x 204 x 11.8 ft. (85.1 x 31.8 x 3.6 m). "This is a large, and in many ways significant project, which shows Cascade General's ability to compete in the interna-

tional market for newbuilds," said Cascade executive vice president, Suren Menon. "This contract confirms that our modernization and restructuring of work practices at Portland Shipyard has moved us in the right direction."

The seven generating sets will be housed in an engine hall, which will be prefabricated at Cascade General. A steel deckhouse structure will accommodate control room, offices, workshops, supplies and electrical facilities. Siemens has been tapped to supply all generators, switchgear and transformers.

The overall barge design was supplied by Kvaerner Masa Marine.

Circle 37 on Reader Service Card

Tidewater Taps Breaux Bros. For New Boat

Breaux Brothers Enterprises Inc. are building a 155 x 30-ft. (47.2 x 9.1 m) crew boat for Tidewater Marine. The boat will have four KTA38 M2 main engines rated 1,350 hp at 1,950 rpm for a total of 5,400 hp.

The engines will turn 46 x 42-in. props through WVS 430/1 S.C. 2.458:1 marine gears. A maximum speed in excess of 24 knots with a 100 LT deadweight cargo is anticipated with a range of 1,415 nm at 19 knots.

The vessel is certified to carry 72 people.

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Maritime Reporter/Engineering News

New Shipyard Orders

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TAUBATKOMPANIET	NETHERLANDS	DALIAN SHIPYARD	AHTS	1	0	2,500	6/05	19.5	P & O	U.K.	FINCANTIERI	CRUISE SHIP	1	0	110,000	02	460
INDIAN NAVY	INDIA	COCHIN SHIPYARD	AC CARRIER	1	32,000	0	-	400	P & O	U.K.	MITSUBISHI H.I.	CRUISE SHIP	2	0	110,000	3/04	800
BOCIMAR	BELGIUM	SASEBO	BULK CARRIER	170,000	0	2000	35		AKER MARITIME/	NORWAY							
AU BULK II (UGLAND)	NORWAY	TSUNEISHI	BULK CARRIER	3	76,500	0	2001	60	COMBISA	/MEXICO	AKER GULF MARINE	DRILLING RIG	3	0	0	2001	-
SOUTHERN STAR	US	DAEWOO	BULK CARRIER	2	75,000	0	2001	43	SHELL DEEPWATER	U.S.	DAEWOO	DRILLING UNIT	1	13,500	0	6/01	70
CHANDRIS	GREECE	DAEWOO	BULK CARRIER	2	75,000	0	2001	43	MINOAN LINES	GREECE	AUSTAL SHIPS	FAST FERRY	3	0	0	2000	89.3
JINHUI SHIPPING	HONG KONG	SUMITOMO	BULK CARRIER	1	74,000	0	2/02	20.8	STRINTZIS	GREECE	HELLENIC SHIPYARDS	FERRY	1	2,000	18,000	5/01	35
GREEK INTEREST	GREECE	NAMURA DOCK	BULK CARRIER	1	74,000	0	-	21.7	P & O	U.K.	MITSUBISHI H.I.	FERRY	1	0	19,000	2000	50
SHOEI KAIUN	JAPAN	IMABARI SHIPBUILDING	BULK CARRIER	1	73,900	38,900	2000	20.3	REMOY MGMT.	NORWAY	CONSTANTZA	FISHING	1	1,070	2,300	4/00	-
KLAVENESS	NORWAY	OSHIMA SHIPBUILDING	BULK CARRIER	2	72,000	0	2001	57	MARR VESSEL MGMT	U.K.	APPLEDORE	FISHING	1	300	0	2/00	-
LEVANT MARITIME	GREECE	SANOYAS	BULK CARRIER	2	62,000	0	2001	36	POLAR SEAFOOD	GREENLAND	ORSKOV	FISH TRAWLER	2	0	0	5/00	19.3
KLAVENESS	NORWAY	OSHIMA SHIPBUILDING	BULK CARRIER	2	51,000	0	2001	36	MARLBAY	ESTONIA	ASTILLEROS DE HUELVA	CARGO	1	5,836	3,893	-	-
SEVENT SEAS MAR.	GREECE	SHANGHAI SHIPYARD	BULK CARRIER	2	48,000	0	00/01	32.5	ARKLOW SHIPPING	IRELAND	BARKMEIJER STROOBOS	CARGO	2	3,193	0	2/00	-
MITSUBISHI AND NIS.	JAPAN	HAKODATE DOCK	BULK CARRIER	1	32,000	0	2000	-	KUMIAI SENPAKU	JAPAN	KAWASAKI H.I.	LPG	1	50,000	0	2001	60.4
VIETNAMESE OWNER	VIETNAM	BACH DANG-VINASHIN	BULK CARRIER	1	8,500	0	2000	8	KOMAYA	SINGAPORE	ASAKAWA SHIPBUILDING	LPG	1	9,100	6,650	2/00	-
TEH-HU CARGOCEAN	CHINA	HALLA	BULK CARRIER						SLOMAN NEPTUN	GERMANY	FERROSTAAL	LPG	1	0	0	-	19
			ORE STRENGTH	1	170,000	0	2001	32	BERGEBSEN	NORWAY	GDYNIA	LPG	2	0	0	2/00	-
DIANA SHIPPING	GREECE	HALLA	BULK CARRIER						FRENCH INTERESTS	FRANCE	MARINTEKNIK	PASS/FERRY	1	0	300	1/99	-
			ORE STRENGTH	2	74,000	0	2/00	37.6	B&N NORDSIOFRAKT	SWEDEN	MAWEI	MULTI-PURP.	2	17,500	12,150	2001	33.6
RAY SHIPPING		GDYNIA	CAR CARRIER	1	0	0	2/00	-	NORASIA	SWITZERLAND	DAMEN SHIPYARDS	MULTI-PURP.	2	8,650	0	2/00	-
ODFJELL	NORWAY	KVAERNER FLORO	CHEM TANKER	2	37,350	0	1/02	110	PALKKIYHTYMA		MAWEI	MULTI-PURP.	1	0	0	2001	16.6
MARNAVI	ITALY	CANTIERE NAVALE							SHIPPING CO. OF INDIA	INDIA	COCHIN SHIPYARD	PASS./CARGO	1	0	500	2/00	3
		FRATELLI ORLANDO	CHEM TANKER	1	26,000	0	2001	49.7	JAYA OFFSHORE	SINGAPORE	JAYA SHIPBUILDING	SUPPLY VESSEL	1	0	1,400	2/00	-
ESSBERGER	GERMANY	J.J. SIETAS	CHEM TANKER	2	4,500	3,300	2000	96	COGEMAR/DAMICO	MONACO	DAEDONG SHIPBUILDING	PROD. TANKER	2	45,000	0	2001	49
HOEKENS-SOMERS	NETHERLANDS	FULTON HEMIKSEM	CONTAINER	1	0	0	2000	-	SEARLAND SHIPPING	LIBERIA	DAEDONG SHIPBUILDING	PROD. TANKER	2	35,000	23,843	2000	43
GEBAB	GERMANY	DAEWOO	CONTAINER	4	75,000	0	2000	260	GEMARFIN	SWITZERLAND	DAEDONG SHIPBUILDING	PROD. TANKER	2	35,000	0	2000	44
NORD CAPITAL	GERMANY	SAMSUNG	CONTAINER	2	67,500	0	2001	108.6	ANDROMEDA	MONACO	DAEDONG SHIPBUILDING	PROD. TANKER	2	35,000	0	2000	43
NEPTUNE ASSO. LINE	SINGAPORE	JURONG	CONTAINER	4	15,000	0	2001	74	FINNCARRIERS	FINLAND	JINLING	ROBO	2	8,100	10,900	2001	-
EUROAFRICA SHG.	POLAND	GDANSK	CONTAINER	1	6,000	0	2000	10	CIA SARDA DI NAV.	ITALY	SZCZECIN SHIPYARD	ROBO	2	8,100	0	00/01	-
SCHONING	GERMANY	GDANSK	CONTAINER	1	0	0	2000	-	GRIMALDI	ITALY	DAEWOO	ROBO/FERRY	2	19,500	52,000	00/01	88
OLDENBURG-									ALAFUZOS								
PORTUGIESISCHE	GERMANY	MAWEI	CONTAINER	4	0	0	2001	-	(MARUBENI CORP)	GREECE	NIPPON KKK	TANKER	1	160,000	0	2001	45.8
FASTSHIP	U.S.	NASSCO	CONTAINER	1	0	0	2002	220	MARUBENI CORP	JAPAN	MERWEDE SHIPYARD	TANKER	1	149,950	0	2001	-
ATHINA SHIPPING	GREECE	SAMSUNG	CONTAINER	1	0	0	2001	50	OSG SHIP MGMT	U.S.	HYUNDAI HEAVY (HHI)	TANKER	4	133,000	0	00/01	136
A. P. MOLLER	DENMARK	ODENSE	CONTAINER	4	0	0	-	-	COSCO	CHINA	DALIAN SHIPYARD	TANKER	2	68,000	0	2001	56
TIRRENIA SOC. NAV.	ITALY	FINCANTIERI	CRUISE SHIP	2	0	30,000	1/02	210									
P & O	U.K.	CHANTIERS DE L'ATLANT.	CRUISE SHIP	2	0	88,000	2/04	720									

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(Continued from page 22)

(Dalhousie University, Canada) revealed that the rusticles had a very open form of crystalline structure, which effectively bound the structure together. Studies in Regina found that the rusticles were a complex network of separate microbial communities interconnected with water channels and protected by resinous matrices and various forms of iron-rich oxidized plates. Species were recovered from the iron related, sulfate reducing, slime forming, denitrifying, nitrifying, sulfur oxidizing, and heterotrophic bacterial groups as well as species of fungi and some algae. The rusticles therefore appeared to be large and complex structures — but not created by a single plant or animal species — but by a whole range of microbial species working together to develop a common home (i.e., the rusticle). In many ways, the rusticles can be viewed as biological concretions, in other words, a form of living concrete.

In 1996, the survey revealed that 65 percent of the side shell, and 25 percent of the bulkhead plating was coated in rusticles to a total mass of 650 tons. This would be equivalent to 178 tons of iron being held in the rusticles that could have been biologically "mined" from the ship's steel. While this would appear to

be a relatively small amount of iron being extracted from a steel ship that had a gross weight of over 45,000 tons. Research conducted in Regina between 1996 and 1999 has found that this iron is not passively accumulated in the rusticle, but is released from these growths at a rate equivalent to 0.016 to 0.02 percent of the biomass weight per day as a mixture of red dust and yellow colloidal particles. Thus it can be determined that the iron in the steel of the RMS Titanic is being biologically extracted by the rusticles and released into the oceanic currents in various forms of suspended particles. Essentially, the iron is being returned to nature again.

Steel plates are not rich sources of nutrients for biological growth, so a very fundamental question has to be: what do the rusticles feed on? A constant companion to expeditions diving down to the resting site of the RMS Titanic is the sea snow. This sea snow is a mass of suspended living particles that gently rain down on the ship. Often the rusticles appear to be coated with this white snow as it settles. Dissection of the rusticles reveals that they have many ducts and passageways through which the nutrients from the sea snow can be taken into the biomass and "digested."

To examine whether the rusticles attach to, and grow faster, on different grades of steel that have been subjected to different stresses, four IPSCO Test Platforms were placed down at the wreck site in August, 1998. These IPSCO Test Platforms have three different steels, a mild steel (A), a tough steel (AH36) and a notch tough steel (EH36). Each steel was represented by five 6 x 1 x 0.25-in. coupons that were either twisted 180 degrees along the long axis to create buckling. A second was buckled and then tempered; the third was subjected to hammering at five points with a 3,000 psi pressure for one hour, the fourth was also hammered and then burnt in bunker fuel oil for three hours, and the fifth was the control. As that chapter closes, so there is the question as to what can be learned? Research has found that the biological plugging of water wells occurs through the growth of microbial communities that have a close resemblance at the microscopic level to rusticles. Nature is integrated. For steel clad, particularly twin hulled ships, there is an open question as to whether rusticles are not a part of the biological community causing fouling and corrosion problems. For example, the gap between the hulls on a twin



One feature that stood out in those first images of Titanic was that the ship was festooned with rust-like growths, called rusticles. Examination of Titanic's hull are drawing some interesting conclusions regarding the natural removal of iron from steel, and the potential compromise in safety and performance.

hulled ship provides a potential site for the covert growth of rusticles at sites where the extraction of the iron from the steel may suddenly compromise the ship in a fateful manner.

The preceding was excerpted from a story by D. Roy Cullimore Ph.D., Regina Water Research Institute, University of Regina, Canada; and Lori Johnston, Droycon Bioconcepts Inc., Regina, Canada. The Authors wish to acknowledge the following sponsorship for their parts in the project: IPSCO Corporation, SNAME, National Research Council of Canada-IRAP, Discovery Channel, Stardust Visual and RMS Titanic Inc.

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U.S. Shipyard Orderbook (continued from page 60)

Owner	Vessel Name	Type	Dimensions	Engines	Delivery Date	Owner	Vessel Name	Type	Dimensions	Engines	Delivery Date
U.S. Navy	Roosevelt	Aegis destroyer	510 x 66	Gas Turbine	3/00	Neuville Boat Works, New Iberia, La.					
U.S. Navy	DDG 82	Aegis destroyer	510 x 66	Gas Turbine	10/00	Seacor Marine	N/A	Crewboat	165 x 34 x 13	Cummins KTA38	5/1/00
U.S. Navy	Iwo Jima	Multipurpose Assault	844 x 106	Steam Propulsion	12/00	Seacor Marine	Sara F. McCall	Crewboat	165 x 34 x 13	Cummins KTA38	11/1/99
U.S. Navy	DDG 89	Aegis destroyer	510 x 66	Gas Turbine	4/03	Newport News Shipbuilding, Newport News, Va.					
U.S. Navy	DDG 93	Aegis destroyer	510 x 66	Gas Turbine	4/04	U.S. Navy	Ronald Reagan	Aircraft Carrier	N/A	N/A	2002
U.S. Navy	DDG 97	Aegis destroyer	510 x 66	Gas Turbine	4/05	Ocean Technical Services, Harvey, La.					
U.S. Navy	DDG 100	Aegis destroyer	510 x 66	Gas Turbine	4/06	MODDEC Int'l.	N/A	Hose Handling Boat	23 ft.	N/A	6/99
U.S. Navy	DDG 84	Aegis destroyer	510 x 66	Gas Turbine	5/01	USCG	USCG Scioto	Push Boat	65 ft. (100 ft. barge)	N/A	5/99
U.S. Navy	DDG 88	Aegis destroyer	510 x 66	Gas Turbine	8/02	Kruger Marine Technology	M/V Dolphin	Yacht	75 ft.	N/A	6/99
U.S. Navy	DDG 91	Aegis destroyer	510 x 66	Gas Turbine	10/03	USCG	USCG Cimarron	Push Boat	65 ft. (130 ft. barge)	N/A	7/99
U.S. Navy	DDG 95	Aegis destroyer	510 x 66	Gas Turbine	10/04	U.S. Army Corp. of Engineers	M/V Breton	Crew Boat	46 ft.	N/A	7/99
U.S. Navy	DDG 98	Aegis destroyer	510 x 66	Gas Turbine	10/05	Orange Shipbuilding Co., Orange, Texas					
U.S. Navy	DDG 102	Aegis destroyer	510 x 66	Gas Turbine	10/06	N/A	N/A	Ocean Deck Barge	150 x 45 x 9	N/A	2-Q 99
U.S. Navy	DDG 86	Aegis destroyer	510 x 66	Gas Turbine	12/01	U.S. Army	N/A	Tugboat (9 vessels)	59 x 22 x 8	(2) Cummins	1998-99
Intermarine U.S., Savannah, Ga.						USACE	N/A	Inland Deck Barge	230 x 68 x 12	N/A	3-Q 99
N/A	N/A	Motor Yacht	N/A	N/A	8/15/99	Palmer Johnson, Inc., Sturgeon Bay, Wis.					
Jeffboat, Jeffersonville, Ind.						N/A	N/A	Yacht	114 x 22.5 x 5	(2) 16V2000	Summer 1999
USACE	N/A	Inland River Towboat	150 x 42 x 11.5	(2) CAT 3606	5/00	N/A	N/A	Motor Yacht	144 x 28 x 6.2	(2) CAT 3508	Spring 2000
Leevac Shipyards, Inc., Jennings, La.						Pequot River Shipworks, New London, Conn.					
HV Marine	Hull 322	OSV	190 x 54 x 16	CAT 3516B	8/99	Fox Navigation	Tatobam	Fast Ferry	150 x 48	N/A	N/A
HV Marine	Hull 323	OSV	190 x 54 x 16	CAT 3516B	11/99	Quality Shipyards, Inc., Houma, La.					
HV Marine	Hull 324	OSV	190 x 54 x 16	CAT 3516B	2/00	Luhr Brothers	N/A	River Towboat	76 x 35 x 9.5	CAT 3512	7/15/99
N.A. Shipyard	Hull 204	OSV	240 x 54 x 21	CAT 3516B	7/99	Mulzer Crushed Stone	N/A	River Towboat	136 x 33.7 x 10.5	CAT 3516	10/1/99
MARCO Seattle, Inc., Seattle, Wash.						Rodriguez Boat Builders, Bayou La Batre, Ala.					
Baydelta Marine	N/A	Stem Z-Drive Tractor Tug	105 x 36.8 x 16.5	CAT 3516B (2)	7/1/99	Al McElroy	N/A	6-Pack	50 x 17 x 7	(2) CAT 3196	7/5/99
Marine Builders, Inc., Utica, Ind.						Sea Service Marine, La Place, La.					
N/A	N/A	Workboat	N/A	N/A	8/1/99	Hvide Marine	N/A	SDM	N/A	(2) Wartsila	8-99
Marine Inland Fabricators, Panama City, Fla.						Hvide Marine	N/A	SDM	N/A	(2) Wartsila	12-99
American Yacht Club	N/A	Floating Dock	100 x 24 x 4	N/A	7/15/99	Seacraft Shipyard Corp., Morgan City, La.					
American Yacht Club	N/A	Barge	60 x 11 x 14	N/A	N/A	N/A	N/A	Crew/Supply Boat	115 x 22 x 10	(3) Cummins KT38	8/99
American Yacht Club	N/A	Barge	40 x 11 x 4	N/A	N/A	N/A	N/A	Dive Yacht	115 x 22	(2) GM 12071T3	10/99
American Yacht Club	N/A	Barge	40 x 11 x 14	N/A	N/A	Semco, Inc., Marrero, La.					
American Yacht Club	N/A	Canilivered Section	N/A	N/A	N/A	Elliott Machine Int'l	N/A	(3) Cutterhead/Suction Dredges	190 x 40 x 12	N/A	7-99
Clarendon Farms	N/A	Stallion Workboat	25.3 x 12 x 4	Rebuilt Detroit Diesel 6-71N/A	N/A	Power Offshore Services	Power 250	Class 250 Liftboat	156.5 x 103 x 13	Cat 3508	12-99
Clarendon Farms	N/A	Barge	60 x 12 x 4	N/A	N/A	Power Offshore Services	Power 250A	Class 250 Liftboat	176 x 103 x 13	Cat 3508	3-00
Clarendon Farms	N/A	Barge	60 x 12 x 4	N/A	N/A	Sedco Forex	Prisa 112	Multipurpose Service Vessel	156.5 x 103 x 13	Cat 3508	8-99
Clarendon Farms	N/A	Hydraulic Ramp	N/A	N/A	N/A	SkipperLiner Industries, Lacrosse, Wis.					
Manson Construction	N/A	Dredge Tender	55 x 24 x 6	DD 8V-71	7/10/99	Island Girl River Cruises	Island Girl XII	Dinner/Charter Cruise	91	N/A	5/1/00
Marinette Marine Corporation, Marinette, Wis.						Treasure Island Resort & Casino	Treasure Island Princess	Dinner/Charter Cruise	91	N/A	7/15/99
N/A	N/A	Barracks Barge	269 x 68 x 64	N/A	11/1/00	Steiner Shipyard, Inc., Bayou La Batre, Ala.					
N/A	N/A	Barracks Barge	269 x 68 x 64	N/A	1/2/01	Pott of Corpus Christi	Hull 388	Fire/Rescue Vessel	110 x 30 x 9	GM 6-V92DDECIII	12/1/99
N/A	Spar	Seagoing	225 x 46 x 13	N/A	3/9/01	Swiftships, Inc., Morgan City, La.					
N/A	Maple	Seagoing	225 x 46 x 13	N/A	6/7/01	Tidewater Marine	Hull 524	Crew/Supply	145 x 27	N/A	8/99
USCG	Anthony Pettit	Coastal Buoy Tender	175 x 36 x 7.9	N/A	3/1/00	Tidewater Marine	Hull 525	Crew/Supply	145 x 27	N/A	10/99
USCG	Barbara Mabry	Coastal Buoy Tender	175 x 36 x 7.9	N/A	7/3/00	Tidewater Equipment, Norfolk, Va.					
USCG	William Tate	Coastal Buoy Tender	175 x 36 x 7.9	N/A	10/2/00	Hughes Bros.	N/A	Deck Barge	120 x 45 x 7	N/A	7/30/99
USCG	Harry Clathorne	Coastal Buoy Tender	175 x 36 x 7.9	N/A	3/1/01	Norfolk Dredging Co.	Pullen	Dredge Deck House	N/A	N/A	7/15/99
USCG	Maria Bray	Coastal Buoy Tender	175 x 36 x 7.9	N/A	7/2/01	Vancouver Shipyards, N. Vancouver, B.C.					
USCG	Henry Blake	Coastal Buoy Tender	175 x 36 x 7.9	N/A	10/1/01	BC Ferry Corporation	N/A	Pacific 1000 High Speed Car Ferry	402 x 85 x 20	(4) MTU	12/99
USCG	George Cobb	Coastal Buoy Tender	175 x 36 x 7.9	N/A	3/1/02	Washburn & Doughty, East Boothbay, Maine					
USCG	Frank Drew	Coastal Buoy Tender	175 x 36 x 7.9	N/A	10/6/99	Cajun Express	N/A	Casino Boat	186 x 38 x 7.5	(2) CAT 3508B	11/99
Master Marine, Bayou LaBatre, Ala.						Moran Towing Corp.	Marci Moran	Z-drive Tug	92 x 32 x 13.9	EMD 16-645-E2	9/99
State of Florida	N/A	Pushboat	40 x 15	(2) 3116CAT@205-hp	8/99	Western Towboat Terminal, Seattle, Wash.					
N/A	N/A	Fishing Vessel	85 x 22	CAT 3412 @ 540-hp	11/99	Western Towboat	Hull 12	Reverse Z-drive Tractor Tug	110 x 34 x 18	35' 6-B CAT	10/99
May Ship Repair, Staten Island, N.Y.						Westport Shipyard, Inc., Westport, Wash.					
N/A	N/A	Deck Barge	250 x 72 x 16	N/A	N/A	Westport Shipyard	7632	FRP Motoryacht	112 x 23.4 x 5.5	MTU/DDC 16V2000	9/99
N/A	N/A	Office Barge	150 x 32	N/A	N/A	Westport Shipyard	7633	FRP Motoryacht	112 x 23.5	MTU/DDC 16V2000	8/99
Modutech Marine, Inc., Tacoma, Wash.						Westport Shipyard	7639	FRP Motoryacht	112 x 23.5	MTU/DDC 16V2000	12/99
Puget Sound Naval Shipyard	N/A	Docking/Push Tug	26 x 11.5 x 6	671 Detroit Diesel	9/99	Westport Shipyard	8509	FRP Motoryacht	112 x 23.4 x 5.5	MTU/DDC 16V2000	1/00
Moon Engineering, Portsmouth, Va.						Westport Shipyard	7642	FRP Motoryacht	112 x 23.5	MTU/DDC 16V2000	4/00
Marad	Cape Race	Vehicle/Container Carrier	647 x 105	Diesel	N/A	Westport Shipyard	1501, 1502	2Tri-Deck FRP Motoryacht	128 x 25	MTU/Det Diesel	9/00; 10/00
Marad	Cape Rise	Vehicle/Container Carrier	647 x 105	Diesel	N/A	Winnihoff Boats, Rowley, Mass.					
NASSCO, San Diego, Calif.						N/A	N/A	Sportfishing Yacht	48 x 15	Twin Jet	5/00
U.S. Navy	Dahl	Sealift	N/A	N/A	10/99	St. Johns River Water Mgmt. District	N/A	Water Sampling	26 x 9.5	Twin Outboard	8/99
U.S. Navy	N/A	Sealift	N/A	N/A	4/00						
U.S. Navy	N/A	Sealift	N/A	N/A	10/00						
U.S. Navy	N/A	Sealift	N/A	N/A	4/01						
U.S. Navy	N/A	Sealift	N/A	N/A	9/01						

McLean Named Man Of The Century; Lowman Earns Humanitarian Award

The Maritime Association of the Port of New York and New Jersey sponsored a tribute to **Malcolm P. McLean**, founder of Container Shipping and **George F. Lowman**, chairman and CEO, Farrell Lines, at the International Hall of Fame Awards Dinner on the evening of May 12, 1999.

Held in the Delegates Dining Room of the United



(Pictured L-R): **George F. Lowman**, chairman and CEO of Farrell Lines; and **Malcolm P. McLean**, the founder of Container Shipping.

Nations, the gala event honored McLean, who is the founder of Container Shipping as Man of the Century and Lowman, who received the Hall of Fame's premiere Humanitarian Award.

Described by *Forbes* Magazine as "one of the few men who changed the world," McLean founded the trucking company that bears his name in 1934 — which became one of the largest trucking firms in the U.S. After divesting his company to establish McLean Industries, he introduced what would later become an innovation for the 20th Century — container shipping through Sea-Land Service. Using his own means, McLean established this concept which eventually set Sea-Land up for rank as the world's largest shipping company. Sea Land was later sold to R.J. Reynolds in 1969.

McLean continued his presence in the maritime industry almost 30 years later when, in 1992, he formed the foundation for Trailer Bridge — the first company to construct vessels specifically for 53 ft. (16.1 m) containers.

The only individual, (according to New York Exchange Officials), to have found five public companies — three of which are listed on the New York Stock Exchange, McLean has garnered an impressive list of awards and citations throughout his career. Namely, the American Legion Merchant Marine Award, presented to McLean in 1958 at the White House by then-President Dwight Eisenhower, as well as an appointment in 1970 by former President Richard Nixon to serve on the Commission on International Trade and Investment Policy.

Lowman Helps Less Fortunate In Times Of Crisis

According to the International Hall of Fame Committee, the recipient of the 1999 Humanitarian Award must possess qualities such as contributions to the well-being of a broad spectrum of the world population and a demonstration of a rapid response to world humanitarian efforts or appeals in times of emergency. **George F. Lowman**, chairman and CEO of Farrell Lines more than adequately exemplifies these qualities since becoming chairman of the board with the company in 1978, and CEO since 1979.

Active on both the East and West Coasts of Africa, Farrell Lines operates major runs of relief supplies in the Black, Adriatic and Mediterranean Seas. It is because of Lowman's generosity that this program continues to run successfully in bringing aid in times of crisis. Supplying such necessities as food, medical supplies and emergency tenting, Farrell has opened its entire fleet to meet the needs of those less fortunate.

Lowman received both his undergraduate and law degree from Harvard University. A Fellow, a Captain, and Honorary Member of the American Bar Association since 1957, he was the senior partner in the Stamford, Conn. law firm of Cummins & Lockwood and president of the city's Bar Association from 1963-1964.

Before assuming his current position, Lowman also held a career in the armed forces. A veteran of World War II, he was enlisted in 1942 with the highest rank S/Sgt., eventually earning the title of Lt.Col. that same year. Active in combat assignment of the famed D-Day invasion in Southern France, the highly-decorated officer held his title of Lt. Col., in the U.S. Army Reserve until his retirement from the armed forces in 1970.

Lowman, a three-time inductee into the Hall of Fame offered his words of gratitude regarding his recent honor.

"I was pleased to receive the Humanitarian Award," he said. "It is a great honor to be recognized by the Maritime Association."

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CMP Corporation, P.O. Box 15199, Oklahoma City, OK 73155
- COMPUTER LOGGING**
Barranite Logging Co., Inc., 1616 Baratta Blvd., Ste. 4, Marrero, LA 70072
- COMPUTER / COMPUTER SOFTWARE**
Autoship Systems Corp., #403, 611 Alexander St., Vancouver, BC, CANADA V6A1E
Chand Corporation, 157 Hwy 654, Matthews, LA 70375
Coastal Oceanographic, Inc., 11-G Old Indian Trail, Middlefield, CT 06455
Fleet Technology, 311 Leggett Dr., Karata, Ontario, Canada K2K 1Z9
Sener, C/Severo Ochoa, 4 Parque Tecnologico de Madrid, 28760 Tres Cantos - Madrid SPAIN
Integrator Corp., 2150 Boggs Rd., Duluth GA 30096
Lloyd's Register, 100 Leadenhall St., London, England EC3A 3BP
Ship Motion Associates, 10 Danforth St., Portland, ME 04101
Azcon Corp., 900 Middlesex Tpk., Billerica, MA 01821
Protex Engineering, 301 Pier One Rd., Stevensville, MD 21166
Information Management Consultants, Media House, Mann Island, Pier Head, Liverpool, England L31DQ
Star Associates, 927 West St., Annapolis, MD 21401
Unifor Ship Service Inc., P.O. Box 31115, Shreveport LA 71130
- CONSULTANTS**
Horslow Marine, Pier 3 Ferryboat Santa Rosa, San Francisco, CA 94111
Coretec Inc., Prince Charles Bldg., 120 Torbay Rd., Suite E100, St. John's, Newfoundland, Canada A1A 2G8
- CONDENSERS/REPAIRATORS**
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
- Raytheon Marine Co., 676 Island Pond Rd., Manchester, NH 03109
- CONTROL SYSTEM - Monitoring/Steering**
Koborn General Corporation, 2945 Hwy 311, Schriever, LA
Engine Monitor, Inc., 179 Hickory Ave. Harahan, LA 70123
Ian-Conrad Bergan, 3409 Gulf Breeze Pkwy, Gulf Breeze, FL 32561
MMC International, 60 Inp Dr., Inwood NY 11096
Robertson Marine Systems, 3000 Kingman St., Suite 207, Metairie, LA 70006
Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
Koborn Mfg. Co. Ltd., 6238-129 St. Surrey, B.C. V3W0A6
Stork-Kwart BV, P.O.B. 23, 8600 AA Sneek, Netherlands
Primo Mover Controls, 3600 Gilmore Way, Burnaby BC V4R 6P6 Canada
Raytheon Marine Co., 676 Island Pond Rd., Manchester, NH 03109
Eaton Marine Systems, 800 Fendola Pl., Rahway, NJ 07065
AutoNav Marine Systems Inc., 55A Clipper St., Coquitlam, B.C., Canada V3K 6X2
Koborn Electronics, Inc., 819 Veterans Blvd., Suite 201, Kenner, LA 70066
Tano Corp., 5700 Citrus Blvd., Suite E, New Orleans, LA 70123
- CONVERSIONS & REPAIRS**
Anconver Shipyards, 50 Pemberton Ave., N. Vancouver, B.C. CANADA V7P 2R2
- COOLERS/FREEZERS**
Meston Engineers, 2112 SE 8th Ave., Portland, OR 97214
- CORDAGE**
Cordia Corp., 26 Morin St., Biddford, ME 04005
- COUPLINGS**
Mappco Products, 91 Willetts Rd. Unit B, Oxford, CT 06478
Certa Corp., 8185 Class Ave., Danen, IL 60961
Haley Clutch and Coupling Corp., 1500 Hwy. 1 North, Greenville, MS 38702
Feltner Corp., P.O. Box 103, Skippack, PA 19474
Hi-Res Vibration Control Ltd., 156 West 8th Ave., Vancouver, B.C. V5Y 1N2
American Vulcan, P.O. Drawer 673, Winter Haven, FL 33882
MMC Int'l. 80 Inp Drive, Inwood NY 11096
Renold Hi-Tec, 512 W. Cresskillville Rd., Cincinnati, OH 45246
- CRANE-HOIST-DERRICK-WHIRLEYS**
Eisco Marine Co., P.O. Box 4113, New Orleans, LA 70178
Holly Hoist Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086
Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358
McEroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
Liebherr-Werk Nenzing GMBH, A-8710 Nenzing/Austria, Thallergang 3, P.O. Box 19
Eisco Marine, 11451 Beavering Road, Cincinnati, OH 45241
- CRANKSHAFT DEFLECTION ANALYZER**
FCS, Inc., 22 Main St., Centerbrook, CT 06409
- CRANKSHAFT GRINDING**
Gollens, 160 Van Brunt St., Brooklyn, NY 11231
- CRANKSHAFT REPAIR**
Industrial Engine, 1925 North Bullum St., Milwaukee, WI 53212
- CUSTOM CLOSURES**
Waltz & Krenzer, 91 Willetts Rd., Oxford, CT 06478
- CYCLING AND WELDING MACHINES**
Buc-O-Systems, Inc., 3001 W. Carson St., Pittsburgh, PA 15204
- CYLINDER LOAD ANALYZER**
General Thermodymics, 210 S. Meadow Rd., Plymouth, MA 02960
- DAVIS SYSTEMS**
Holly Hoist Corp., P.O. Box 86, St. Clair Shores, MI 48080-0086
Royal Larnie N.A. Inc., 18 Ridgeway Drive, Bridgewater Nova Scotia, Canada B4V 3V8
- DECK MACHINERY - Cargo Handling Equipment**
Marine Machinery Co., Inc., P.O. Box 24788, Seattle, WA 98142-0788
McEroy Machine & Mfg Co., Inc., P.O. Box 4454, Biloxi, MS 39535-4454
Skookum, Inc., P.O. Box 290, Hubbard, OR 97032
Laurista Machine, P.O. Box 9, Drachten, Netherlands, 9200AA Intercontinental Engineering, P.O. Box 9055, Kansas City, MO 64108
Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358
E.H. O'Neil, 1405 Chipendale Rd., Lutherville, MD 21093
New England Trawler Equipment Co., 291 Eastern Avenue, Chelsea, MA 02150
Ponnes, PO Box 102, N-4818, Flevink, NORWAY
Schoelton-Albrecht, P.O. Box 29110, St. Louis, MO 63116
Smith Berger Marine Inc., 7915 10th Ave. S., Seattle, WA 98108
Timberland Equipment, P.O. Box 490, Woodstock, Ontario N4S 7Z2 CANADA
Waterman Supply Co., P.O. Box 598, Wilmington, CA 90748
Superior Lidgerwood-Mundy, 1101 John Ave., Superior, WI 54980
Jered Industries Inc., P.O. Box 904, Brunswick, GA 31521
- DEHUMIDIFIERS**
Dry Air Technologies, 313 N. Oak St., Burlington, WA 98233
Munters Corp., 79 Monroe St., Amesbury, MA 01913
- DESALINATION REVERSE OSMOSIS**
Liestman Waterystems, Inc., P.O. Box 494, Huntington Beach, CA 92647
Matrix Desalination, 3295 S.W. 11th Ave., Fort Lauderdale, FL 33315
Reverse Osmosis of South Florida, 12301 SW. 133 Court, Miami, FL 33186
- DESIGN CONSULTING**
Fleet Technologies, 311 Leggett Dr., Kanata, Ont, K2K 1Z8 Canada
- DIESEL ENGINE ANALYZER**
Drew Marine, 1 Drew Plaza, Broomton, NJ 07005
FCS, Inc., 22 Main Street, Centerbrook, CT 06409
Icon Research & Market Street, Elexonere, Shropshire SY12 0AN, England
Hermont Marine Inc., 3528 Griffith, St. Laurent, Quebec Canada
Industrial Engine Systems, Inc., P.O. Box 494, Huntington Beach, CA 92647
Sarcana Americas Bkg., 502 Empire St., Greefield Park, J4V1V7 Canada
Alaska Diesel 4200 14th Ave. NW, Seattle WA 98107
Barginette Services Ltd, 48 Wang Lok St., Yuen Long
Hermont Marine Inc., 3528 Griffith, St. Laurent, Quebec Canada
Industrial Estate, New Territories, HONG KONG
- Caterpillar, Inc., Engine Div., P.O. Box 610, Mossville, IL 61550-0610
Castoldi S.p.A., Viale Mazzini, 161, 20081, Abbiategrasso, 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
Datz Canada Inc., 4420 Garand St., Montreal, Que. H4R 2A3
Gollens, 160 Van Brunt St., Brooklyn, NY 11231
Governor Control Systems, 3190 S.W. 4th Ave., Ft. Lauderdale, FL 33315
Hermont Marine, 3528 Griffith, St. Laurent, Quebec, Canada H4T 1A7
Kawasaki Heavy Industries, Ltd., Tokyo Head Office, World Trade Center Bldg., 4-1 Hamamatsu-cho 2-chome, Minato-ku, Tokyo 105-6116 Japan
MAN BAW Diesel AG, Stadthausstrasse 1, D-66153 Augsburg 1, GERMANY
Centrifugal Marine Systems, Inc., P.O. Box 680, West Elizabeth, PA 15088-0680
MAN BAW Diesel AS, Tegholmsgade 41, DK-2450 Copenhagen SV, DENMARK
MAN BAW Diesel, 17 State St., New York, NY 10004
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
Littlin Bergen AS, PO Box 804, NS020 Bergen, NORWAY
Wartsila Diesel, 201 Defense Highway, Annapolis, MD 21401
Gollens, 160 Van Brunt St., Brooklyn, NY 11231
CMB Cummins Engine Co., 500 Jackson St., Comarbus, IN 47202
FM / Alco 701 Lawton Ave., Beloit, WI 53511
Kerne Diesel, 325 South Fairbanks, Addison, IL 60101
H.J. Menzies, P.O. Box 4420 Garand St., Montreal, Que. H4R 2A3
H.P. International, Inc., 3812 W. Linebaugh Ave., Tampa, FL 33624
Anglo Belgian Corp., 9508 N. Alpine Rd., Machesney Park, IL 61115
Powerhouse Diesel, 5505 Broadway, Ardenwood Canyon, CA 94589
- DIESEL FUEL DECONTAMINATION**
Fuel Dynamics, 707 Mallet 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. Menzies, P.O. Box 23122, New Orleans LA 70153
JW Fishers, 65 Anthony St., Berkley, MA 02279
North Sea Underwater Divers, 2921 16th Ave. North, Texas City, Texas 77550
Muldoon Marine Services, Inc., P.O. Box 3221, Terminal Island, CA 90731
- DOCK BOXES**
Bettanway Products, 70891 County Rd. 23, New Paris, IN 46553
- DOCK FENDERING SYSTEMS**
Seward Int'l., P.O. Box 99, Clear Brook, VA 22624
Plastic Piling Inc., 1485 South Willow Ave., Riata, CA 92376
Urethane Products Corp., 17007 South Broadway, Gardena, CA 90248
- DOORS - MARINE & INDUSTRIAL**
Branton Int., 1101 Edwards Ave., Jefferson, LA 70181
Basspo, Inc., 90 Forest Ave., Locust Valley NY 11560
Waltz & Krenzer, 91 Willetts Rd., Unit B, Oxford CT 06478
Marine Accommodations, Inc., 3530 Williamsburg Park Blvd., Building F, Jacksonville, FL 32257
Manly Marine, PO Box 86788, N. Vancouver B.C. Canada V7L 4L3
Rahway Specialties Corp., 2979 State Rd., P.O. Box 29, Briarcliff, PA 19007
Belvalat Manufacturing Inc., #2200 Jamieson Bone Rd., Belleville, Ont. Canada K8N 5T3
- DRY DOCK 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., P.O.B. 6605, Holliston, MA 01746
- DOUBLE HULL TECHNOLOGY**
Matrxans, 1818 Market St., Philadelphia, PA 19103
- DUCTORS**
Vite Molitor, 568 Parker St., Newark, NJ 07104
- ELECTRICAL EQUIPMENT**
Baylor Co., 500 Industrial Blvd., Sugarland, TX 77478
L. F. Gautier & Co., Inc., P. O. Box 50500, New Orleans LA 70150
MMC International, 60 Inp Dr., Inwood NY 11096
Sanico Marine Inc., 3721 SW 47th Ave., Ste 309, Ft. Lauderdale, FL 33314
- ELECTRONIC INFORMATION SUPPORT**
Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolbotn, NORWAY
- ELECTRICAL INSTRUMENTS**
Sisco USA, 2508 Lake Brock Ct., Atlanta, GA 30360
- ELECTRICAL MOTOR DRIVES**
Tech Power Controls, 10507 Fallsone, Houston, TX 77099
- ELECTRONICS**
Azzore Corp., 300 Middlesex Tpk., Ellerslie, MA 01821
- ELEVATORS**
McEroy Machine, 1101 Lorraine Rd., Biloxi, MI 39535-4454
Jered Industries Inc., P.O. Box 904, Brunswick, GA 31521
- EMPLOYMENT**
Boat Crews, 1 Saine Court, Suite 309, New Orleans, LA 70114
Marine Vicos, Inc., 800 Downtowner Blvd. Ste. 111, Mobile, AL 36689
- ENGINEERING SERVICES / MARINE ENGS**
PAF 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
- ENGINE LUBRICATION SYSTEMS**
Dow Corning Corp., P.O. Box 994, Midland, MI 48686-0994
Engine Lubrication Systems, 84 State Rd., Paoli, PA 19301
- ENGINE ROOM LIGHTING/MONITORING & CONTROL SYSTEMS**
PalJohn Electric Mfg. Co., Inc. 1616 N. Main, P.O. Box 53, Pearland, TX 77581
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

EVACUATION SYSTEMS
 DEC, 1251 Bridgeport Rd., Richmond, BC Canada

EVAPORATORS
 Alfa-Laval Separation, Inc., 955 Meams Rd., Warminster, PA 18974
 Beaird Industries Inc., P.O. Box 31115, Shreveport, LA 71130

EXPANSION JOINTS
 Slixco Inc., 7850 Trammere Dr., Mississauga, Ontario L5S1L9
 Applegate Industrial, 1440 Government Street, Baton Rouge, LA 70802

FAIRING COMPOUND
 Philadelphia Resins, P.O. Box 209, Montgomeryville, PA 18936

FANS - VENTILATORS - BLOWERS
 Dry Air Technologies, 313 N. Oak St., Burlington, Wis 52623
 Jon M. Lass Associates, Inc., 411 Borol Ave., San Mateo, CA 94402

FABRICATORS
 Jamestown Distributors, P.O. Box 348, Jamestown, RI 02835
 Superbol, P.O. Box 683, Carnegie, PA 15106

FENDERING SYSTEMS/BOUYS - Dock & Vessel
 Plastic Fritings Inc., 1465 South Willow Ave., Rialto, CA 92376
 Kahlerberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
 Seaward International, Inc., Clearbrook Industrial Park, P.O. Box 88, Clearbrook, WA 22624
 Duramax Marine, 16025 Johnson St., P.O. Box 67, Middlefield, OH 44132-0067
 Vang Fender Co., 1160 State St., Perth Amboy, NJ 08861
 Ultra Poly, Inc., 2826 South Steeles St., Tacoma, WA 98409
 Promar, 115 Industrial Blvd., Keamsysville, VA 25430
 Schnyer Rubber Co., 16901 Wooded Rd., Woodville, WA 98172

FILTER/FILTER SYSTEMS
 Bolt-Filtr Corp., 15111 Dr. E. Grandy, CT 06026
 Kraist Co., 299 Williams Avenue, Hackensack, NJ 07061
 Luke-Fraser, Inc., 200 South 4th St., Alton, FL 62806-1313

FIN STABILIZERS
 Blohm & Voss Industries GmbH, P.O. B. 11289, D-2042 Hamburg 1, GERMANY
 U.S.A. Reaps, Simpler-Turner Inc., P.O. B. 675, Tonawanda, NY 14151
 Ralko Ltd., Louwater, High Wycombe, Bucks
 Hampshire ENGLAND HP109027

FIRE & SAFETY PRODUCTS
 Brookdale International, 1-8755 Ash St., Vancouver BC, V6P6T3
 Nautical Safety Products, P.O. Box 590462, Houston, TX 77259
 IMSSCO, 2040 Harbor Island Dr., Suite 201A, San Diego, CA 92101
 Nautical Safety Products, P.O. Box 590462, Houston, TX 77259
 Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807
 Union Ship Service Inc., 2375 West Esther Street, Long Beach, CA 90813
 Grenfell Fire Protection Systems, 835 Sharon Drive, Westlake, OH 44145
 Panel Specialist, Inc./Thermax, 3115 Range Rd., Temple, TX 76791

FLUID HANDLING EQUIPMENT
 Graeco, Inc., P.O. Box 1441, Minneapolis, MN 55441

FRESH WATER GENERATOR
 Salsburg Engineering, 7-32 Takezima, 4-chome, Nishiyodogawa, KY, Chusokai, Japan

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

FUEL DECONTAMINATION
 Algae X Int'l, PO Box 4011, Ft. Myers Beach, FL 33932
 Fuel Dynamics, 707 Mulder Dr., #110, Cape Canaveral, FL 32920
 Environmental Solutions Int'l, 11022 Racoon Ridge, Reston, VA 20191-4911

GALLEY EQUIPMENT
 Cooprich Refrigerator Co., 949 Industry Rd., Kenner, LA 70062
 Jamestown Metal Marine Sales, Inc., 4710 Northwest Second Ave., Boca Raton, FL 33431
 Lang Manufacturing, P.O. B. 905, Redmond, WA 98073
 Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257
 Richard Galley Supply, PO Drawer 4035, Houma, LA 70361

GANGWAYS, LADDERS
 ACL Industries, 177 Gay St., Manchester, NH 03103
 Nautical Safety Products, P.O. Box 590462, Houston, TX 77259-0462
 Schoellhorn-Albrecht, 575-105 Rudder Rd., St. Louis, MO 63026
 SlipNot Safety Flooring, 2545 Beaufort 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
 Gokens, 160 Van Brunt St., Brooklyn, NY 11231
 Huey Marine Gears International, Inc., 2600 N. Concord Belle Chase, LA 70007
 Nico Marine Specialties, 39 Louisiana St., West Waco, LA 70784
 The Falk Corp., PO Box 492, Milwaukee, WI 53201-0492
 Marine Gears, P.O. Box 689, Greenville, MI 30702
 Centofanti Marine Systems, Inc., P.O. Box 650, West Elizabeth, PA 15088-0650
 Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227

GENERATOR
 Aukco Diesel, 4420 14th Ave., NW, Seattle, WA 98107
 Baylor Co., 500 Industrial Blvd., Sugarland, TX 77478
 Insuland Recycling B.V., Deccaweg 3, 1042 AT Amsterdam, NETHERLANDS

GMDS
 International Communications, 813 Diligence Dr. Ste 120, Newport News, Va. 23606
 Furuno USA, Inc., 271 Harbor Way, S. San Francisco, CA 94080
 Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017
 Sea, Inc., 7030 220th S.W. Mt. Lake Terrace, WA 98043

HATCHES AND DOORS
 Schoellhorn-Albrecht, 575-105 Rudder Rd., St. Louis, MO 63026
 Railway Specialties Corp., 2979 State Rd., P.O. Box 29, Bristol, PA 19007

HEAT EXCHANGERS
 Alfa-Laval Separation Inc., 955 Meams Rd., Warminster, PA 18974
 Beaird Industries Inc., P.O. Box 31115, Shreveport, LA 71130
 Computex (Bitram's Heat Transfer) Ltd., 15-20 Colehill Industrial Estate, Slaton Road, Colehill, Birmingham B46 1P UK
 Crane Heaters, 17 Grandview Ave., West Orange, NJ 07052
 Tramer, Inc., 1054 Claussen Rd., Augusta, GA 30807-0215
 Tramer, Inc. (Texas Div.) P.O. Box 2289, Wichita Falls, TX 76707

HEAT TRANSFER FLUID
 Paratherm Corp., 1050 Colwell Rd., Conshohocken, PA 19428

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

HORN/WHISTLES
 Archline Mfg. Co. Ltd., 5478 267th Street, Gloucester Industrial Estate, Langley, B.C. Canada V4W 3S9
 Kahlerberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
 Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062

HYDRAULICS
 Cunningham Marine Hydraulics Co., 201 Harrison St., Hoboken, NJ 07030
 Dayton T. Brown, 555 Church St., Bohemia, NY 11716
 Engine Monitor, Inc., 179 Hickory Ave., Hanahan, LA 70123
 Hamilton Jet, P.O. Box 709, Christchurch, NEW ZEALAND
 Offshore Island, Inc., 3521 Brookdale Drive, Mobile, AL 36618
 Ultra Hydraulics Limited, Cheltenham Road East, Gloucester, GL2 9QA, ENGLAND
 Demaree Inflatable Boats, 410 Oak St., Friendsville, MD 21531
 Ocean Technical Services Inc., 1140 Peters Rd., Harvey, LA 70058-1785

HYDRAULIC SYSTEM FLUSHING
 Consolidated Fluid Power, 155 Wright Ave., Dartmouth, N.S. Canada B4C 3M1

HYDRAULIC TRAINING
 Consolidated Fluid Power, 155 Wright Ave., Dartmouth, N.S. Canada B4C 3M1

INCINERATORS
 Therm-Tec Inc., PO Box 1105, Tualatin, OR 97062

INFLATABLES
 Ocean Technical Services Inc., 1140 Peters Rd., Harvey, LA 70058-1785
 Zodiac of North America, P.O. Box 400, Thompson Creek Road, Stevensville, Sparks, MD 21152

INSULATION
 Blohm & Voss Light Insulation, Barials & Leders GmbH, Norderstrasse 15, 20457 Hamburg GERMANY
 Panel Specialist, Inc./Thermax, 3115 Range Rd., Temple, TX 76791
 Insulations, Inc., 1101 Edwards Ave., Hanahan, LA 70123
 Mascoal Products, 3500 E. T.C. Jester, Suite N, Houston, TX 77018
 Pacor, Inc., P.O. Box 107, Westville, NJ 08090
 Superior Energies Inc., P.O. Drawer 386, Groves, TX 77619

INTEGRATED MONITORING SYSTEMS
 Datasat, Unit 100, 18 Goswick Place, N. Vancouver, BC Canada

INTERIORS
 Baxter Interiors, 733 Darie St., New Orleans, LA 70118
 Custom Ship Interiors, Inc., P.O. Box 882, Solomons, MD 20988
 Hopeman Brothers, P.O. Box 820, 435 Essex Ave., Warrneboro, VA 22980
 Insulations, Inc., Rt. 5, 12360 Leisure Rd., Baton Rouge, LA 70807
 Jamestown Metal Marine Sales, Inc., 4710 NW Second Ave., Boca Raton, FL 33431
 Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257
 Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97131

ISOLATORS
 Lo-Res Vibration Control, Ltd., 186 West 8th Ave., Vancouver, B.C. V5Y 1N2

JET BOWTHUSERS
 Westmaster of Texas, P.O. Box 840189, Houston, TX 77084-0189

JOINER - Waterlight - Door - Paneling - Ceiling Systems - Decking
 All Alpha Int'l., Inc., P.O. Box 48995, Cincinnati, OH 45249
 Branton Ind., 1101 Edwards Ave., Jefferson, LA 70181
 Customship Interiors, Inc., P.O. Box 882, Solomons MD 20988
 Hopeman Brothers, Inc., P.O. Box 820, Warrneboro, VA 22980
 Insulations, Inc., 1101 Edwards Ave., Hanahan, LA 70123
 Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257
 Maritime Services Corp., 3457 Guignard Drive, Hood River, OR 97131
 Panel Specialist, Inc./Thermax, 3115 Range Rd., Temple, TX 76791
 Walz & Koenig, 91 Willenbrook Rd., Unit B4, Oxford CT 06478

KEEL COOLERS
 F.W. Fenstrom & Co., 1716 Eleventh Ave., Menominee, MI 49858
 Kahlerberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
 The Water Machine Co., Inc., 84-96 Cambridge Avenue, Jersey City, NJ 07310

LASER ALIGNMENT
 Boland Industrial & Consulting Services, P.O. B. 91360, Mobile, AL 36691

LAUNDRY EQUIPMENT
 Richard Galley Supply, PO Drawer 4035, Houma, LA 70361

LIFESAVER EQUIPMENT
 American Eagle Mfg., Inc., 780 Peoria Jensen Way, LaConner, WA 98257
 Avar Marine, 12115 Young River Ave., Fontaine Valley, CA 92708
 DCO Marine Safety Systems, 12351 Bridgport Rd., Richmond, B.C. CANADA V6V 1J4
 Nonsale AS, P.O. Box 115, N-4818 Fenwick, Norway
 Edgewater Machine & Fabricators, P.O. Box 358, Edgewater, FL 32132-0358
 Wang Life Saving Equipment, 1625 N. Miami Ave., Miami, FL 33136
 Willard Marine Co., Inc., 1250 N. Grove St., Anaheim, CA 92806
 Zodiac of North America, P.O. Box 400, Stevensville, MD 21666

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

LIFESAVER EQUIPMENT
 MGI International, 119-225 West 1st St., North Vancouver, B.C. CANADA
 Stearns Manufacturing, P.O. Box 1498, St. Cloud, MN 56302
 Zodiac of North America, PO Box 400, Thompson Creek Rd., Stevensville, Sparks, MD 21152

LIFT EQUIPMENT
 JLG Industries, Inc., JLG Drive, McConnellsburg, PA 17233-9533

LIFT EQUIPMENT TESTING
 Water Weights Inc., 5139 Bowles St., Suite E, Montclair, CA 91763

LIGHTING SYSTEMS / EQUIPMENT
 ACR Electronics, Inc., 5757 Ravenswood Rd., Ft. Lauderdale, FL 33310-5247
 Archway Marine, 4501 Swan Ave., St. Louis, MO 63110
 Golden Marine, 160 Van Brunt St., Brooklyn, NY 11231
 Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062
 Pauluhn Electric Mfg. Co., Inc. P.O. Box 53, Pearland, TX 77588
 Francis Searchlights/Star Supply Co., 4415 6th N.W., Seattle, WA 98107

LIQUID OVERFILL PROTECTION SYSTEMS
 E.L.M. Marine Products, P.O. Box 1028, New Albany, IN 47151
 King Engineering Corp., P.O. Box 1228, Am Arbor, MI 48106

LOGISTICS
 VL Logistics Consultants, Inc., 3420 Bienville Blvd., Ocean Springs MS 39564

MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING
 Golin Marine Co. Inc., 160 Van Brunt St., Brooklyn, NY 11231
 Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27604-1851
 Maritime Power 200 Henderson St., Jersey City, NJ 07302

MANAGEMENT SYSTEMS & SERVICE
 Hopeman Marine, Pier 3 Ferryboat Santa Rosa, San Francisco, CA 94111
 PCS Marine, 174 Colonnade Road S., Nepean, Ontario K2E715

MARINE ACCOMMODATIONS
 Marine Accommodations, Inc., 3830 Williamsburg Park Blvd., Building 7, Jacksonville FL 32257

MARINE BUILDING SUPPLIES
 King Wholesale Supply Co., Inc., P.O. Box 4002, New Orleans, LA 70179-4002

MARINE CEILING
 Hydro-Aluminum, Vik Verk, N-5880 VIK I SOGN, Norway
 Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807
 Panel Specialist, Inc., 3115 Range Rd., Temple, TX 76501

MARINE CONSULTANTS
 PCS Marine, 174 Colonnade Road S., Nepean, Ontario K2E715
 Hopeman Marine, Pier 3 Ferryboat Santa Rosa, San Francisco, CA 94111
 Boland Industrial & Consulting Services, P.O. B. 91360, Mobile, AL 36691

MARINE DECKING & FLOORING
 Hopeman Brothers, Inc., P.O. Box 820, Warrneboro, VA 22980
 E.H. O'Neil, 1405 Chippendale Rd., Lutherville, MD 21093
 Insulations, Inc., Rt. 5, 12360 Leisure Road, Baton Rouge, LA 70807
 Seby, P.O. Box 1600, Sapulpa, OK 74067
 Flexible Decking, 2708 N. Austinian Ave. Ste. 9, West Palm Beach, FL 33407
 Lonsell Inc., 928 E. 238th St., Carson, CA 90742
 Slipnot Safety Flooring, 2545 Beaufort St., Detroit, MI 48207

MARINE DRILLING & BLASTING
 Raytheon Marine Co., 678 Island Pond Rd., Manchester, NH 03109
 Lonsell Inc., 928 E. 238th St., Carson, CA 90742
 Slipnot Safety Flooring, 2545 Beaufort St., Detroit, MI 48207
 Raytheon Marine Co., 678 Island Pond Rd., Manchester, NH 03109-4999

MARINE ELECTRONICS
 Frank L. Beier Radio, 2001 Ridgelande Dr., Metairie, LA 70001
 Autonics USA, 234 Industrial Pkwy, Northvale, NJ 07647
 Kockum Sonics, Inc., 933 Industry Rd., Ste105, Kenner, LA 70062
 Saab Marine Electronics AB, Box 13045, 402 S1 Göteborg, SWEDEN
 Marine Electric & Process Control, 3931 Leary Way NW, Seattle, WA 98107
 ACR Electronics, Inc., 5757 Ravenswood Rd., P.O. Box 5247, Ft. Lauderdale, FL 33310-5247
 Raytheon Marine Co., 678 Island Pond Rd., Manchester, NH 03109
 Scandinavian Micro Systems, P.O. Box 155, N-1411, Kolbotn, NORWAY
 Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
 Sea School, 10812 Gandy Blvd., St. Petersburg, FL 33702
 Seaworthy Systems Inc., P.O. Box 965, Essex, CT 06426, 17 Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544
 George G. Sharp, Inc., 101 Church St., New York, NY 10007
 R.A. Steam, Inc., 283 N. 1st Ave., Sturgeon Bay, WI 54253
 MSCG, Inc., 1432 Duke Street, Alexandria, VA 22304
 A.K. Sule & Ass., 304 19th St., Mezzanine, LA 70002-4899
 TIMSCO, P.O. Box 91360, Mobile AL 36691
 Sea Transport Corp., PO Box 1043, Southampton Old 4213 Australia

NAVIGATION & COMMUNICATIONS EQUIPMENT
 Byrne Rice & Turner, 1172 Camp St., New Orleans, LA 70130
 C-MacCommercial, 133 Falmouth Rd., Maple Ave. MA 02649
 Corelec Inc., Prince Charles Bldg., 120 Torbay Rd., Suite 1010, St. Johns, Newfoundland, Canada A1A 2C8
 Electronic Marine Systems, 820 Farnside Pl., Rahway, NJ 07065
 Furuno USA, 271 Harbor Way S., San Francisco, CA 94080
 CSC Electronics Ltd., Unit V, Rufford Industrial Estate, Ford, Arundel, West Sussex, UK
 Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
 Nelson Marine Consultants, 840 Bond Street, Elizabeth, NJ 07201
 Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017
 Raytheon Marine Co., 678 Island Pond Rd., Manchester, NH 03109
 Scandinavian Micro Systems P.O. Box 155, N-1411, Kolbotn, NORWAY
 Kahlenberg Bros., P.O. Box 358, Two Rivers, WI 54241
 Simead Robertson, 10801 Hammerly, Suite 100, Houston, TX 77043-1923
 Mackay Communications, P.O. Box 92151, Los Angeles, CA 90009
 Trimble Navigation, 585 North Mary Avenue, P.O. Box 3642, Sarverville, CA 94966
 Waterway Communications System, Inc. 453 E. Park Pl., Jeffersonville, IN 47130
 Offshore Systems International, 5013 Pacific Hwy East, Fife, WA 98424
 Raytheon Marine Co., 678 Island Pond Rd., Manchester, NH 03109
 Offshore Systems International, 107-930 W. 1st St., N.Vancouver, BC Canada V7P9N4
 Litor Marine Systems, 1070 Seminole Trail, Charlottesville, VA 22901-2591
 Magellan Systems Corp., 960 Overland Crt., San Dimas, CA 91773-7142
 Icom America, Inc., 2380 116th Ave. NE, Bellevue, WA 98004
 KVH Industries, Inc., 110 Enterprise Center, Middleton, R.I. 02842-9268

NOISE & VIBRATION
 Saurdoon, 1 Burn Dr., Deer Park, NY 11729

NOZZLES/NOZZLE SYSTEMS
 Harrington Metals, 6720 124th Ave., Fennville, MI 49408

OFFSHORE BUILDINGS
 Pinnacle Buildings Sys., LLC, 306 Caldwell Ave., Earth, LA 70533

OIL - Marine - Additives - TESTING
 Mobil Oil Corporation, 3225 Gallops Road, Fairfax, VA 22037-0001

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

OILWATER SEPARATORS
 Alfa-Laval Separation, Inc., 955 Meams Rd., Warminster, PA 18974-0556
 Blohm & Voss Industrie GmbH P.O. B. 100720, D-2000 Hamburg 1, GERMANY
 Fast Systems, 30-60 North Broadway, St. Louis, MO 63147
 MMC International, 60 Inip Dr., Inwood NY 11096
 Nelson Industries, Highway 51 West, Stoughton, WI 53589
 RGF Environmental Group, 3875 Fiscal Court, W.Palm Beach, FL 33404

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 DSA Pipe Tools Div., 407 Hadley St., Holly, MI 48442
 Loding Corp., 396 Hatch Drive, Foster City, CA 94404
 Victaulic Co., 4901 Kesslerville Rd., Easton, PA 18042
 Blucher-Dean, 2501 S. Front Street, Philadelphia, PA 19148

POLLUTION CONTROL PRODUCTS
 Enecon Corporation, 125 Bayfs Rd., Melville, NY 11747-3800

POWER SUPPLIES
 Schuler, Inc., 200 Butlerfield Dr., Ashland, MA 01721

GHM Inc. (Ind. Measurement Consultants), P.O. Box 1836, Newport News, VA 23601
 Gibbs & Cox, Inc., 50 West 23rd St., New York, NY 10010
 Heper Dry Dock Engineers, Inc., P.O. B. 6905, Holliston, MA 02104
 John W. Gibert & Assoc., Inc., 193 State St., Boston, MA 02109
 The Glosten Assoc., Inc., 600 Mutual Life Bldg., 605 First Ave., Seattle, WA 98104
 Guido Perla & Assoc., 720 3rd Ave., Ste. 1200, Seattle, WA 98104
 Morse-Surabitnick Associates, Inc., 130 Sutter St., Ste. 400, San Francisco, CA 94104
 JHJ Inc., 3412 Progress Dr., Bensalem, PA 19020
 R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
 Kvaerner Masa Marine Inc., 201 Defense Highway, Suite 202, Annapolis, MD 21401
 James S. Krogger, 793 Brickell Plaza Ste. 701, Miami, FL 33131
 Rodney E. Lay & Associates, 13891 Atlantic Blvd., Jacksonville, FL 32225
 MCA Engineers, Inc., 2960 Arway Ave., #A-103, Costa Mesa, CA 92626
 Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063
 McElroy Machine & Mfg Co., Inc., P.O. Box 4454, Bixoi, MS 39535-4454
 John J. McMillan Associates, Inc., 4300 King St., Suite 400, Alexandria, VA 22302
 Fenald Marbury, P.O. Box 2321, Annapolis, MD 21401
 Marine Design & Operations, Inc., 225 E. 1st Ave., Roselle, NJ 07063
 Martech, Seaside, Bay Road, Newmarket, NH 03857
 Maritime Design, 13000 Sawgrass Village Circle, Ponte Vedra Beach, FL 32082
 R.J. Mellus & Co., 71 Hudson St., New York, NY 10013
 Nautical Design, Inc., 2101 S. Andrews Ave., Suite 202, Ft. Lauderdale, FL 33316
 Olsen Marine Surveyors Co., P.O. Box 283, Port Jefferson, NY 11777
 M. Rosenblatt & Son, Inc., 2341 Jefferson Davis Hwy, Arlington, VA 22202
 Sargent & Herkes, 225 Baronne St., Suite 1405, New Orleans, LA 70112
 Scientific Marine Services, Inc., 101 State Pl., Suite F, Escondido, CA 92029
 Sea School, 10812 Gandy Blvd., St. Petersburg, FL 33702
 Seaworthy Systems Inc., P.O. Box 965, Essex, CT 06426, 17 Washburn Doughty, P.O. Box 296, E. Boothbay, ME 04544
 George G. Sharp, Inc., 101 Church St., New York, NY 10007
 R.A. Steam, Inc., 283 N. 1st Ave., Sturgeon Bay, WI 54253
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 A.K. Sule & Ass., 304 19th St., Mezzanine, LA 70002-4899
 TIMSCO, P.O. Box 91360, Mobile AL 36691
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 Corelec Inc., Prince Charles Bldg., 120 Torbay Rd., Suite 1010, St. Johns, Newfoundland, Canada A1A 2C8
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 Furuno USA, 271 Harbor Way S., San Francisco, CA 94080
 CSC Electronics Ltd., Unit V, Rufford Industrial Estate, Ford, Arundel, West Sussex, UK
 Mackay Communications, 2721 Discovery Dr., Raleigh, N.C. 27616-1851
 Nelson Marine Consultants, 840 Bond Street, Elizabeth, NJ 07201
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 Raytheon Marine Co., 678 Island Pond Rd., Manchester, NH 03109
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 Kahlenberg Bros., P.O. Box 358, Two Rivers, WI 54241
 Simead Robertson, 10801 Hammerly, Suite 100, Houston, TX 77043-1923
 Mackay Communications, P.O. Box 92151, Los Angeles, CA 90009
 Trimble Navigation, 585 North Mary Avenue, P.O. Box 3642, Sarverville, CA 94966
 Waterway Communications System, Inc. 453 E. Park Pl., Jeffersonville, IN 47130
 Offshore Systems International, 5013 Pacific Hwy East, Fife, WA 98424
 Raytheon Marine Co., 678 Island Pond Rd., Manchester, NH 03109
 Offshore Systems International, 107-930 W. 1st St., N.Vancouver, BC Canada V7P9N4
 Litor Marine Systems, 1070 Seminole Trail, Charlottesville, VA 22901-2591
 Magellan Systems Corp., 960 Overland Crt., San Dimas, CA 91773-7142
 Icom America, Inc., 2380 116th Ave. NE, Bellevue, WA 98004
 KVH Industries, Inc., 110 Enterprise Center, Middleton, R.I. 02842-9268

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 Saurdoon, 1 Burn Dr., Deer Park, NY 11729

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

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 Pinnacle Buildings Sys., LLC, 306 Caldwell Ave., Earth, LA 70533

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

OILWATER SEPARATORS
 Alfa-Laval Separation, Inc., 955 Meams Rd., Warminster, PA 18974-0556
 Blohm & Voss Industrie GmbH P.O. B. 100720, D-2000 Hamburg 1, GERMANY
 Fast Systems, 30-60 North Broadway, St. Louis, MO 63147
 MMC International, 60 Inip Dr., Inwood NY 11096
 Nelson Industries, Highway 51 West, Stoughton, WI 53589
 RGF Environmental Group, 3875 Fiscal Court, W.Palm Beach, FL 33404

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 Jesse Engineering, 5225 7th St. East, Tacoma, WA 98424
 Georg Fischer DSA Pipe Tools Div., 407 Hadley St., Holly, MI 48442
 Loding Corp., 396 Hatch Drive, Foster City, CA 94404
 Victaulic Co., 4901 Kesslerville Rd., Easton, PA 18042
 Blucher-Dean, 2501 S. Front Street, Philadelphia, PA 19148

POLLUTION CONTROL PRODUCTS
 Enecon Corporation, 125 Bayfs Rd., Melville, NY 11747-3800

POWER SUPPLIES
 Schuler, Inc., 200 Butlerfield Dr., Ashland, MA 01721

IOPELLERS
Kärlenberg Bros. P.O. Box 358, Two Rivers, WI 54241
Associated Marine Technologies, 4015 Seaboard St.,
Portsmouth, VA 23701
Byrne Rice & Turner, 1172 Camp St., New Orleans, LA 70130
Holland Rotor Propellers, 2273 Balfour Blvd., New Orleans
LA 70072
Rice Propeller, Av Rios Esposito No. 88, Col. Benito Juárez,
Matamoros, Sin. Mexico 82180
Rotta SP Propellers SA, P.O. Box 251, Via Silva 5, 8828
Battina, SWITZERLAND

PROPULSION EQUIPMENT
**Outboard Motors, Diesel Engines, Gears, Propellers, Shafts,
urbines**
Avondale Industries, Harvey Quick Repair, P.O. Box 116,
Harvey, LA 70058
American Air Filter, P.O. Box 35690, Louisville, KY 40342
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-Raumä Ltd., Box 220, SF-26101, Rauma,
FINLAND
Karnewa America Inc., 106 Park Place, Suite 200, Covington, LA
70433, USA
Karnewa AB, Box 1010, S-68129, Kristinehamn, Sweden
Karnewa Finland Oy, "Aquamaster", Box 220, FN-26101, Rauma,
Finland
Kawasaki Heavy Industries, Ltd.,
Tokyo Head Office, World Trade Center Bldg.,
4-1 Hamamatsu-cho 2-chama, 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
Cernia Corp., 8185 Cass Ave., Danen, IL 60581
DeWijl Marine International B.V., Postbus 320, 1969 NJ
Heemskerk, Nederland
The Falk Corp., PO Box 482, Milwaukee, WI 53201-0492
Financin, Diesel Engines Div—GM, Bagnoli della
Rosaonda 324, Trieste, ITALY
GE ALSTHOM Diesels Inc., 10801 Kenwood Dr. Ste 1,
Houston, TX 77043-1412
Götens Worldwide, 100 Vandeburt St., Brooklyn, NY 11231
Hartmaster Marine Inc., 31777 Industrial Rd., Livonia, MI
48150
Harrington Metal, 6720 124th Ave., Lennoxville, MI 49408
Kärlenberg Bros. Co., P.O. Box 358, Two Rivers, WI 54241
Krupp Mak, 7555 Danbro Crescent, Mississauga, Ontario,
CANADA L4N 6P9
LIPS B.V., P.O. Box 6, 5150 BH Drunen, The Netherlands
Lohmann & Stolterhoff, P.O. Box 1860, D-58408 Witten,
Germany
Lo-Rez Vibration Control, 186 West 8th Ave., Vancouver, BC
CANADA, V5Y 1N2
Masoco, Inc., 31 Wilberbrock Rd., Unit B4, Oxford CT 06478
Marichowsk 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, Ostensvej 2, DK-6900 Holstebro,
DENMARK
MAN B&W Diesel AS, Alpha Diesel, Nels Jøns Vej 15, DK-6900
Frederikshavn, DENMARK
MAN B&W Diesel GmbH, Stadtbahnhofstrasse 1, D-86153
Augsburg 1 GERMANY
Onit Corp., 1111 Cedar Creek Rd., Gratton, WI 53024
Oy Warble Ab, Vasa and Abn Divisions, P.O. Box 244,
SF-8100 Vasa, FINLAND
Propulsion Systems Inc., 801 N.E. 2d Cir., Pompano Beach,
FL 33064
Karl Senner Inc., 25 W Third, Kenner LA 70002
Schottel-Werke, Mainzer Strasse 99, D-55322 Speyer/Rhein,
GERMANY
Schoffel, Inc., 500 Industrial Blvd., Sugar Land, TX 77478
Siemens Electric Ltd., 1180 Courtney Park Rd., Mississauga,
ONTARIO
Stewart & Stevenson, 1400 Drethehan, P.O. Box 8, Harvey
LA 70059-0008
Thru-master of Texas, P.O. Box 840189-1227 IFM 529,
Houston, TX 77284-0189
Ulsain Bergen Diesel AIS, P.O. Box 924, N-5002, Bergen,
NORWAY
Ultra Hydraulics Limited, Cheltenham Road East, Gloucester,
GL2 9LN, ENGLAND
Vaini Hydro Marine Technology, P.O. B. 1125, 08950,
Heidenheim, GERMANY
Marine Population Inc., 1505 Corbin Ave., Hammond, LA 70403
The Cincinnati Gear Company, 857 Hoester Pike
Cincinnati, OH 45227
Renold Hi-Tec, 512 W. Crescentville Rd., Cincinnati, OH 45248
U.S. Rep. Voth Schneider America Inc., 121 Squawman Ave.,
Great Neck, NY 11021
Schottel-Werke, Josef Becker GmbH & Co. KG,
Mainzer Strasse 99, D-55322 Speyergemany

PUMP—Repair—Drives
Sardiana Americas Bkg, 502 Emple St., Greenfield Park, J4V1V7
Canada
Advanced Environmental Systems, 2 Sutton Rd., Webster,
MA 01570
Giles, Inc., PO Box 628, Seabrook, TX 77586
Hannworthy Marine, Inc., 1129 Hospital Dr. Ste 3C,
Stockbridge, GA 30281
Marine Electric & Process Control, 3931 Leary Way NW, Seattle,
WA 98107
Kraissl Co., 299 Williams Avenue, Hackensack, NJ 07061
Via Molitor, 258 Planer St., Newark, NJ 07104
Alfa Tec, Inc., 4027 21st Ave. West, Seattle WA 98199

RADARS—ARPA
Furuno USA, Inc., 271 Harbor Way, San Francisco, CA
94080
Radio-Holland USA, 8943 Gulf Freeway, Houston, TX 77017

REFUEL 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

RH PROPELLER
Boll Filter, 15 International Dr., East Granby, Ct., 06026
Götens, 169 Van Brunt St., Brooklyn, NY 11231

RIGID INFLATABLE BOATS
Wildard Marine, Inc., 1252 N. Grove St., Anaheim, CA 92806
Zodiac of N. America Thompson Creek, P.O. Box 400,
Stevensville, MD 21686

ROPE—Manila—Nylon—Hawfers—Fibers
American Mfg. Co., 200 Southpark Rd., Lafayette, LA 70508
Bayer AG, D-41538, Dormagen, GERMANY
Phyllytan Inc., 151 Commerce Drive, Montgomeryville, PA
18938-8628
Puget Sound Rope, 1012 Second St., Anacortes, WA 98221
Raamsussen Equipment Co., P.O. Box 81206, Seattle, WA
98108
Yale Cordage, 28 Morn. St., Rodeford, Maine 04005

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

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

Thoron Bearings, Inc., 3225 Mainway, Burlington, Ontario
Canada L7M 1A5

SAFETY PRODUCTS
Brookdale International, 1-8755 Ash St., Vancouver BC, V6P8T3
Viking Life Saving, 1025 N. Miami Ave., Miami, FL 33136
Wellin Lambe N.A., Inc., 18 Ridgeway Drive, Bridgewater Nova
Scotia, Canada B4V 3V8
New England Marine & Industrial, 200 Spaulding Turnpike,
Pomfret, NH 03801
Nautical Safety Products, P.O. Box 590462, Houston, TX 77259
Rohlfed, P.O. Box 1172 Camp St., New Orleans, LA 70130

SANITATION DEVICES—Pollution Control
Byrne, Rice & Turner, Inc., 1172 Camp Street, New Orleans,
LA 70130
Ecotech International Corp., 1110 Industrial Blvd., Sugarland, TX
77478
Envirovac Inc., 1260 Turnet Dr., Rockford, IL 61111
Fast Systems, 2340 North Broadway, St. Louis, MO 63147
AlfaTec, Inc., 4027 21st Ave. West, Seattle, WA 98199
Owens Mfg., Hwy 92, Youngsville, LA 70592
Byrne Rice & Turner, 1172 Camp St., New Orleans, LA 70130

SATELLITE COMMUNICATIONS
Boatrac, Inc., 6440 Lusk Blvd., #D-201, San Diego, CA
92121-2758
Furuno USA, Inc., 271 Harbor Way, San Francisco, CA
94080
KWH Industries, Inc., 116 Enterprise Center, Middleton, RI
02842-5288
ICG Satellite Communications, 8400 NW 52nd St., Suite 110,
Miami, FL 33166
Mackay Communications, 2721 Discovery Dr., Raleigh, N.C.
27604-1851
Iridium 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., 678 Island Pond Rd., Manchester,
NH 03109
Singapore Telecom, 15 Hill Street, Telephone House, 2nd
Storey, Singapore 0617
Telex Mobile Satellite & Radio Services, 79 St. Hillers Rd.,
Auburn NSW 2144, AUSTRALIA
Magellan Systems, 960 Overland Court, San Dimas, CA 91773
Sincos, 155 Metcalfe St., Suite 1900, Ottawa, Ontario K2P 1P1
Canada
Comsat Maritime Services, 6580 Rock Spring Drive, Bethesda, MD
20817-1146

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

SEALS
John Crane Marine, USA, 1536 Barclay Blvd., Buffalo Grove,
IL 60089
Blom & Voss Industries GmbH, P.O. B. 112289, D-2042
Hamburg 1, GERMANY
U.S.A. Repr. Simplex-Turner 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
Cortona, CA
Onit Inc., 2535 Prairie Rd., Unit D, Eugene, OR 97402
Onit Composites Ltd., Bradmarsh Business Park,
Rotherham S80 1BX

SEATING
H.O. Boston, 818 Progress Ave., Waukegan, WI
53091

SHAFT HOBSPOWER MEASURING SYSTEM
FCS, Inc., 22 Main Street, Centerbrook, CT 06409
Instruments Computers & Controls, 78 Londonderry Tpk.,
Suite F, 12 Hoosier, NH 03106

SHIRT SEALS
Duramax Marine, 16025 Johnson St., Middlefield, OH 44062
Blom & Voss Industries GmbH, P.O. B. 112289, D-2042
Hamburg 1, GERMANY
U.S.A. Repr. Simplex-Turner Inc., P.O. B. 675, Tonawanda,
NY 14151

SHAFTS
American Vulcan, 2525 Dundee Rd., Winter Haven, FL 33884

SHIP LIFTS
Syston Corp., Two Darian Center, 6130 S. Daedland Blvd.,
Miami, FL 33156-7850

SHIP VALUATION
G.S. & Co., Fargo, P.O. Box 1246, Fargo, ND 58108

SHIPBOARD MANAGEMENT SYSTEMS
Spe Associates, 927 West St., Annapolis, MD 21401

SHIPBOARD TESTING
Dayton T. Brown, 555 Church St., Bohemia, NY 11716
11716
SHIPBUILDING—Repairs, Maintenance, Drydocking
American Eagle Mfg., 780 Pearle Jensen Way, La Comer
WA 98257
Amfels, Inc., P.O. Box 3107, Toronto, TX 78523
Asilene Espanoles, S. A. Ocharandri, 14-18 28033 El Plantio
SPAN
Atlantic Marine, Inc., P.O. Box 3202, Mobile, AL 36682
Atlantic Marine, Inc., 8500 Heckscher Dr., Jacksonville, FL 32226
Avondale Industries Inc., P.O. Box 50280, New Orleans LA 70150
Bender Shipbuilding & Repair, P.O. Box 42, Mobile AL 36601
Basso Marine Co., P.O. Box 413, New Orleans, LA 70178
Blount Marine, 461 Water St., Warren, RI 02885
Bolinger Lockport & Larose, P.O. Box 250, Lockport, LA 70374
Cairdco, P.O. Box 1147, Port of Spain, Trinidad, W.I.
Chris-Marine AB, P.O. Box 9025, S-2000 39, Malmö, SWEDEN
Corrad Industries, 1501 Front Street, P.O. Box 790, Morgan City,
LA 70381
Eastern Shipbuilding Group, 2200 Nelson Street, Panama City,
FL 32402
Finanzieri SPA Cantieri Navali Italiani, Via Cipro 11, 16129 Genoa
ITALY
Götens Worldwide, 160 Van Brunt St., Brooklyn, NY 11231
Hitoashi Co., Chiyoda-ku Tokyo 100 Japan
In-Place Machine Co., Inc., 929 North Bullum Street, Milwaukee,
WI 53212-3793
Jacksonville Shipyards, 750 E. Bay St., Jacksonville, FL 32202
Jellicoff, Inc., P.O. Box 810, Jeffersonville IN 47130
Kvaerner Mass-Yards Oy, Box 132, SF-00151, Helsinki, FINLAND
Kawasaki Heavy Industries, Ltd.,
Tokyo Head Office, World Trade Center Bldg.,
4-1 Hamamatsu-cho 2-chama, Minato-ku, Tokyo 105-6116 Japan
Larvac Shipyards, P.O. Box 1190, Hwy 90 East, Jennings, LA
70546
Lindau GmbH, Skagerakvæker 10, Postfach 9093 D-2300 Kiel,
Friedrichshafen GERMANY
Motor-Service AB, Box 2115, 144 04 Rominge, SWEDEN
Munson Hammerhead, 780 Pearle Jensen Way, La Comer WA
98257
Newport News, 4101 Washington Ave., Newport News, VA
23607
Peterson Builders, Inc., 101 Pennsylvania Ave., Surgeon Bay,
WI 54235-9559

Thomas Marine, 37 Bramford Street, Patchogue, NY 11772
Samsung Heavy Ind., 28, 1-ka, Dongjae-dong, Chungku, Seoul,
Korea
SeaArk, P.O. Box 210, Montello AR 71655
SeaFib, P.O. Box 1851, 4111 Cedar St., Pasco WA 99367
Service Marine Industries, P.O. Box 3606, Morgan City LA 70381
Southwest Marine, Foot of Sampson Street, P.O. Box 13008, San
Diego, CA 92170
Skipperliner Shipyards, 621 Park Plaza Dr. Dept 21, LaCrosse WI
54601
Stener Shipyards, Inc., P.O. Box 742, Bayou la Batre, AL 36509
Swath Ocean, 979 G Street, Chula Vista, CA 92011
Talleres Navales del Golfo, Isote San Juan de Ulva S/N, 81800
Veracruz, Ver. Mexico
Vasco Rios, P.O. Box 296, E. Boothbay, ME 04544
Westport Shipyards, P.O. Box 308, Westport, WA 98596
Willard Marine, Inc., 1252 N. Grove St., Anaheim, CA 92806
Zodiac of North America Inc., Thompson Creek Rd., P.O. Box 400,
Stevensville, MD21686
Friede Goldman, 525 E. Capitol Street, Suite 402, Jackson, MS
39201
Tampa Bay Shipbuilding, 1130 McClosky Blvd., Tampa, FL
33608
Ocean Technical Services Inc., 1140 Peters Rd., Harvey, LA
70058-1705
FirstWaveNewark Shipbuilding, 2102 Broadway, Houston TX
77102
Cascadia General Inc., 5555 N. Channel Ave., Bld. 71, Portland,
OR 97217

SHIPYARDS
Derektor Shipyards, 311 E. Boston Post Rd., Mamaronek,
NY 10543
Naval Technical Services, 1140 Peters Rd., Harvey, LA 70058

SHIPYARD/CABLES
American Shipyard Corp., One Washington St., POB
570 Newswort, RI 02840-5343
Arnoter Wire & Cable, 2617 Edendorn Ave., Melaria, IL
70002

SHIVERS
Stookum, P.O. Box 280, Hubbard, OR 97032

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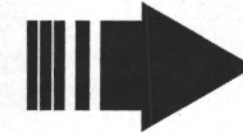
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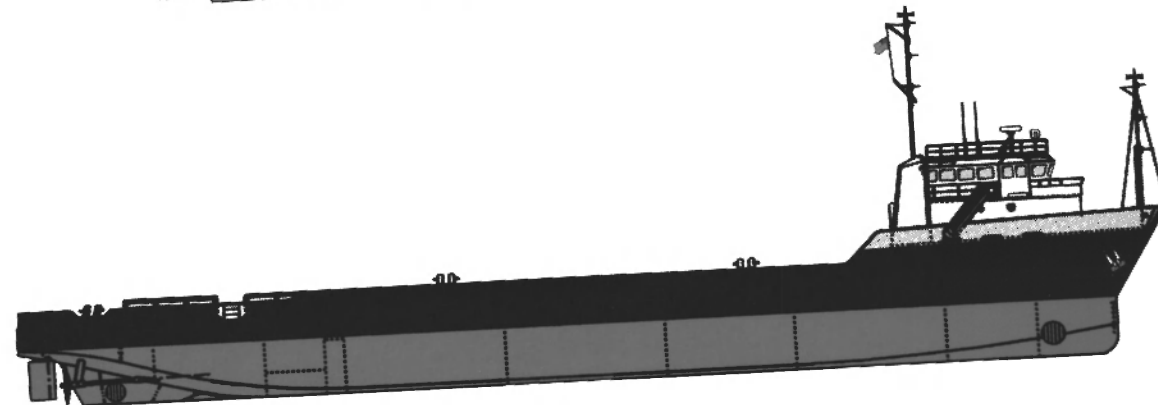
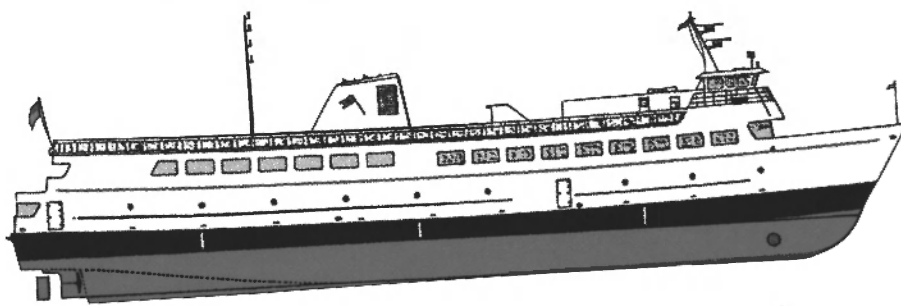
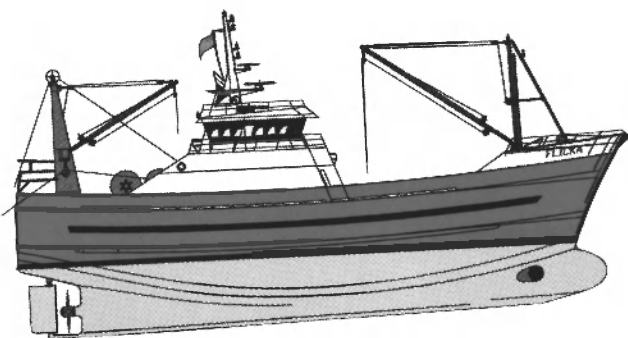
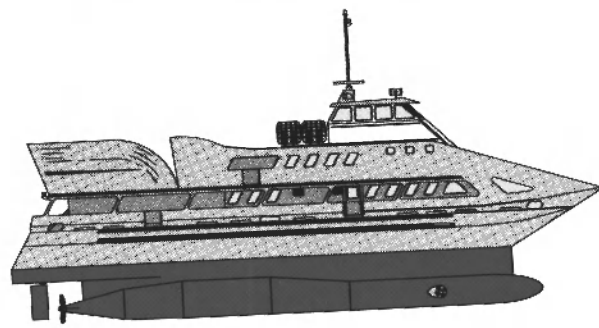
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