

# MARITIME REPORTER AND ENGINEERING NEWS



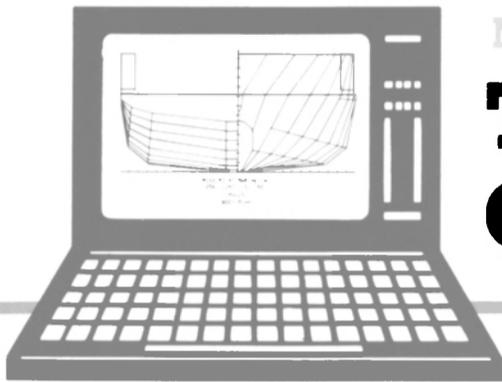
## DIESEL POWER REVIEW

The Humboldt Express—One Of Hapag Lloyd's New Containerships

**Samsung Delivers  
Two Containerships  
To Hapag Lloyd**

(SEE PAGE 4)

**JULY 1, 1984**



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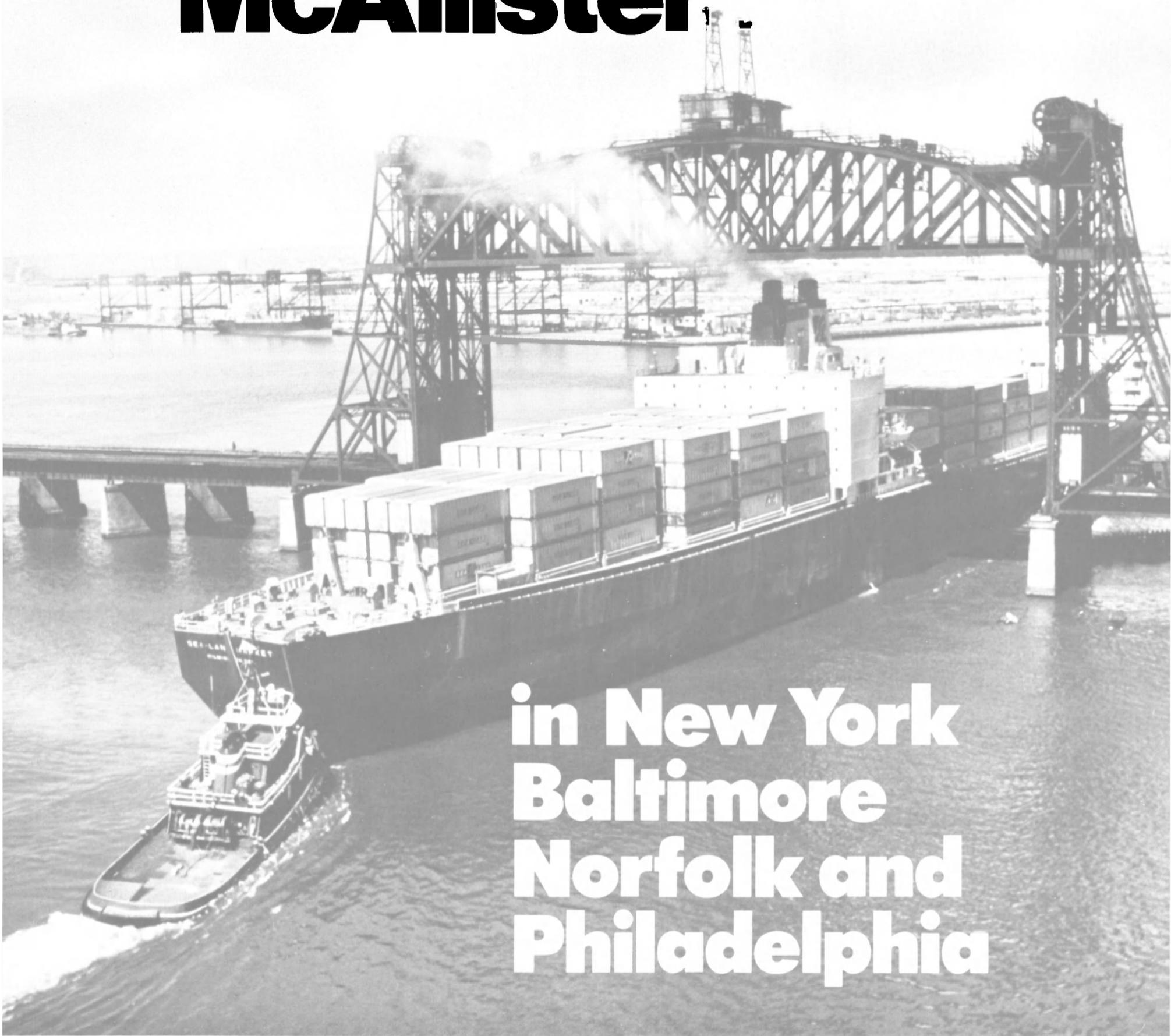
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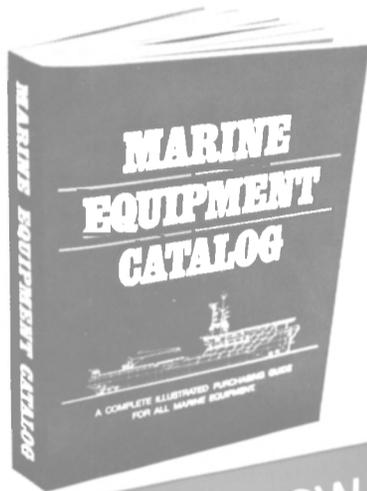
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## ON THE OOVER

**Samsung Delivers Two  
Containerships To  
Hapag-Lloyd**

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**Diesel Power  
Review**

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### Modular Systems Wins Two Contracts

Esso France has contracted Modular Systems to build a Rudder Arresting System for the tanker Esso Port Jerome. This will be the 53rd Esso tanker retro-fitted with the Modular Systems supplied rudder arresting system.

Modular Systems has also been awarded a contract to supply forced draft blower modification kits, with a total value of \$767,894, by the Naval Sea Systems Command, Washington, D.C.

For further information,

Circle 71 on Reader Service Card

### Thomas Schroppe Elected VP—Foster Wheeler Energy Corporation

J. Thomas Schroppe has been elected a vice president of Foster Wheeler Energy Corporation.

Mr. Schroppe joined Foster Wheeler in August 1962 as a proposal engineer in the Marine Department. He was elected president of the subsidiary, Foster Wheeler Boiler Corporation in 1978 and was appointed managing director and chief executive of Foster Wheeler Power Products, Ltd., London, England, in 1982.

A graduate of the New York State Maritime College (Bachelor of Marine Engineering), Mr. Schroppe is a member of the Society of Naval Architects and Marine Engineers, serves as chairman of its Boiler Panel and is a member of other SNAME, ASTM & ABMA committees. He is a licensed professional engineer and the author of numerous technical publications.

## MARITIME REPORTER and Engineering News

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ALL MATERIAL FOR EDITORIAL CONSIDERATION SHOULD BE ADDRESSED TO ROBERT WARE, EDITOR.

## The Ferry Narrabeen Launched At Carrington

Mrs. Desley Mulock, wife of the Hon. R.J. Mulock, Deputy Premier of New South Wales, recently launched the Ferry Narrabeen at Carrington Slipways Pty. Ltd., Tomago, N.S.W. The ceremony was attended by members of the Urban Transit Authority including G.A. Bayutti, chairman, the Hon. B. J. Unsworth, M.L.A. Minister for Transport, Alderman Don Geddes, Newcastle City Council and other local dignitaries.

The ferry was constructed by Carrington for the Urban Transit Authority for use on the Circular Quay/Manly ferry computer service on Sydney harbor.

The vessel's principal dimensions are length overall 230.92 feet, moulded breadth, 410.12 feet and moulded draft of 108.6 feet. It was completed within eight months of commencement of the project.

The ferry will be suitable for cruises outside the harbor but within the NSW coastal limits between Broken Bay and Wollongong.

## Williams Announces Lubricating Innovation For Steel Cables



Harold G. Williams

After more than 45 successful years in the foreign and domestic shipping industry, building and operating ships, tugs, and barges, inventor Harold G. Williams, president of Atlantis Services, introduces Cable Saver, a device for the automatic lubrication of moving steel wire cable.

The unit, manufactured of polyethylene, is in two equal halves and may be installed without disturbing any part of the machinery. Cable Saver™ is designed for use on revolving boom cranes, fixed cranes, drag lines, skagit heavy car movers, tension winches, elevators, drill rigs and many other automated machines using steel cable. Unit #1 accommodates cable sizes from 1/2 inch to 2 inches, unit #2 will fit sizes 2-3 inches. An alemite hand pump, placed on a 35-pound can, pumps special lubricant into the Cable Saver. On larger operations, a regulated air pressure pump may be installed on a 55-gallon drum for lubrication.

When used on a machine with undamaged cable and properly lu-

bricated, Cable Saver should double or triple the useful life of a cable. It has six foreign registrations, including Germany, Norway, Denmark, Sweden, Finland and the British Isles. It is also registered in about one-half of the United States to date.

For complete information and a copy of the color brochure describing the Cable Saver,

Circle 62 on Reader Service Card

## Carrier Offers New 12-Page Brochure

Carrier Transicold Division of Carrier Corporation is offering a new 12-page brochure on their line of products for marine refrigeration and air conditioning applications.

More than two dozen products, from compressors and condensing

equipment to liquid chillers and coolers are highlighted.

Carrier Transicold marine equipment is used in a variety of craft from tugboats and military vessels to the largest ocean-going tankers as well as on offshore rigs and platforms.

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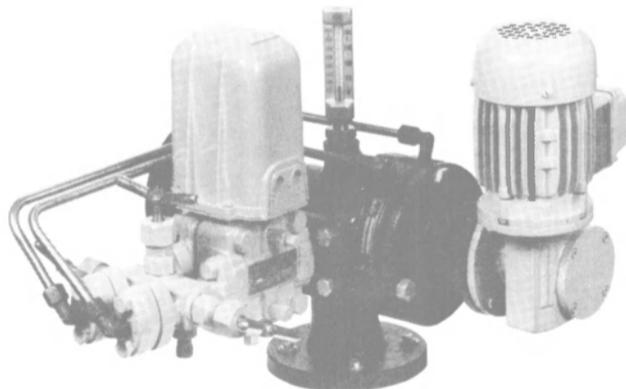
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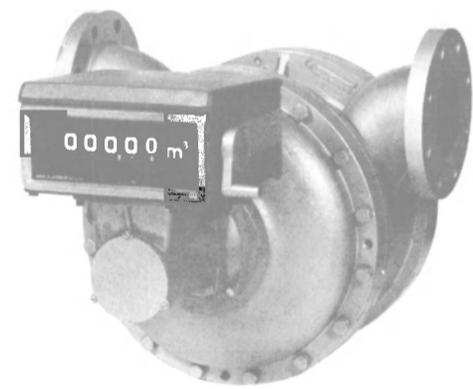
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## Sonat Marine Names Two Assistant VPs



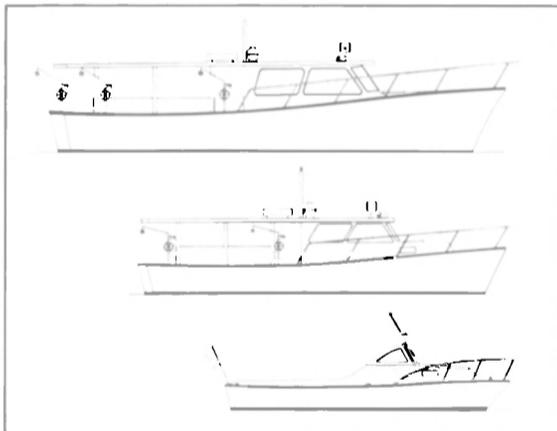
John R.L. Hihn

Royal D. Joslin

Stephen A. Van Dyck, president of Sonat Marine, announced recently that **John R. L. Hihn** has been named assistant vice president-operations and **Royal D. Joslin** has been named assistant vice president-Eastern operations.

Mr. **Hihn** will be responsible for a company-wide operations audit program designed to ensure that safety and training programs developed over the years are implemented throughout the fleet. Mr. **Joslin** will assume the overall operational control of all Sonat Marine vessel operations conducted from the Philadelphia fleet center. Both will report to **James H. Sanborn**, vice president-operations.

## Desco Marine Adds Three New Fiberglass Hulls To Line of Fishing Boats



Desco Marine announced today the addition of three new multipurpose fiberglass hulls to their existing lines of commercial fishing boats.

According to Desco vice president **Emerson Shank**, Desco purchased the molds from **Robert McCoy** of Jacksonville and will offer the boats rigged for either commercial or sport fishing. The hull sizes include a 29, 37 and 46 foot size that can be used for long-lining, gill-netting, bottom fishing, snapper/grouper, sport and charter fishing.

The molds were first used by Sermon's Boat Yard of Tarpon Springs, Fla. where they developed a reputation for quality with fishermen in the Southeastern Coastal United States. Desco will equip these boats with single or twin screws and plans to develop a police or military patrol boat where there is a need for speed.

In addition to the Sermon FRP molds, Desco has added three larger fiberglass hulls with a 60-, 65-, and larger 90-foot hull with extra room for various types of onboard processing

equipment. These new Desco planing hulls were designed for use as charter boats, party boats, or dive boats in lengths varying from 50 to 65 feet. The 65-foot hull can also be used in crewboat work or military patrol where speeds of 35-40 knots are required.

Desco Marine, Inc. is a modern shipbuilding and repair facility located in St. Augustine, Fla. Desco's capabilities include steel boats up to 200 feet, fiberglass boats from 29 to 90 feet and wood boats to 73 feet. For information regarding Desco Marine's products and services,

Circle 49 on Reader Service Card

## ASMAR Completes Repairs On LPG Carrier Andes Gas

ASMAR, Chile's leading ship repairer, has just completed repairs to a 12,601 grt LPG carrier, the *Andes Gas*, owned by Sociedad Naviera Ultragas S.A. of Chile.

The vessel was repaired at ASMAR's Talchuanu yard and work carried out involved the removal for survey of the propeller shaft and the renewal of Simplex seals.

In addition to routine drydocking requirements, a new heat exchanger was installed along with new pipework to the propane gas system. The booster pump for this system was also completely overhauled and a new base constructed and fitted.

Four of the Deepwell pumps were removed for survey and overhauled and the vessel's hull was recoated with a self-polishing anti-fouling system.

For further information,

Circle 50 on Reader Service Card

## Two Appointments Announced By Marathon Marine



John S. Laird III

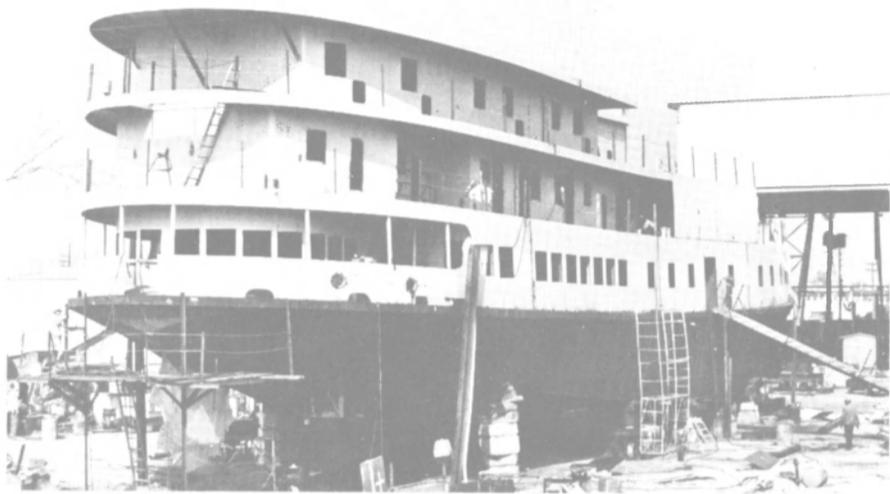
David R. Lewis

Marathon Marine Engineering Company has named **John S. Laird III** as manager of engineering and has appointed **David R. Lewis** to the position of chief structural engineer. The announcement of these two appointments was made by **Robert E. Bradbury Jr.**, president of Marine Engineering Company.

Prior to his appointment as manager of engineering, Mr. **Laird** served as chief structural engineer for Marathon Marine Engineering Company. He is a graduate of the University of Houston and holds a B.S. degree in mechanical engineering. He is a Registered Professional Engineer (State of Texas).

**David R. Lewis** joined Marathon Marine in 1979 as a structural engineer and served as assistant chief structural engineer from 1981 until his more recent appointment as chief structural engineer. He holds a B.S. degree in Civil Engineering from the University of Missouri-Rolla and a M.S. degree in Civil Engineering from the University of Houston.

Maritime Reporter/Engineering News



## Unique Mini-Liner Nearing Completion At Bender Shipbuilding Yard In Mobile

Richard M. Scudder, president of Hyannis Harbor Tours, Inc., has announced that Coastwise Cruise Line, a new service of his corporation, is building a new mini-cruise liner, 150-passenger the Pilgrim Belle, at Bender Shipbuilding and Repair Company, Inc. in Mobile Ala. Bender specializes in construction and repair of fishing vessels, supply boats, large tugs, and a wide variety of ocean-going and inland work vessels. Lofting and engineering for the mini-liner started in late summer of 1983; delivery of the new vessel is scheduled for the fall of this year.

John W. Gilbert of Boston is the naval architect for the new cruise vessel. He is recognized internationally as one of the leading designers of commercial vessels in this size range. The Pilgrim Belle has an overall length of 192 feet, beam of 40 feet, and draft of 7½ feet. She is twin-diesel powered with 1,055-bhp Caterpillar engines, and has a 300-hp bow thruster. The vessel is thoroughly modern in her machinery and electronics inventory. Electrical power is supplied by two 390-kw Caterpillar diesel generators.

The 49 outside cabins all have private bathroom facilities and individually controlled heating and air conditioning. An elevator serves three decks for passenger conven-

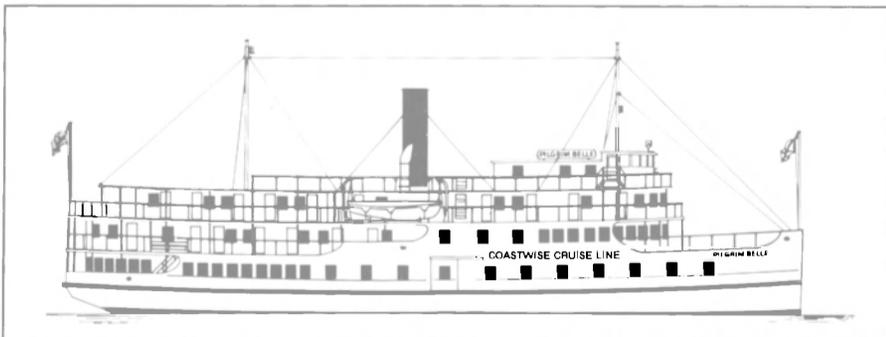
ience. Her appearance is in the manner of a 1925 coastal steamer, with a decor and ambiance that Coastwise Cruise Line has dubbed the Steamer Class™.

The design of the vessel's interior has been assigned to Interior Design International of Seattle and Copenhagen. The trio of Richard D. Roselle, Shirley LaFollette, and Doreen Hamann come from a select association of designers in the field of marine, aircraft, and commercial interiors. They have the responsibility for the decor and appointments for the multimillion-dollar flagship of Coastwise Cruise Line.

The vessel's hull was built upside down from the stern forward. During January this year, steel was plated over the framework and the hull was rolled over into an upright position in March.

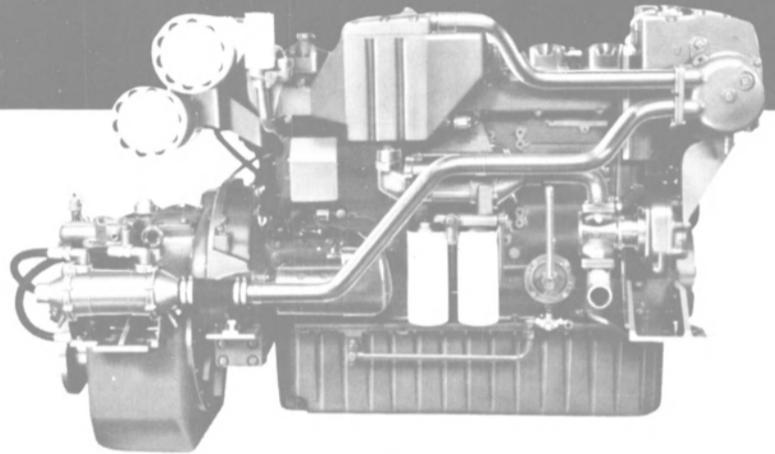
Hy-Line general manager Robert C. Nelson will captain the Pilgrim Belle during shakedown and repositioning from Mobile to Hyannis in preparation for her maiden voyage. The vessel is designed to be highly maneuverable, with a speed greater than other coastal cruise ships.

The Steamer Class coastal cruise vessel is the first of its type to be constructed by Bender Shipbuilding, and is to be a showpiece for the quality product of this Gulf Coast yard of 60 years' experience.



Resembling a 1920s coastal steamer on the outside but thoroughly modern in machinery and electronics, the Gilbert-designed Pilgrim Belle is under construction at Bender Shipbuilding and Repair Company in Mobile for Coastwise Cruise Line of Hyannis.

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## Daewoo To Build Offshore Gas/Oil Production Plant

Esso Production Malaysia, Inc. (EPMI) has asked Daewoo Shipbuilding and Heavy Machinery Ltd. to build an offshore oil and gas production plant and to supply a dehydration module for a second plant. The total price of the projects, including owner-furnished equipment, is \$35 million.

The production plant Daewoo is building will comprise six modules for oil and gas production, two modules for gas compression, and one dehydration module. Upon completion in May 1985, the equipment will be transported by Daewoo to Malaysia's "Gunong 'A'" offshore oil field.

A separate dehydration unit is being built for use by a plant in the "Tiong 'A'" offshore oil field; it

will also be delivered by May 1985.

The plant provides basic oil and gas treatment, compresses gas to be transported to another platform or plant, and removes moisture from gas.

Daewoo Shipbuilding last year built and transported two modules for compression and dehydration for EPMI's use in the "Bekok 'C'" offshore oil field.

Daewoo Shipbuilding is a member of the Daewoo Group, founded in 1967 and now one of Korea's largest business groups.

## Joseph Cangelosi Forms New Consulting Firm



Joseph Cangelosi

**Joseph Cangelosi**, formerly chief estimator and general superintendent of Bethlehem Steel Corporation's Hoboken shipyard and most recently manager of **Elliott S. Braswell's** Hoboken and Bayonne shipyards, announced the formation of his own firm, **Seacon**. **Seacon** will offer its services to owners, operators, repairers and underwriters involved in ship repair.

Mr. **Cangelosi's** experience in the industry since 1966 will provide the basis for the services which the firm will render.

**Seacon** will be task oriented with expertise in survey and specification preparation, cost estimation, price negotiation, on site supervision, contract administration and reconciliation of disputes.

For complete details on all ship repair services offered,

Circle 76 on Reader Service Card

## Dockside Signs Contract With M.A.N./B&W Service — Rennie Joins Staff

**Dockside Machine & Ship Repair** recently announced its signing of a contract with **M.A.N./B&W Service GmbH** of Ausburg, Germany. **Dockside** is under contract to act as a manufacturers approved service/repair shop which is part of the worldwide service organization of **M.A.N./B&W Diesel**. Consumation of the contract took place at **Dockside's** Wilmington, Calif., offices with the company's vice president, **Robert Strachan**, and **Wolfgang Knoerle** of American **M.A.N.** Corporation signing the contract.

The company also announced that **Alan Rennie** has joined the engineering staff at **Dockside**. Mr. **Rennie** served his apprenticeship in marine engineering in Scotland, maintains a chief engineer's license and has considerable experience in marine diesel power plants.

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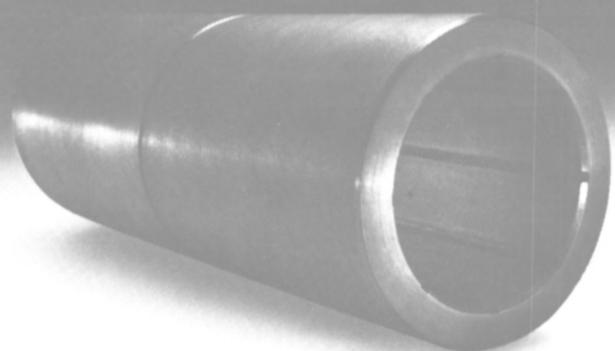
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...the marine radio people

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**Marathon LeTourneau Offshore Announces Major Reorganization**

Marathon LeTourneau Offshore Company recently announced a major internal reorganization designed to position the company's marketing, contract administration, and customer service capabilities in line with current market conditions and future demands. Details of the reorganization were announced by **David C. Crawford**, executive vice president, Marathon Manufacturing Company, and chairman, Marathon LeTourneau Offshore Company.



David E. Rogers

**David E. Rogers** has been appointed to a position within Mara-

thon LeTourneau Offshore Company where his primary responsibilities will be in the areas of customer contact and sales. Prior to this appointment, **Mr. Rogers** served as project manager with Marathon Marine Engineering Company.

**Mr. Crawford** also announced as part of the reorganization that **James L. Fox, Jr.**, who after 38 years of service to Marathon and recently a vice president of Marathon LeTourneau Offshore Com-



James L. Fox

pany, has assumed the role of consultant to the company.



Carl A. Wendenburg

As part of this realignment of key personnel and their responsibilities, **Carl A. Wendenburg** has become president of Marathon LeTourneau Offshore Company.



Kenneth J. Farmer

**Kenneth J. Farmer**, his predecessor and an employee for 28 years, will continue active association with Marathon LeTourneau Offshore Company as a consultant. **Mr. Wendenburg's** most recent assignment with Marathon was as manager of engineering, Marathon Marine Engineering Company.



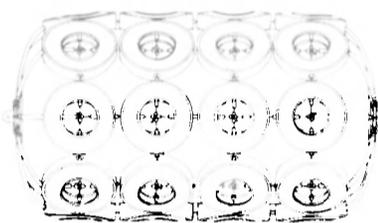
Clifford E. Hart

In the area of contract administration, **Clifford E. Hart**, who has served as Contract Manager, has been named vice president—Contracts, Marathon LeTourneau Offshore Company.

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## Moss Point Marine Launches 'Nikor Safety'



Moss Point Marine, of Escatawpa, Miss., has announced the recent launching of the Nikor Safety, a twin-screw line launch vessel. The vessel measures 82 feet 6 inches by 24 feet by 11 feet 3 inches.

Along with Nicor representatives present for the launching there also was a representative of the Nigerian Oil Company that will charter the vessel.

## CDI Marine Appoints Smith And Dodson

Donald W. Jett, executive vice president of CDI Marine Company, recently announced the appointments of John S. (Steve) Smith and Clinton Dodson.

Mr. Smith is a graduate of the University of Notre Dame and has a Master of Science degree in Electronic Engineering from the Naval Post Graduate School.

He was an Engineering Duty Officer in the Navy holding positions as shipyard repair superintendent, combat systems superintendent,



John S. Smith

Clinton Dotson

and design superintendent. He retired with the rank of captain.

Mr. Smith is currently serving as chairman of the Sections Committee for ASNE.

Mr. Dotson recently joined CDI as naval architecture division manager, Jacksonville office, with additional duties as chief naval architect of CDI.

Mr. Dotson has a Structural Designers Certificate from the Newport News Apprentice School and a B.S. degree in naval architecture and marine engineering from the University of Michigan.

He has served as vice chairman and chairman of the Southeast section of SNAME and is a member of ASNE.

## Malcolm Jacques Appointed President of DYVI (USA) Inc.

Malcolm Jacques, formerly with Offshore Supply Association Ltd. has been appointed president of DYVI (USA), Inc. Mr. Jacques will be primarily responsible for the marketing of DYVI's fleet of heavy lift carriers.

## Bulk Carrier 'Rich Alliance' Delivered To Japanese Owner By Hitachi Zosen-Hiroshima



The lake-type bulk carrier Rich Alliance.

The Rich Alliance, a 28,074-dwt bulk carrier, was recently completed at Hitachi Zosen's Hiroshima Works and delivered to the owner, Marubeni Corporation of Japan.

The Rich Alliance is a Hitachi Zosen-developed, standardized laker-type bulk carrier which can sail the Great Lakes and the St. Lawrence River, and is designed to carry grain, coal, ore, lumber and hot-rolled coils. Its main engine is a Hitachi Zosen Sulzer Diesel Engine of the latest RTA type. For cargo handling, the ship has four 25-ton deck cranes.

The vessel has a length overall of about 548½ feet, breadth of 75¾ feet, and depth of 48½ feet. The main engine is Hitachi Zosen Sulzer 6RTA58-type diesel engine with a maximum continuous output of 9,600 hp × 116 rpm, producing a trial speed of 17 knots. The bulk carrier is classified by ABS.

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Introduces The MCS-9100  
Ship Earth Station**

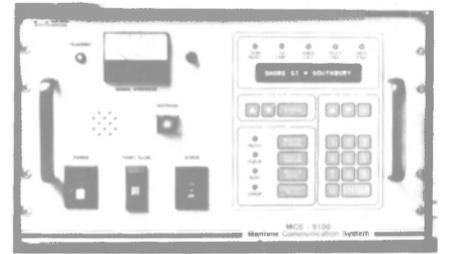
Cosat TeleSystems, Inc., Fairfax, Va., has introduced the MCS-9100 ship earth station, a maritime satellite communications system designed to accommodate the size and weight requirements of yachts, fishing boats, and similar-sized craft, but which also meets

the rugged construction and design standards demanded for the largest oceangoing vessels and off-shore facilities.

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munications. Automatic tuning is to all 339 available channels.

The MCS-9100 offers a wide variety of optional features and peripheral equipment. An emergency power supply ensures communications for a full six hours in event of shipboard electrical failure. A remote terminal control unit is available to provide communications control from any location onboard the vessel. Other



TeleSystems' MCS-9100 below decks equipment.

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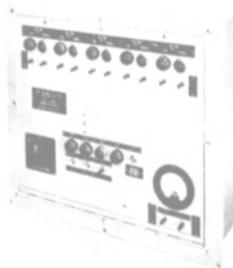
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For more information on the MCS-9100,

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**Socal Announces  
Executive Changes**

Standard Oil Company of California (Socal) has announced that **Douglas C. Wolcott** has been appointed president of Chevron Shipping Company, the corporation's marine transportation subsidiary.

Mr. **Wolcott**, currently a vice president and general manager of Chevron Shipping's operations department, succeeds **James R. Sylla** who assumes new responsibilities as president of Chevron U.S.A. Inc.

Mr. **Wolcott's** current position will be filled by **John B. Arado**, who is vice president and general manager of Chevron Shipping's engineering department. Stepping into Mr. **Arado's** current position will be **Robert A. Ternus**, who transfers from Chevron U.S.A., where he is presently a purchasing manager.

Mr. **Wolcott** began his career with Socal in 1957 as an engineer in the company's oil producing operations. In 1969 he transferred to Chevron Overseas Petroleum Company for assignments as chief engineer and production manager in Maracaibo, Venezuela, and in 1972 he joined Chevron Shipping as assistant manager of the international fleet.

He graduated from the University of California at Berkeley with a degree in engineering and completed graduate work in petroleum engineering at the University of Southern California.

Mr. **Arado** is a graduate of U.C. Berkeley and has a degree in chemical engineering. He has experience in refinery operations, economics analysis and marine engineering.

Mr. **Ternus** has degrees in electrical engineering from Marquette University and the University of Pennsylvania. He served five years as an engineering officer in the U.S. Navy.

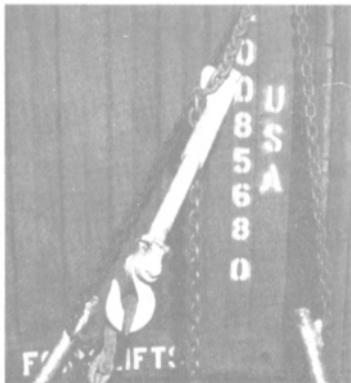
## Rockwell International Announces Key Top Management Promotions

The appointment of **Hugh Galt** to vice president and general manager of Rockwell International Corporation's Autonetics Marine Systems Division (AMSD) heads the list of key top management promotions within the division.

Mr. Galt had served as director of the division's navigation and control systems prior to his new assignment. He replaces Dr. **Don Pickrell Jr.**, who has been named vice president and general manager of Rockwell's newly formed Strategic Defense and Electro-Optical Systems Division.

Promoted to newly created posts within the division at the same time were: **Jim Winter**, former manager of tactical navigation programs, to vice president of navigation and control systems; **Donald (Buz) Sawyer, Jr.**, former director of program management, to director of electronic systems; **Floyd Fay**, former director of engineering and technology, to director of advanced programs; and **Dave Hillman**, former manager of project engineering, to director of engineering and technology.

## Marine Cargo Tensioner From W.W. Patterson Works By Hand Or Power



Tensor used as container lashing tie-down tensioner.

Tensor, available from W.W. Patterson Company, Pittsburgh, Pa., uses eccentric-loading design principle to prevent backing off under vibration.

Up to 1,000 pounds tension can be applied by turning the drive head by hand—no tools needed. Maximum tension—up to 6,000 pounds—can be reached with a common ratchet or impact wrench.

All working parts are protected and enclosed. This rugged design makes Tensor indestructible in the RO/RO or containership environment. Tensor survives being run over by heavy vehicles such as Army trucks and tanks.

Safe working load capacities range from 2,000 to 20,000 pounds. A variety of end fittings are available for use with chain, webbing, wire rope or rods.

For more information,

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## New Remote Control Subsea Gyrocompass Introduced By Robertson

Robertson has now extended the applications potential of the Robertson Subsea Gyrocompass (RSG) with the development of a remote control.

The remote control facility incorporates a high degree of micro-

processor technology. The most immediate benefit for operators will be the ability to adjust the gyrocompass without the need to remove it from its pressure chamber. Thus, the RSG can now more easily be incorporated into the overall electronic system.

The RSG has been installed onboard many underwater vehicles, ranging from ROVs to Sea Bed Crawlers. This solution to the

problem of underwater navigation is unique, the RSG's north seeking ability and its total absence of drift being of crucial importance to firms engaged in survey work. Actual operating experience indicates that the accuracy of such operations is greatly increased through the use of the RSG, especially where work is performed close to steel structures.

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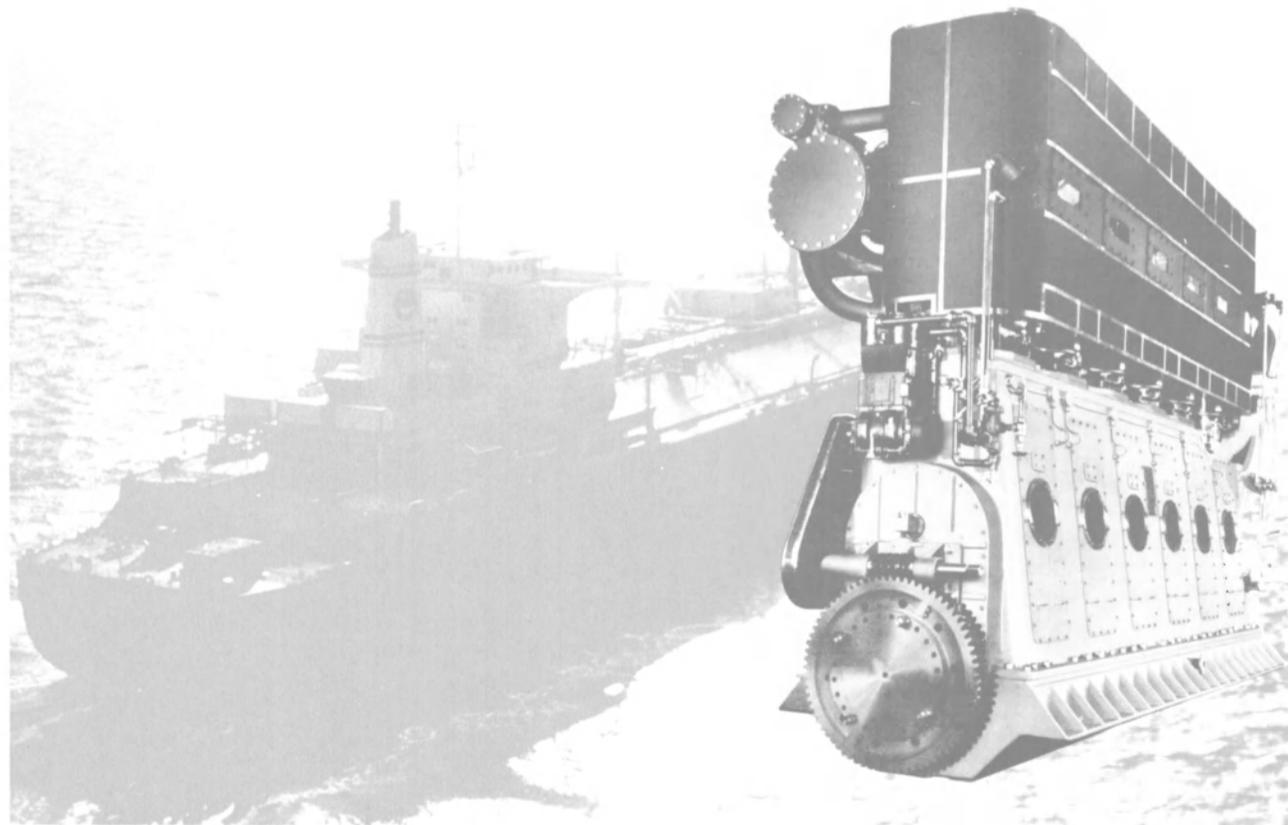
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Shown above for the dual naming ceremonies for the USNS Algol/Sgt. Matej Kocak, left to right: Capt. **Theodore Atwood Jr.**, CHC, USN, Staff Chaplain, Naval Surface Force; The Hon. **Everett Pyatt**, Assistant Secretary of the Navy (Designate), Shipbuilding & Logistics, Department of the Navy; **Mrs. Everett Pyatt**, guest of honor, Sgt. Matej Kocak; Rear Adm. **Warren C. Hamm Jr.**, Vice Commander/Director of Operations, Military Sealift Command; **Mrs. Warren C. Hamm**, guest of honor, USNS Algol; **Mrs. John Hanselman**, matron of honor, USNS Algol; **C. Larry French**, chairman of the board, NASSCO; **William Deasy**, president, Morrison-Knudsen Company, Inc.; **Richard Vortmann**, president, NASSCO; **Edward Walsh**, president, Waterman Steamship Corporation; and **Alfred W. Lutter**, senior vice president, marketing and business affairs, NASSCO.

## NASSCO Holds Naming Ceremonies For Two Ship Conversions

Naming ceremonies were held recently at National Steel and Shipbuilding Company (NASSCO) for the Sgt. Matej Kocak, a Maritime Prepositioning Ship converted for the Department of the Navy, and the USNS Algol (T-AKR-287), a Fast Sealift Ship converted for the United States Navy.

The Sgt. Matej Kocak is the first of three roll-on/roll-off (RO/RO) vessels that NASSCO is converting into Maritime Prepositioning Ships. The vessels are being converted for the Waterman Steamship Corporation; upon completion, each will be time-chartered to the Military Sealift Command in support of the U.S. Marine Corps.

A keel-laying ceremony for the Sgt. Matej Kocak was held in November 1983, and the ship will be delivered in September 1984. Start of construction for the USNS Algol was January 1983 and delivery is

scheduled for this summer.

**Mrs. Everett Pyatt**, wife of the Hon. **Everett Pyatt**, Assistant Secretary of the Navy (Designate) for Shipbuilding and Logistics, was the guest of honor for the Sgt. Matej Kocak. **Mrs. Warren C. Hamm**, wife of Rear Adm. **Warren C. Hamm Jr.**, Vice Commander/Director of Operations, Military Sealift Command, was the guest of honor for the USNS Algol. **Mrs. John W. Hanselman**, sister of Admiral **Hamm**, served as matron of honor for the Algol.

The Sgt. Matej Kocak is 821 feet in length, 105 feet in beam, with a draft of 33 feet. This ship will provide the capacity to rapidly transport to any desired locations throughout the world 25 percent of the vehicles and initial supply of ammunition, fuel, and rations for a marine amphibious brigade. All ships in the T-AK Maritime Prepositioning Ship program will be

named for deceased Marine Corps Medal of Honor recipients. The Sgt. Matej Kocak was named for the marine who received the Medal of Honor posthumously from both the Army and Navy for heroism displayed above and beyond the call of duty in action against the enemy on July 18, 1918.

The USNS Algol is 946 feet in length, 105 feet in beam, with a draft of 37 feet. The Algol will be stationed in the United States and, if an emergency arises, will be loaded with military cargo to provide rapid, second-wave support to deployed combat troops. The T-AKR ships will be named after stars. The USNS Algol was named after a star located in the constellation Perseus (The Hero).

National Steel and Shipbuilding Company is a wholly owned subsidiary of Morrison-Knudsen Company, Inc. of Boise, Idaho.

### MarAd Acquires RO/RO Vessel Atlantic Bear With Bid Of \$17.5 Million

The Maritime Administration recently acquired the roll-on/roll-off vessel Atlantic Bear at a federal auction held in Norfolk, Va., with a bid of \$17.5 million. The vessel was owned by Pacific Far East Line, Inc., which went bankrupt in 1978. The government holds a preferred mortgage on the ship. In June 1978 it paid off \$37.6 million in unpaid principal and \$1.7 million in accrued interest on the vessel's mortgage which was backed by the government's Title XI financing guarantees.

Acadian Marine Co. of Lake Success, N.Y., has a conditional contract with the Secretary of Transportation to purchase the ship for \$21.8 million plus the cost of all repairs and reconditioning work necessary to put the vessel in class. (The ship has been idle in the National Defense Reserve Fleet for most of the past six years). As a condition of the agreement, Acadian has been issued a Letter of Commitment for Title XI guarantees covering 87½ percent of the depreciated original actual cost of the vessel and its reconditioning costs.

Acadian is a Delaware partnership of two corporations, Atlantic Shipping Corp., and Spirit Marine, Inc., which will own the vessel, to be renamed the Atlantic Spirit.

The vessel, built in 1976 at Sun Ship, Chester, Pa., is 790 feet long and has a capacity to carry 400 trailers and 150 vehicles.

### Perolin Offers Handbook On Fuel Oil Treatment

A 38-page handbook on the chemical treatment of fuels has been made available by British-based Perolin Marine, a Unitor company. Titled "The Perolin Fuel Oil Treatment Handbook," the publication has been prepared for guidance in the selection and application of Perolin products in a balanced program of fuel oil treatment.

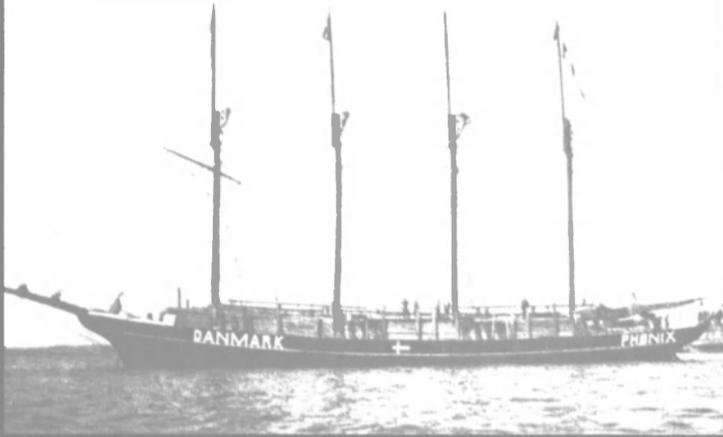
The handbook lists some 10 serious problems in connection with ship operations, along with a range of carefully prescribed treatments and products for improved performance and savings in fuel and maintenance costs. The cause, effect, product application, and method of dosing are detailed separately and concisely for each problem, along with an application chart.

Perolin also has publications for maintenance, tank cleaning and water treatment products.

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1982 — »ELSAM JYLLAND« — 137 000 dwt coal carrier  
— equipped with three Heavy Fuel M.A.N.-B&W Holeby  
Marine GenSets — type 6S28LH.

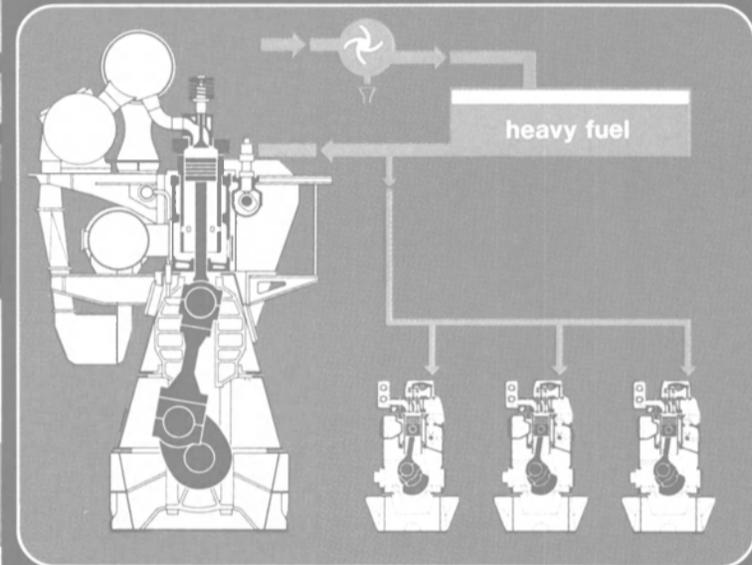


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Multi-purpose containership Humboldt Express shown on sea trials.

## Two Samsung-built Hapag-Lloyd Ships Feature Unique Asymmetric Stern

The Koje Shipyard of Samsung Shipbuilding & Heavy Industries Company, Ltd. in Korea recently delivered two multi-purpose containerships to Hapag-Lloyd A.G. of Hamburg, the West German shipping company that operates worldwide services. Christened Humboldt Express and Cordillera Express, they each have a capacity of 1,938 TEUs in six cellular cargo holds and on deck. These sophisticated vessels were designed and built under the rules of Germanischer Lloyd, and are classed + 100A4, E, MC, AUT, Multi-purpose Container Vessel.

These ships are diesel-propelled, single-screw cellular containerships of 34,000 dwt. A traveling gantry crane is installed on the main deck for self-loading/unloading of boxes and breakbulk cargoes, making them independent of shoreside cranes. With a con-air ducting system installed, they can carry up to 262 TEUs of reefer

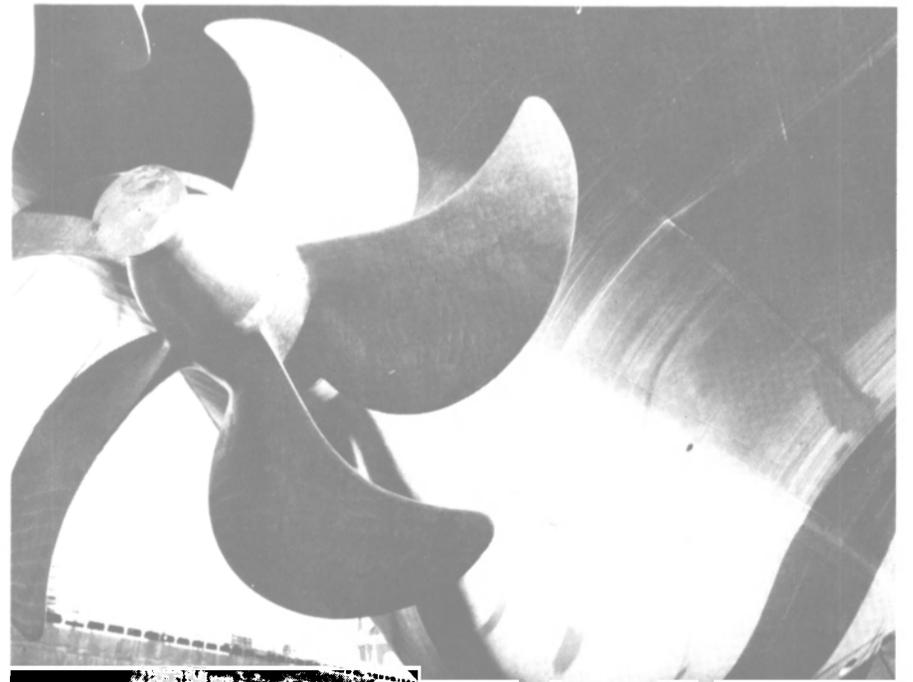
containers in the hold, and up to 100 TEUs of integral reefer boxes as deck cargo.

The ship has an overall length of 675.14 feet, beam of 105.64 feet, depth to main deck of 61.68 feet, and design draft of 30 feet. Accommodations are provided for a crew of 33, all in private cabins that were installed as prefabricated units.

Humboldt Express is propelled by a low-speed Hyundai/B&W 5L90GBE diesel engine with a maximum continuous rating of 19,800 bhp at 97 rpm, direct-connected to a five-bladed, highly skewed Ostermann propeller via Kobe Steel shafting. Operating at 85 percent of mcr, service speed on a draft of about 30 feet is 18.4 knots. Cruising range at the service speed is 20,000 nautical miles. The main propulsion engine is designed to burn heavy fuel oil at a rate of 46.5 metric tons per day.

The most unique feature of these

Asymmetric stern developed at Hamburg Ship Model Basin is more expensive to build than a conventional afterbody, but fuel savings repay extra cost rapidly.



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new Hapag-Lloyd ships is the asymmetric afterbody hull form, newly developed by **Ernst A. Nonnecke** of Hamburg in cooperation with the Hamburg Ship Model Basin. Though it looks unconventional below the waterline, the new stern has already proven its advantage in cutting fuel costs by up to 10 percent.

The ships now being built with the asymmetric stern are all destined for German owners. In addition to the Hapag-Lloyd ships, nine vessels are being built in Brazil for three different German owners, all with a capacity of 700 TEU. The first vessel built with this unique afterbody was a 502-TEU containership constructed at the Heinrich Brand Shipyard in Oldenburg, West Germany. An ice class cargoliner is being built at the same shipyard, and several other vessels that will have the asymmetric stern are now being constructed or programmed for German owners.

Though the asymmetric stern is

Another view of the new Hapag-Lloyd ship's asymmetric stern.



Circle 274 on Reader Service Card

slightly more complex and therefore a little more expensive to construct, the extra cost of the ship is recovered rapidly in fuel savings. As international shipowners become increasingly aware of the German development, the asymmetric stern may well become as common as the bulbous bow is today. Development work on the new stern design has taken place

at the Hamburg model basin over the past 10 years, but it is only the recent steep rise in fuel costs that has brought its advantages home to German shipowners.

Electric power for the Hapag-Lloyd ships is provided by Fuji equipment—two 1,500-kw diesel generators, one 2,200-kw generator, and one 115-kw emergency generator. Steam generation is by

an Aalborg oil-fired boiler and an exhaust gas boiler. Two ballast pumps each have a capacity of 600 cubic meters per hour.

Navigation equipment includes two radars, a satellite navigation system, two gyrocompass/autopilots, a magnetic compass, and a weather facsimile unit. The main radio is a 1.5-kw SSB; a VHF radiotelephone is also provided.

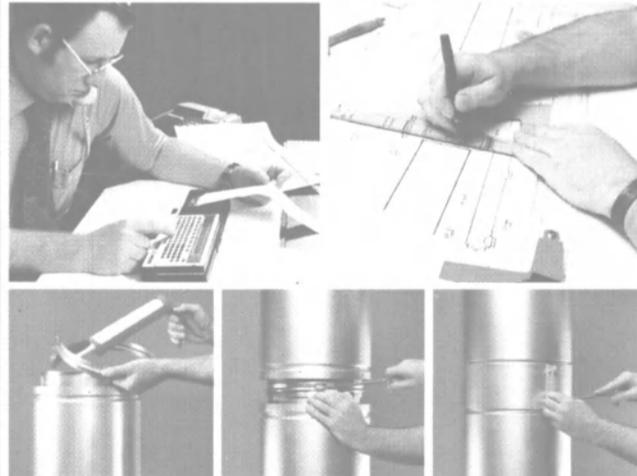


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# DIESEL POWER REVIEW

*During the 1960s and early 70s, the focus of diesel engine design, development, and manufacture was on ever-increasing power outputs per unit in order to satisfy the propulsion needs of the huge tankers and the very highspeed container-ships that were being designed and constructed in abundance during that period.*

*The rapid escalation of fuel costs following the oil crisis of 1973, as well as the trend away from super-large tankers and 23-33 knot speeds for container-ships, shifted that emphasis. All of the major diesel engine manufacturers turned their design and R&D efforts to improving fuel economy and the capability to burn heavy, poorer quality fuel safely and efficiently. Some of the engine designs introduced re-*

*cently have made remarkable progress towards those objectives.*

## FOR MORE INFORMATION

MR/EN asked the diesel manufacturers to provide data on their latest developments in fuel-efficient engines. The following review is based on the replies that we had received at press time.

Product literature and technical reports are available free from the manufacturers included in this review. Just circle the appropriate Reader Service number on the card in the back of this issue.

If you wish to receive information from all the manufacturers and suppliers of diesel engines and systems included in this review,

Circle 40 on Reader Service Card

## ALCO POWER

Circle 10 on Reader Service Card

Alco Power Inc. is currently involved in a project that will add increased fuel efficiency to its model 251 diesel engine, as well as decrease the amount of time required to achieve rated horsepower and speed from engine idle speed. This is accomplished by the application of the model 131 turbocharger on the Alco 16-cylinder, model 251 CE diesel engine. This is now being tested in towboat service on the lower Mississippi and is receiving very favorable results.

Alco is also involved with the development of a new piston design to further increase fuel efficiency over its current valve-pocketed design. Although this is in its

preliminary stages, Alco hopes to have it out in the marketplace shortly.

Other developments on the horizon include continued experimentation with heavy fuels, camshaft design changes, and experimentation with turbocharger application, all of which will add up to increased fuel efficiency.

Alco is now utilizing its new \$2.8-million production test facility at its Auburn, N.Y., manufacturing plant to test current production model 251 engines. The engines are loaded by a microprocessor-controlled, fluid friction dynamometer and engine fluids. The new facility incorporates state-of-the-art instrumentation, allowing most engine parameters to be measured remotely in its control

room. This provides for greater on-site testing efficiency.

## AMERICAN LIGURIAN

Circle 11 on Reader Service Card

American Ligurian Company of Stamford, Conn., represents Baudouin of Marseille, France, and Castoldi Jet of Milan and O.M.T. of Turin, Italy.

Baudouin designs and manufactures 4-cycle, water-cooled, direct injection marine diesel engines with outputs ranging from 75 to 1,200 bhp. These engines are specifically designed for marine applications, with long life, reliable performance, and economical maintenance. All Baudouin engines have been approved by the leading classification societies.

Baudouin also designs and builds: complete oil-lubricated line shafts of 40 to 200 millimeter diameter; water-lubricated line shafts of 40-70 mm; and stern type gland systems. These line shafts, together with the stern tube, couplings, bearings, seals, and the entire technical method of installation provides a fully proven assembly.

Castoldi hydrojet marine propulsion units include five lines, 03-07, applicable to engines with outputs from 5 to 1,400 bhp.

Complete marine units include: The Castoldi/B&S 700/03, air-cooled, 13.2-kw direct-coupled unit; the Castoldi/Fiat 970/04, water-cooled 22.09-kw direct-coupled unit; and five Castoldi/Fiat water-cooled units ranging from 38.3 to 99.3 kw.

O.M.T. offers for the OEM and after-sales markets a line of nozzles, nozzle holders, injection pumps, plungers, and delivery valves that are interchangeable with the ones used by the leading diesel engine builders.

## BERGEN DIESEL

Circle 12 on Reader Service Card

A.S. Bergens Mekaniske Verksteder (Bergen Diesel) of Norway has used heavy fuel in its engines for more than 20 years and has very solid experience in this field. Some 500 engines, both propulsion and generator sets, are in operation on heavy fuel, with the longest running times in excess of 100,000 hours. The company's U.S. subsidiary, Bergen Diesel, Inc., is located in Kenner (New Orleans), La.

This extensive experience, together with in-depth development work to meet the challenges of the poorer quality fuels, has meant that Bergen Diesel today delivers its K engine for unrestricted operation with fuel viscosities up to 700 cSt at 50 C. The K engine is delivered in in-line form with three, five, six, eight, and nine cylinders, and as a V engine with 12, 16, and 18 cylinders. With a speed range of 720 to 900 rpm and mean effective pressures of 16-18 bars, they cover a power output range of 600 to 4,500 bhp. Their main applica-

tions are in generating sets and propulsion engines for ships.

Despite the declining quality, recent experience with heavy oil has shown very good operational results, for example, 10,000 hours between cylinder head overhauls and 20,000 hours for the running gear. Upper cylinder liner wear is less than 0.01 mm per 1,000 hours, and the life of the cylinder liner is about 60,000 hours.

Recently there have been great

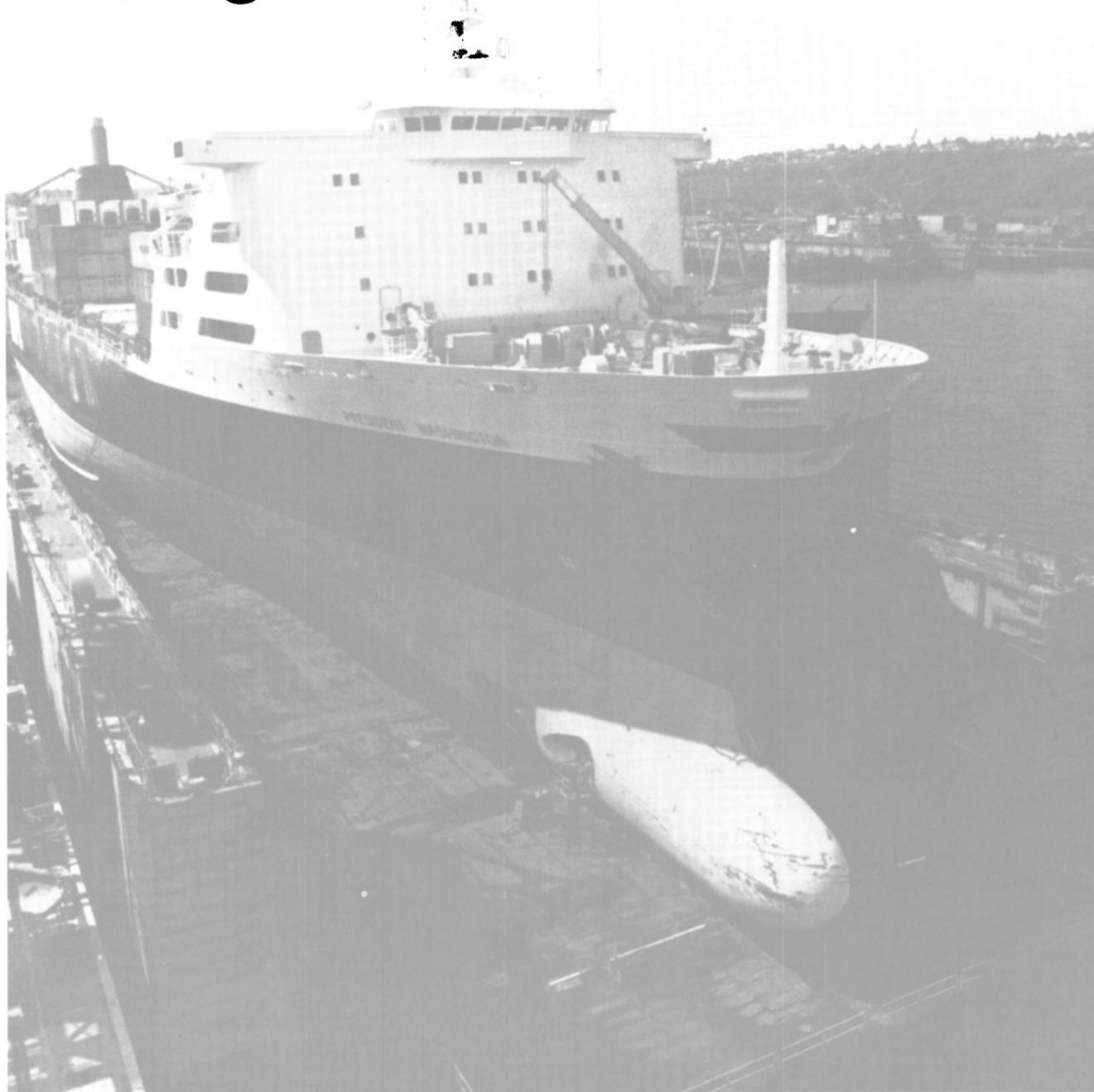
improvements in this area, due mainly to higher injection pressures and reduced nozzle hole size. Both contribute to better atomization and thereby improved combustion, particularly of the heavier hydrocarbons that today's heavy oils contain. The injection period is also reduced, which gives a considerable reduction in fuel consumption. Optimum fuel consumptions are now 142 grams per bhp hour without engine-driven lube

oil and cooling water pumps, and 145 grams per bhp hour with engine-driven pumps.

Special attention has been given to the hydraulic forces arising in the fuel system, which insures a longer life for the nozzles and pump components. The system is designed for and endurance tested at an injection pressure of 1,500 bars, but in normal operation runs at a maximum of about 1,200 bars.

(continued on page 20)

# Todd gives berth to a president



Recently, the 33,000 ton President Washington was drydocked at Todd's Seattle shipyard. It was the largest commercial ship ever drydocked in Puget Sound, but there was still room to spare on the mammoth 873' x 140' dry dock.

This newly installed, 40,000 ton dry dock is just a portion of many facility improvements Todd has implemented in recent months. The company has also upgraded its other shipyards at Los Angeles, San Francisco, Galveston and New Orleans.

Our modern, capable and efficient shipyards provide fast turnaround and around-the-clock service. Whether it be a minor voyage repair, propeller and tailshaft repairs, a major overhaul or an extensive conversion job, we have the

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## Diesel Power Review—Bergen

(continued from page 19)

This insures an essential safety margin if the viscosity control system were to fail.

Brown Boveri turbochargers, type VTR series 1, are in general use for all Bergens K-type engines. The charging system is based on the impulse principle, as this is

considered to be the best, both with respect to the engines' ability to cope with shock loading, and because it gives greater air flow rates at part load than the constant-pressure system. At part load, ample quantities of air are essential to insure complete combustion of heavy oil; the low frictional losses of the turbocharger (ball bearings) also help here.

For the 8- and 16-cylinder engines, pulse converters are em-

ployed. This normally results in widely varying exhaust gas temperatures for the individual cylinders, but this is avoided on K engines with the help of a specially shaped exhaust gas system.

## BMW OF NORTH AMERICA

Circle 13 on Reader Service Card

BMW (Bavarian Motor Works) the German automobile, motorcy-

cle, and engine manufacturer, has set its sights on an expanding share of the future marine market in the U.S. The American marine division, BMW of North America, is located in Montvale, N.J.

BMW's turbocharged sterndrive diesel, designated the D-190-S, is being installed in increasing numbers in many of America's mid-size boats. This rugged, precision-built power plant is a 190-bhp, six-cylinder in-line diesel. Weighing just 1,061 pounds, the compact unit provides responsive power quietly throughout its speed range.

The turbocharger forces extra volumes of air into the cylinders to mix with a larger fuel charge, creating additional power. The combustion process is efficient and the engine runs smoothly. The increased air flow keeps temperatures lower, and the manifold is water-jacketed to keep the temperatures relatively constant, contributing to longer engine life. An exceptionally large air filter helps keep sound levels low.

The D-190-S features BMW's double-circuit cooling system, in which the heat exchanger, oil cooler, and expansion tank are completely integrated as a single entity. This is a further contribution to its low weight and high power-to-weight ratio.

## BOYCE MACHINERY

Circle 43 on Reader Service Card

Jerry T. Boyce, executive vice president of sales and marketing for Boyce Machinery Corporation, has announced the introduction of a new concept in engine service packages for Caterpillar engine owners in South Louisiana. The new packages will be marketed as Diesel Engine Maintenance and Repair Options. The Boyce program is a systematic approach to reduce costs and increase engine life through proper preventive maintenance.

Options range from a diesel tune-up to a complete engine overhaul, or Boyce-Built (remanufactured, rebuilt, or exchange) engine. Boyce starts with a repair determination inspection and recommends an option that is best matched to the condition of the engine. The company currently has programs available for the Cat D399, D398, D379, D353, 3306, and 3208 model engines, and is working on plans for the 3304, 3406, 3408, and 3412 models.

All options carry the full Boyce warranty, guaranteed prices, and guaranteed turnaround time. Well-defined options reduce costs, save time, avoid over-repair, and enable engine owners to schedule work.

Boyce Machinery is South Louisiana's Caterpillar and Pettibone dealer, with branches in New Orleans, Baton Rouge, Lafayette, Morgan City, Lake Charles, and Reserve.

# The Tri-Feature "DL Series"— New Technology from Daihatsu.

In response to modern demands for fuel conservation, Daihatsu has developed the DL Series Tri-Feature Diesel Engine. The DL Series is designed for improved combustion efficiency at low load, easier start-up and higher durability, with future fuel trends also taken into consideration. All these characteristic improvements are test verified.



DL Series, Extra Economy with:

Low-quality fuel burning  
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## CATERPILLAR

Circle 14 on Reader Service Card

Caterpillar Engine Division offers five series—3200, 3300, 3400, 300, and 3500—of diesel engines in 12 basic models applied specifically in marine propulsion and auxiliary power applications. The 3200 series offer ratings from 150 to 315 bhp at 2,400 and 2,800 rpm, respectively. The 3300 series offer ratings from 85 to 290 bhp at 2,000 and 2,200 rpm. The 3400 series offer ratings from 250 to 764 bhp at 1,800 and 2,100 rpm. The 300 series offer ratings from 500 to 1,380 bhp at 1,225 and 1,300 rpm. The 3500 series offer ratings from 600 to 1,700 bhp at 1,200 and 1,800 rpm.

When Caterpillar goes into production of its medium-speed 3600 series in 1985, the company will offer four additional models with a continuous output range from 1,700 bhp at 700 rpm to 6,000 bhp at 1,000 rpm.

Time-proven Cat diesel power provides optimum marine propulsion reliability, efficiency, and economy due to such features as direct injection, adjustment-free fuel systems, and matched turbocharging and aftercooling to pack more air into cylinders for complete combustion and extra power.

Available for all of the main propulsion engines is a complete line of factory-matched marine transmissions to assure operational efficiency. Coordinated design compatibility allows common scheduling of major overhauls, reducing repair time and expense.

In addition, Caterpillar offers 11 models of marine generator sets with power outputs and voltages for every vessel's service requirements. Prime power ratings are offered from 85 kw for the 3304B at 1,800 rpm to 1,135 kw at 1,800 rpm for the 3516 (60Hz); 50-Hz ratings are also available from 50 to 1,025 kw. A full range of attachments such as power takeoffs, remote-mounted controls, premium instrument panels, and spare parts kits are also available to meet specific user requirements.

Cat marine systems are backed by a worldwide product support system, linked by the industry's most extensive computer and telecommunications network for rapid location of any part required. More than 14,000 trained dealer servicemen are backed by 24 strategically located Cat parts facilities. Around-the-clock dockside service is available in many ports from technicians and application and installation specialists that use the latest service tools and information.

## COLT INDUSTRIES

Circle 15 on Reader Service Card

Major renovations and manufacturing additions are under way at Colt Industries, Fairbanks Morse

Engine Division, in Beloit, Wis. These are in preparation to build the Colt-Pielstick PC4.2V diesel engine for the U.S. Navy's new Henry J. Kaiser (T-A0-187) Class tanker under construction at Avondale Shipyards. Included in these new projects are the installation of a 46,900-bhp water brake test stand, a 250-ton bridge crane, and several new machining centers.

Two 10-cylinder PC4.2V diesel engines rated at 16,500 bhp are

currently being built for the Navy's T-AO Tanker Program. The PC4.2V is rated from 16,270 to 29,286 bhp, and is capable of burning residual fuels of up to 4,000 sec Redwood 1 at 100 F with a vanadium content of 400 ppm.

Fairbanks Morse continues to produce the Colt-Pielstick PC2.3V, PC2.5V, and PC2.6L in-line and V-form diesel engines, with ratings from 6,420 to 13,266 bhp at 520 rpm. All of these engines are

capable of burning heavier grades of residual fuels.

The Colt-Pielstick marine engine is readily adaptable to remote control operation and automatic monitoring. Systems have been designed to meet U.S. Coast Guard and American Bureau of Shipping requirements for an unmanned engine room watch. The well-known Fairbanks Morse opposed-piston design is still widely used (continued on page 22)

# INDUSTRY NEWS

Marine chemists create new, dual-function fuel additive.

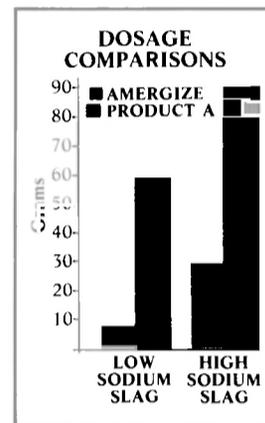
## "INCREASES FUEL EFFICIENCY, DECREASES OPERATING COSTS."

AMERGIZE<sup>®</sup>  
deposit modifier/  
combustion improver

Here's news that will save substantial money for shipowners—savings on fuel, down time and maintenance. You already know that the quality of today's marine fuels, with higher levels of contaminants, not only create operating inefficiencies, but can cause considerable damage to engine parts and leave harmful combustion deposits. To help solve your fuel problems, Drew Ameroid Marine has taken the industry lead once again with AMERGIZE<sup>®</sup> deposit modifier/combustion improver. AMERGIZE is being introduced as part of a 3-way combination program: a product... a service... and cost-saving offer designed to assure proper application. Available individually, or as a total system worldwide:

### 1. THE PRODUCT: A deposit modifier and combustion improver in one.

AMERGIZE is a new, specially formulated, concentrated blend of organometallic compounds that combines both combustion improvement and deposit modification in one product. It improves diesel engine combustion. It reduces smoking. It decreases valve and turbocharger deposits. AMERGIZE is effective in diesel engines burning today's heavy fuels. AMERGIZE is non-abrasive and does not harm engine parts or close-tolerance, metering equipment.



Graph shows quantities of AMERGIZE deposit modifier combustion improver and of a leading competitive product required to maintain low and high sodium-vanadium slag in a dry state to a temperature of 1180 C. In low sodium slag, 12X more competitive product was required, and in high sodium slag, >X more competitive product was required, for desired results.

### 2. THE SERVICE: Dosage treatment analysis and PACE<sup>®</sup> fuel evaluation.

Today's refiners obtain a higher yield from every barrel of crude they process. Unfortunately, that leaves you with higher concentrations of contaminants—the worst of these are unknown quantities of vanadium, sodium and sulfur. Drew representatives will assist ship managers in determining specific AMERGIZE treatment rates for bunker fuels high in these harmful contaminants. In addition, Drew Ameroid Marine offers the PACE<sup>®</sup> program. It provides you with data on the levels of contaminants in your present bunker fuel prior to dosing, and the best course of action to take in handling the fuel with maximum efficiency and minimum cost. Besides being one of the industry's most comprehensive fuel evaluation services, PACE is also the fastest and most economical.

### 3. THE OFFER: AMERGIZE rebate.

The AMERGIZE rebate offer is one more way of demonstrating the commitment of Drew Ameroid Marine to helping ships' managers realize maximum cost efficiency. The rebate on the value of half the price of a dosing unit is available after one year of using AMERGIZE. Our purpose? To *prove* it's a substantial money-saver with proper application.

Documented independent laboratory tests\* have shown that AMERGIZE significantly reduces specific fuel consumption, carbon deposits, exhaust smoke levels, and deposits formed in a test bed engine operated on a residual oil blend containing high levels of carbon residue, vanadium, sodium, and sulfur.

AMERGIZE comes in 120 liter and 200 liter containers, and is available through Drew's network of service representatives in strategically located ports worldwide.

For further information on AMERGIZE<sup>®</sup> deposit modifier/combustion improver, the PACE analysis and the special dosing system offer, contact the nearest Drew Ameroid Marine Sales Office, or...





### SPECIAL LIMITED TIME OFFER

Drew offers a rebate of one-half the cost of a Simplex dosing system, worth over \$1,000, to customers after one year of using AMERGIZE<sup>®</sup> deposit modifier/combustion improver.

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\*Report available upon request.

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## Diesel Power Review—Colt

(continued from page 21)

in marine applications. Four each of the Colt-Pielstick PC2.5V, and the Fairbanks Morse opposed-piston engines, provide propulsion power and electric power, respectively, for the Navy's ongoing LSD program.

Fairbanks Morse 38D8-1/8 series opposed-piston diesels are available in configurations from four through 12 cylinders in both blower-scavenged and turbo-charged versions, with power ranges from 708 to 3,500 bhp at 750 rpm, and 920 to 4,200 bhp at 900 rpm. This two-cycle, opposed-piston configuration provides an impressive power-to-weight ratio with minimum space requirements. This engine has been used in marine propulsion and power generation applications since the mid-1930s. These engines have always had high fuel efficiency, but today's sophisticated electronic control and monitoring systems are squeezing even better fuel economy from them. In addition to applications such as the LSD Program, this engine provides power for secondary propulsion systems and emergency power for submarines.

In a move to strengthen its entire parts and service organization and to coordinate all field service activities for Fairbanks Morse and Colt-Pielstick engines, the company is undertaking a major restructuring designed to improve all aspects of customer services worldwide. As part of this restructuring, present parts and service facilities are being upgraded and modernized, and new centers are being added. In Beloit, a new training center has been completed to provide hands-on engine service training for Fairbanks Morse and customer personnel.

Typical of the modernization that is taking place in all the service centers is the recently completed move in Norfolk, Va. In its new location, this center now has the capability to handle complete engine rebuilding. A new regional distribution warehouse in Reno, Nev., has been established as the Western Service Region headquarters. This warehouse is designed to complement the existing service shop in Seattle and sales office in San Francisco with improved inventory control and distribution. In addition, a new and modern fuel injection overhaul facility has been located at Reno to provide complete fuel injection service. All of the centers are computer-integrated with the central warehouse in Beloit to quickly process requirements for special and made-to-order parts.

## CUMMINS

Circle 16 on Reader Service Card

Cummins Engine Company of Columbus, Ind., manufactures six

series of marine propulsion engines. Designed for heavy-duty workboat and fishing vessel applications, the Cummins engines are rated at 170 to 1,250 bhp for continuous 24-hour propulsion service. Several reverse and reduction gears are available for each model.

The compact V series engines are V8 configuration with "oversquare" cylinders in which the bore diameter is larger than the stroke. Combining high horsepower, compact size, and light weight, the V-504-M is a naturally aspirated engine rated 170 continuous bhp at 2,800 rpm. The 555 series are naturally aspirated when rated for continuous duty at 185 bhp at 2,800 rpm.

The V/VT/VTA-903 series marine diesels have the oversquare cylinder design and range in horsepower from 255 to 320, continuous duty. The V903-M is naturally aspirated and rated 255 bhp, the VT-903-M is turbocharged rated at 285 bhp, and the VTA-903-M is both turbocharged and aftercooled rated at 320 bhp. All are rated for continuous operation at 2,300 rpm.

The N/NT/NTA-855-M series engines is Cummins's most proven diesel. They are 6-cylinder, in-line engines and operate at 1,800 rpm. The N-855-M is naturally aspirated and rated for continuous duty at 195 bhp; the NT-855-M is turbocharged and rated 270 or 240 bhp; the NTA-855-M is both turbocharged and aftercooled and rated at 350 bhp.

The KT/KTA series engines are in-line 6-cylinder models. The KT-1150-M is a turbocharged model rated 365 or 400 bhp at 1,800 rpm, and the KTA-1150-M is turbocharged and aftercooled and rated 500 bhp at 1,800 rpm.

The VT/VTA-1710 series are 12-cylinder, V-configuration diesels. The VT-1710-M is turbocharged, rated 490 bhp at 1,800 rpm; the VTA-1710-M is turbocharged and aftercooled, with continuous ratings of 545 or 620 bhp at 1,800 rpm.

Introduced into the fishing vessel and workboat markets in 1974 and 1980, respectively, the KT/KTA-2300-M and KTA-3067-M series complete the Cummins product line with the high horsepower, reliability, durability, and fuel economy required for such engine applications. The 2300 series are 12-cylinder, V-configuration design with ratings of 800 bhp at 1,800 rpm for the KT, and 940 bhp at 1,800 rpm for the turbocharged and aftercooled KTA. The turbocharged and aftercooled KTA-3067-M is a 16-cylinder model rated 1,250 bhp at 1,800 rpm.

## DAIHATSU

Circle 17 on Reader Service Card

With its extensive experience in the marine field, Daihatsu Diesel Manufacturing Co. Ltd. of Osaka,

Japan, represented in North America by Daihatsu Diesel (U.S.A.) Inc., has developed a new type of engine, the DL series, which features low quality fuel burning, low load operability, and low fuel consumption.

These DL series engines—DL-20, DL-26, DL-28, and DL-32—are a medium-speed type (600–1,000 rpm) with outputs covering the range from 750 to 3,000 bhp. They

are suitable for both main propulsion and auxiliary generating applications.

Severe tests and experiments under various conditions on all parts of these engines were carried out at the Daihatsu laboratory and factory before they were placed on the market. The company's traditional design concepts—simple and sturdy construction, easy maintenance, and lower maintenance

costs—are fully incorporated in the DL series engines.

Since the DL series was placed on the market, Daihatsu reports an increasing number of orders from many overseas shipowners.

## DETROIT DIESEL

Circle 73 on Reader Service Card

The Detroit Diesel Allison division (continued on page 24)

# The perfect package from the perfect team!

# REINTJES

## MARINE GEARS

# BERG

## propulsion

Karl Semer, Inc., for so many years exclusive U.S. distributor of world-famous Reintjes Marine Gear, is now also exclusive U.S. distributor for the world-famous Berg Propulsion Systems. And there couldn't be a happier pairing, because specs for a Berg Controllable Pitch Propeller almost always call for Reintjes gears. Berg CP Propellers can be adapted to most Reintjes gears in the range of 250 to 1,250 bhp.

The Berg CP wheel system can be linked to a single-input/single-output gear or, as is more often the case, to twin-input/single-output reduction gears as shown here.



## Karl Semer, Inc.

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Mailing address: P.O. Box 10055  
New Orleans, LA 70181 (504) 469-4000

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Mr. Olof J. Wadehn, Olof Wadehn Enterprises, Inc., 30 Sheppard Lane  
Huntington, New York 11743 (516) 692-4548

## Diesel Power Review—Detroit Diesel

(continued from page 23)

sion of General Motors offers advanced fuel economy models of its 149 Series diesel engines. The turbocharged and intercooled engines are said to be the most fuel-efficient heavy-duty diesels available in their power range.

The Detroit 149 engines in 12- and 16-cylinder, V configurations are expected to show fuel economy improvements of about 3.5 percent over previous engines at the same horsepower ratings. The 12-cylinder models are available up to 894 bhp, and the 16-cylinder versions up to 1,212 bhp. The fuel economy improvements are the result of a number of engineering developments, including new turbochargers,

unit fuel injectors, and a new airflow system.

With the new system, the power required to drive the Roots type blowers used in Detroit two-stroke cycle engines is reduced significantly as the engine reaches operating speeds. As that happens, the increased airflow from the turbochargers takes over the function of providing the intake air needed to maintain combustion and scaveng-

ing in the cylinders. A special valve takes the load off the blower by equalizing the pressure on both sides of the rotors, reducing blower horsepower. The new turbochargers and unit fuel injectors have been carefully tailored to match the needs of the new system for optimum fuel efficiency.

Detroit Diesel 149 Series engines have been popular with the commercial fishing industry for many years.

## ELECTRO-MOTIVE

Circle 19 on Reader Service Card

Rating increases of 10 percent, resulting from technological improvements, have been announced by the Electro-Motive Division of General Motors. The leading supplier of diesel engines to the domestic marine market says the 645FB engine provides a five percent improvement in fuel efficiency over its 645EB series of engines.

"EMD engines have been a favorite of the marine industry since they were first introduced in 1937. Their high reliability, ease of maintenance, and the continuing improvements in fuel efficiency have made them the standard of the industry," said G.C. Mulick, EMD manager power products.

The product advances incorporated into the 645 series enables EMD to offer ratings for propulsion engines ranging from 1,050 bhp at 900 rpm for the Roots blower engine model 8-645E6 to 4,000 bhp at 900 rpm for the turbocharged model 20-645F7B engine.

In the EMD marine generator sets, power output ranges from 570 kw, 50 Hz at 750 rpm in the Roots blower engine model 8-645E6 to 2,865 kw, 60 Hz at 900 rpm for the turbocharged 20-645F7B engine.

Electro-Motive is currently in the midst of a 10-year, \$1.3-billion product and facilities improvement program. This program has seen the completion of EMD's blended fuels facility; it will see the addition of 63 computer-controlled machines to accompany the more than 150 already in place. The planned investment also includes the addition of robotics for such applications as material handling, arc welding, and deburring.

## GARDNER

Circle 20 on Reader Service Card

British diesel engine manufacturer L. Gardner and Sons Ltd., represented in the U.S. by Waller Marine of Houston, is now concentrating on the North American marine market with the company's line of naturally aspirated and turbocharged diesels that have a

(continued on page 26)

## Johnson DURAMAX Sleeve and Flanged Bearings

- Molded Rubber — Securely Bonded to Naval Brass Shell.
- They Meet Military Specification MIL-B-17901A (Ships) Class II Full-Molded Type.
- Easy to Install — Easy to Replace
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- Full Range Of Sizes From 3/4 Through 6 Inches In Sleeve Bearings — And From 2 Inches Through 15 Inches In Flanged Bearings.

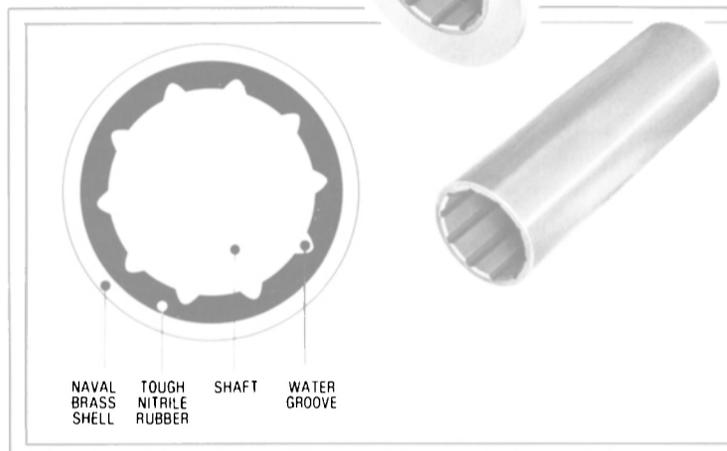
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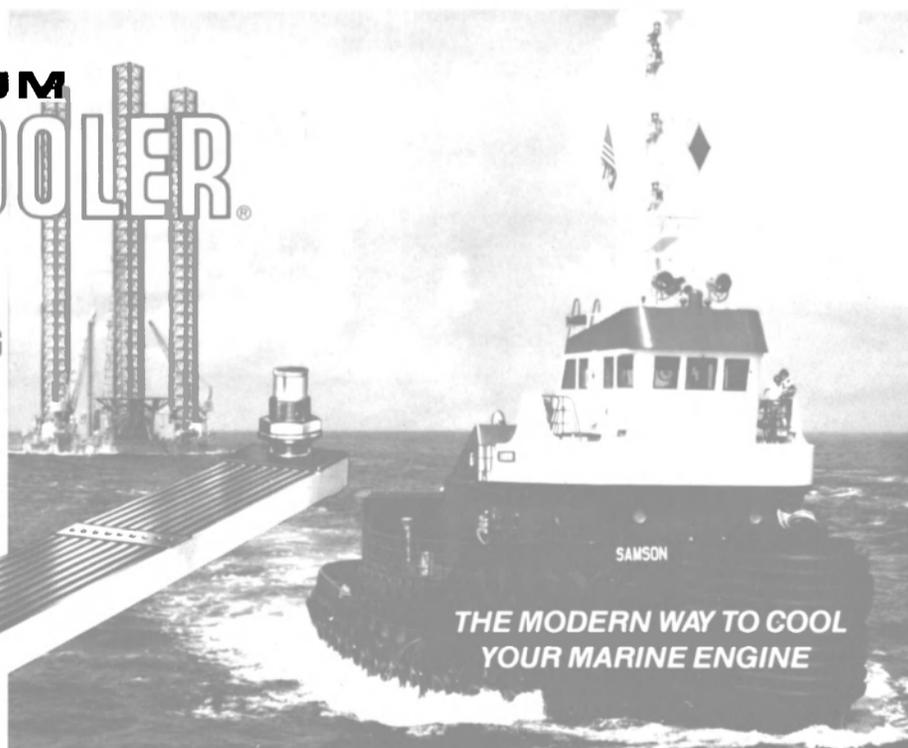
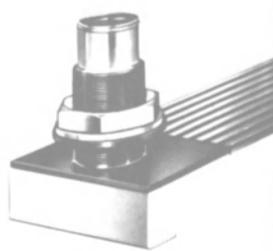


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Circle 115 on Reader Service Card

## Diesel Power Review—Gardner

(continued from page 24)

worldwide reputation for fuel economy, reliability, and durability.

The Gardner engine line ranges from the 6LMB, a naturally aspirated model producing 127 bhp, to the 8LXCT, an in-line, turbo-charged 8-cylinder engine with

output of 200 bhp. The four engine models in this power range are lightweight with aluminum alloy crankcases, with flywheel housing to suit a Twin Disc 509 reduction gear. Specific fuel consumption is in the order of 0.326 pounds per bhp hour.

Gardner also maintains production of the naturally aspirated 8L3B marine diesel, a heavy-duty 8-cylinder engine producing 250 bhp at 1,250 rpm. This engine is of

robust design, highly suited for the fish trawling industry.

## GENERAL ELECTRIC

Circle 21 on Reader Service Card

GE's fuel-efficient, four-stroke 7FDM marine diesel engines now offer ratings from 1,525 to 4,000 bhp. The 8-cylinder model is rated 1,525 bhp at 900 rpm and 1,800

bhp at 1,050 rpm. The 7FDM 12-cylinder engines are rated at 2,550 bhp and 3,000 bhp at 900 and 1,050 rpm, respectively, while 16-cylinder engines carry ratings of 3,400 bhp at 900 rpm and 4,000 bhp at 1,050 rpm.

To help reduce fuel costs, GE's Blended Fuel Testing Program is presently burning a blend of 50 percent #6 fuel with 50 percent #2 fuel in its new Engine Endurance Laboratory in Erie, Pa. It is expected that testing of this 50/50 blend on board an operating vessel will begin later this year.

General Electric's recently introduced three-ring piston design significantly reduced lube oil consumption during field tests. This GE design, using two compression rings and one oil control ring, also reduces ring wear for longer life between overhauls.

The development of GE turbochargers that operate more effectively in marine service has greatly improved acceleration characteristics and can further improve fuel efficiency. The projected life of connection rod bearings and their crankshaft journals has been increased with the development of a grooveless upper rod bearing half, while welded-in, stainless steel 30-degree valve seats improve cylinder head life.

GE's 7FDM marine diesel engines are supported by an extensive parts and service network that engine users can access simply by calling the GE Actionline number—(800) 325-9668. The GE "48 Hours or Free" policy promises that parts needed for all emergency repairs will be delivered to the customer's shoreside location within 48 hours or there will be no charge for the parts or their transportation.

## GEORGE ENGINE

Circle 44 on Reader Service Card

George Engine is offering a six-page full-color brochure describing its range of services for diesel engines including custom power packages for marine and offshore applications. The company has been known as an innovator in the power application industry since 1945 providing its broad range of services from locations in Harvey, Baton Rouge, Lafayette, and Morgan City, La.

As much as an 11.5-percent reduction in fuel consumption can be realized by George Engine Company's "bypass operation"—the upgrading of a Detroit Diesel 149 series engine from its normally aspirated (NA) configuration to a turbocharged, intercooled, blower-bypass (TIB) configuration using the latest high-tech components from Detroit Diesel. Fuel savings provide a rapid payback of the cost of conversion.

The blower-bypass is a simple butterfly valve arrangement that automatically diverts the incoming combustion air around the

◀ Circle 269 on Reader Service Card

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Roots blower when turbocharger boost has reached a sufficient level. With the Roots blower bypassed, it no longer imposes an accessory load on the engine; the horsepower that was previously required is now available at the flywheel to do useful work.

With a smaller fuel injector, the TIB configuration produces the same horsepower at the same rpm as the NA arrangement, but does it with significantly less fuel. Alternatively, the owner may elect to use larger injectors to achieve greater horsepower output, but still at a competitively low specific fuel consumption figure.

## GMT

Circle 22 on Reader Service Card

As a result of more and more interest in the 4-stroke diesel engines, Grandi Motori Trieste (GMT) of Italy is now allocating more of its resources to the development of its already well established range of high- and medium-speed 4-stroke engines for marine, industrial, and other applications. GMT is represented in the U.S. by GMT of America Corporation, Morristown, N.J.

The benefits of this policy are now showing in the newly introduced range of 4-stroke engines, some already in service and others about to be introduced. These offer the steadily gained advantages of higher specific outputs and lower specific fuel consumption with reduced dimensions and weight.

The extent and pace of development of GMT 4-stroke engines is indicated by the following programs:

In March this year the first long-stroke version of the 550 Series of engines (550-mm bore, 630-mm stroke) began a series of intensive tests from which is expected an output of 1,600 bhp per cylinder at 450 rpm, and a fuel consumption of 124 grams per bhp hour.

In September 1984 the first A 420 H (420-mm bore, 480-mm stroke) 12-cylinder engine, developing 800 bhp per cylinder at 600 rpm, will start a series of tests expected to produce a fuel consumption of 136 grams per bhp hour.

In December 1984 running will commence on the 6-cylinder 320 engine (320x360 mm), the latest generation of the well-proven 300 Series of Fiat/GMT engines, of which many hundreds of units are in service for marine and industrial applications worldwide. The latest engine has been designed for an output of 500 bhp per cylinder at 750 rpm with a sfc of 132 grams per bhp hour, while a naval version of the same engine will run at the higher speed of 900 rpm.

In mid-1986 a further development of the 420 Series will follow, with an output of 890 bhp per cylinder at 600 rpm, and an expected fuel consumption of 128 g/bhph.

Circle 227 on Reader Service Card ►

All GMT medium-speed engines are designed to operate on heavy residual fuel up to 6,000 sec Redwood 1/100 F at very high efficiency through appropriate design of the combustion chamber, fuel pumps, intake and exhaust system, and the adoption of high-efficiency turbochargers. Dual-fuel versions are available for operation on natural gas, with ignition by means of five percent pilot fuel.

All GMT medium-speed engines

are suitable for application in total energy plants for effective fuel energy utilization up to a total efficiency of 90 percent by virtue of improved design of liner and cylinder head cooling.

In addition to the medium-speed engines mentioned above, GMT supplies the well-proven diesels of its 230 Series, which cover the power range from 1,088 to 7,600 bhp, with rated service speed from 900 to 1,200 rpm.

## HANSHIN

Circle 23 on Reader Service Card

Hanshin Diesel Works, Ltd. of Japan has developed its EL Series fuel-saving diesel, a low-speed four-stroke engine that has a proven record since 1979. Hanshin is represented in the U.S. by Matsui Corporation of Los Angeles.

Fuel consumption for the EL Series (continued on page 30)



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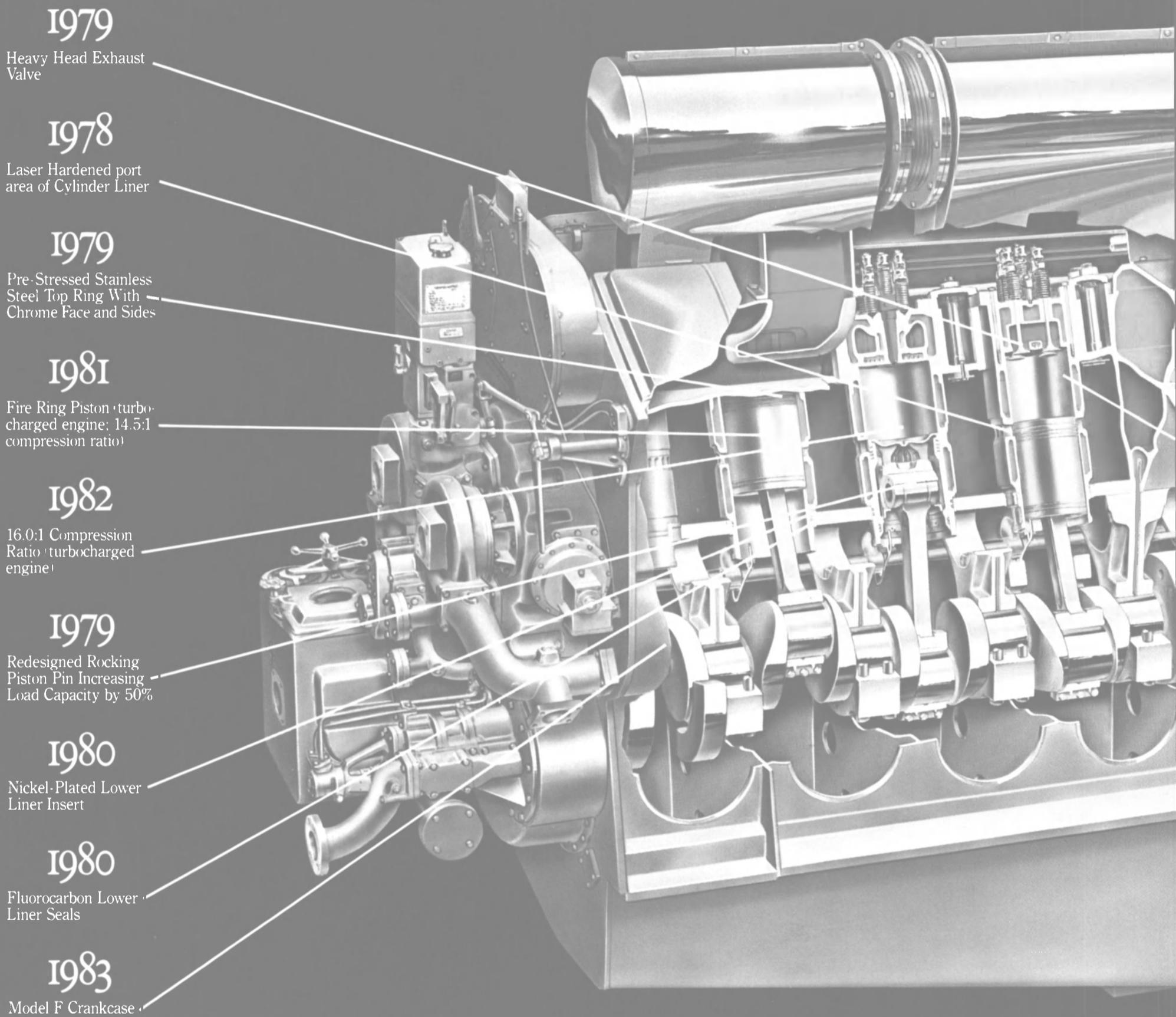
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# The most fuel-efficient Diesel engine

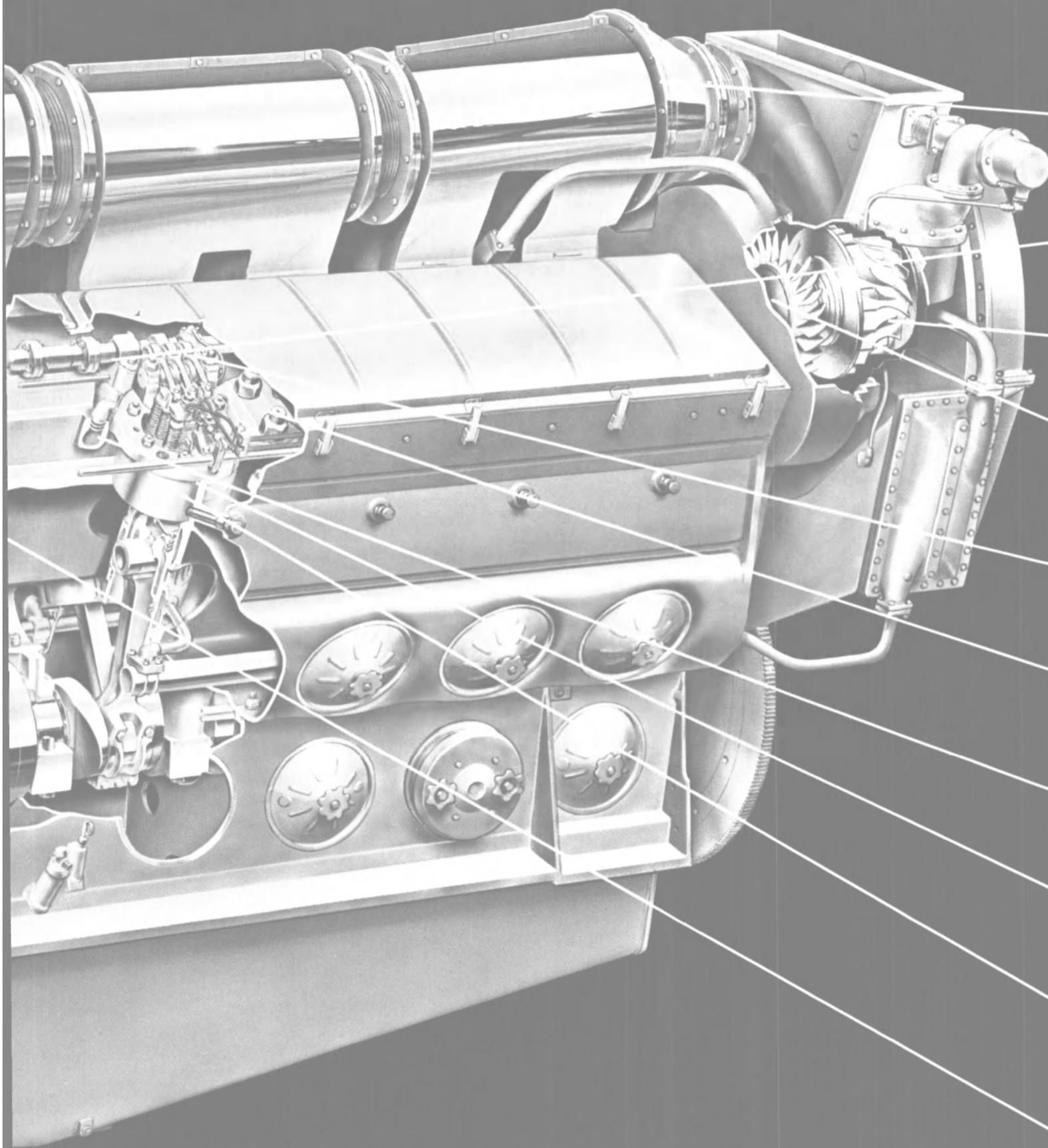
The newest 645 marine Diesel from General Motors' Electro-Motive Division did not appear overnight. Emphatically not.

It was developed after years

of painstaking research and innovative technological improvements because of our absolute determination, in the face of spiraling fuel costs, to reduce fuel consumption in

our Diesel engines.

And now it's here. An engine that is some 2.5% more fuel efficient than our 645 EB. Which was 1.5% more fuel efficient than our 645 EA. Which



1981

Reduced (thermal) Gradient Turbocharger Exhaust Screen

1979

SAE 1080 Camshaft

1982

EC Turbocharger (improved compressor impeller and diffuser)

1978

Increased Capacity Turbocharger Gear Train

1979

Crowned Follower Roller

1980

Plate Crab Power Assembly Retention System

1980

Fluorocarbon Water Outlet Elbow Seals

1979

Aluminum Bronze Head Seat Ring

1979

5/16-Inch Fire Deck Thickness Cylinder Head

1981

Laser Hardened Upper Bore of Cylinder Liner

## in EMD history wasn't built in a day.

was 2.8% more fuel efficient than its predecessor.

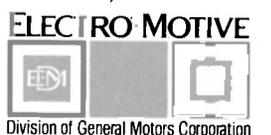
In short, without sacrificing the dependability, reliability, ease of maintenance and parts interchange-

ability expected of EMD, we've put features into our 645 series over the years that have reduced by more than 7% the amount of fuel you put in.

And we're shooting, even now, for

more reductions in fuel consumption.

If you'd like to know more, contact the Electro-Motive Division, La Grange, Illinois 60525.



## Diesel Power Review—Hanshin

(continued from page 27)

ries has been reduced by approximately 11 percent compared with conventional diesels of this class. A long-stroke (700-mm) design permits improved thermal efficiency in the expansion stroke. The fuel injection characteristics have been improved by using a high-pressure injection pump. Improved and well-matched exhaust timing have enhanced supercharging efficiency.

Low-grade fuel may be used; satisfactory combustion can be obtained because of the higher injection pressure. The low engine speed brings about improvements in propeller efficiency of approximately three percent.

The 6EL35 engine has an output of 2,400 bhp at 260 rpm; the 6ELS35 produces 2,600 bhp at 260 rpm. Both models have a bore of 350 mm and stroke of 700 mm. Specific fuel consumption is 138 grams per bhp hour.

## ISOTTA FRASCHINI

Circle 45 on Reader Service Card

Isotta Fraschini S.p.A. is a company of the VM Group, the diesel engine sector of Finmeccanica of Italy. Isotta has been designing and building engines continuously since 1909. It is headquartered in Saronna, about 15 miles from Milan, with a second major facility located in Bari on the Adriatic Sea.

Isotta designs and manufactures a broad range of diesel engines for diverse applications. The ID 32 engine series for marine propulsion has a power output range from 180 to 400 bhp at 2,700–3,000 rpm. The ID 38 series when used for marine propulsion is rated from 180 to 400 bhp at 2,700–2,900 rpm for workboat use, 500 bhp at 3,000 rpm in military applications. The ID 36 engine type is rated 300–1,320 bhp at 1,650–1,800 rpm for workboats, and up to 1,600 bhp at 1,900 rpm for military craft.

The ID 36 diesel engines are

available in V-form models with six, eight, 12, and 16 cylinders; a 10-cylinder version is presently under development. All production engines in this series are available in amagnetic versions. Isotta also manufactures, under license, the Paxman Diesel model PV2000 engine, which has a power range of 1,000–4,500 bhp at 1,600 rpm.

The ID 36 SS6 V-AM amagnetic engine is being supplied to the U.S. Navy for its mine countermeasure ship program. This engine has a continuous power rating of 660 bhp at 1,800 rpm for ambient temperature of 78 F; when derated for 100 F, output is 620 bhp at 1,800 rpm. Parallel operation of two ID 36 SS6 V-AM engines into a common gearbox provides a continuous output power of 1,320 bhp at 78 F ambient.

Cost of ownership/life cycle costs for the ID 36 SS6 V-AM engine is reduced through high reliability and time between overhaul, and low maintainability. Because the engine's magnetic signature is permanent, it never needs to be

removed from the ship for periodic degaussing. ID 36 series engines have demonstrated mean time between overhaul in excess of 14,000 hours per engine on 134 units operating more than 1.9 million hours. The manufacturer reports, through use of Reliability Centered Maintenance, the need for periodic overhauls is non-existent, thus making MTBO in excess of 20,000 hours.

Users of ID 36 type diesel engines for marine applications have included: the Italian, Iraqi, and Thai Navies; hovercrafts in Finland; Italian fishing vessels; passenger ferries in Italy, France, and Thailand; and, when the first MCM ship enters service, the United States Navy.

## JOHNSON & TOWERS

Circle 24 on Reader Service Card

One of the most extensive single-source selections of marine diesel power—15 to 4,000 bhp—for all manner of workboats and com-



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The heart of the Wilden air-operated double diaphragm pump is its unique air valve which shifts the air supply to both diaphragms alternately with complete reliability under all conditions of head and flow.

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Volume is infinitely variable by controlling air flow to pump, from a few gallons per minute to over 14,000 gallons per hour. No pressure relief valve is required and the pump can run dry indefinitely.

Wilden pumps are available with wetted parts in aluminum, cast iron, stainless steel, and Hastelloy C. Non-wetted parts in aluminum or cast iron. Elastomers in Neoprene, Buna N, Norderl, Viton®, and Teflon®.



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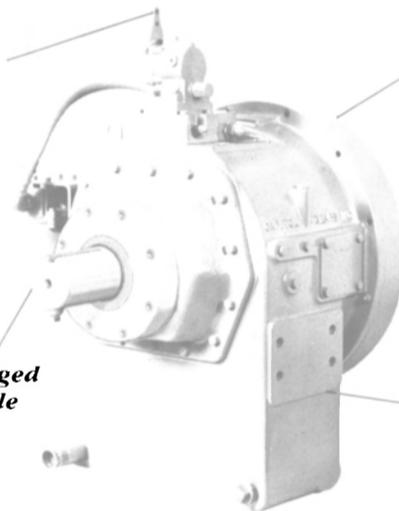
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control cable attaches here

adapters to fit most engines

keyed or flanged shaft available

shallow sump optional where space is tight



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mercial fishing vessels, a wide choice of marine gears to suit most any requirement, and the renowned J & T parts and service backup are available from Johnson & Towers of Mt. Laurel, N.J., marine diesel specialists established in 1926.

This prestigious firm, known for its innovative engineering in marine diesel power, is a distributor of Isuzu diesel engines 15-150 bhp; the full range of Detroit Diesel engines from the 4-53 and 8.2-liter natural up the 1,000-bhp 12V-92TI and 1,600-bhp 16V-149TI, and the full line of Alco diesels up to 4,000 bhp.

J & T was recently appointed a distributor to the high-quality, lightweight, aluminum-cased ZF marine gear from West Germany. In addition, the firm offers Allison, Twin Disc, Capitol, Borg Warner, and Niigata gears.

With facilities in Mount Laurel and Wildwood, N.J., and Baltimore, Cambridge, and Beltsville, Md., J & T stocks new and rebuilt engines and gears, maintains a huge inventory of parts, and has a large staff of factory-trained mechanics noted for prompt expert service at J & T or in the field.

#### KHD-DEUTZ

Circle 25 on Reader Service Card

A research and development project titled The Ship of the Future, sponsored by the Federal German Minister for Research and Technology, is intended to improve the West German shipbuilding industry's chances in the face of international competition. Individual parts of this broad endeavor have been awarded to the shipyard's suppliers.

KHD-Deutz has been selected to carry out an R&D project on the optimization of the combustion process in medium-speed, four-stroke diesel engines. The development goals are: reduce fuel consumption, equip engine to burn cheap heavy fuel oil of ever poorer quality.

The results achieved on the one-cylinder BV1M 540 experimental engine have also been verified by using BV6M 540 and BV8M 540 engines with different turbocharging systems. At one point chosen for comparison at which the BVM 540 engines were producing relatively good operating results, it was possible to reduce specific fuel consumption further on the BV1M by making the following modifications: raising injection pressure by 90 percent; reducing the duration of injection by 30 percent; using optimized injection nozzles; raising firing pressure by 10 percent; and increasing the amount of excess air present during combustion by seven percent.

When certain development steps were applied to the two multi-cylinder engines, most of the results were verified. Thus, the development work done as part of

the Ship of the Future research project comprises an important step towards maintaining the competitiveness of the medium-speed, 4-stroke diesel engine.

#### KRUPP MAK

Circle 26 on Reader Service Card

Fuel consumption in marine engines has been effectively reduced without affecting performance.

Shipowners using Krupp MaK engines can save up to \$160,000 at present world prices in fuel costs annually. Fuel consumption is reduced 10 percent in the most powerful MaK engine, the M 601 with a cylinder output of 1,000 kw (1,341 bhp). This calculation was based on 300 sea or operational days, using the engines at 85 percent of mcr and burning residual oil with a viscosity of at least 380 cSt/50 C or more.

The assessment of the economic viability of a diesel engine for ship propulsion is currently measured by the most important parameter, the specific fuel consumption, followed by reliability and an ability to handle heavy fuel oil. According to this, for a number of years every effort has been made to reduce consumption so as to make the profitability of a ship's propulsion unit independent of other factors (continued on page 32)

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## Diesel Power Review—Krupp MaK

(continued from page 31)

tors, such as propeller and ship design and the layout of auxiliary engines, and to improve the utilization of waste heat as much as possible.

For years Krupp MaK has been involved in these developments. In September 1982 a prototype en-

gine of the M 601 type was unveiled to the maritime industry. For the first time in Europe this eight-cylinder achieved a specific fuel consumption of 126 grams per bhp hour.

This development was made possible by an increase in the turbocharger's efficiency. In this way, considerable reductions in gas exchange loss in a four-stroke engine could be achieved. Furthermore, improvements to injection tech-

niques were being installed, and an increase in the combustion pressure was brought about.

In the course of a few years it has been possible to reduce specific fuel consumption of marine diesel engines by 35 g/bhph. This development has not yet reached the end of the line.

Fuel consumption varies according to piston measurements because of variable losses in the cooling system and friction among the

various parts. Larger engines have a greater mechanical efficiency and lower cooling loss. Overall they are more economical than smaller engines. This fact is equally true for two- and four-stroke engines.

## M.A.N.-B&W

Circle 27 on Reader Service Card

In the fall of 1981, M.A.N.-B&W decided to design and develop a medium-speed diesel engine with a 580-mm bore and 640-mm stroke, with an output of 1,650 bhp per cylinder. The decision was prompted by the following considerations: almost one-half of the main engine horsepower on order in 1981 was for engine outputs between 8,000 and 15,000 bhp; and the high overall economy of a four-stroke, medium-speed propulsion system.

When the go-ahead was given for development, M.A.N.-B&W was sure, and is even more strongly convinced today that, in terms of overall economy, its new L58/64 engine will outperform other four-stroke and two-stroke diesels with a similar large bore and comparable cylinder output.

The new four-stroke, heavy-fuel L58/64 engine will be produced as in-line units with six, seven, eight, and nine cylinders, providing a power range (mcr) from 9,900 to 14,850 bhp.

The L58/64 is a logical upgrading of M.A.N. medium-speed engines that have rendered excellent service in operation on heavy fuel for almost 20 years. This early understanding of heavy fuel burning characteristics was further extended by the 40/45 engine type, which in the 1970s introduced a modern concept with high firing pressure, the basis for low fuel consumption.

During the development of the L58/64 engine, particular emphasis was placed on the following: low fuel consumption; high reliability in unrestricted operation; simple and easy maintenance; and adaptability to varying operating and environmental conditions as well as fuel ignition qualities.

During the test-bed operation of the 3-cylinder 3L58/64 experimental engine, the low fuel consumption rate of 125 grams per bhp hour measured after the first 100 hours of operation is particularly noteworthy, as at that time combustion had not been fully optimized. It should be borne in mind that the mechanical efficiency of a 3-cylinder engine is comparatively low. The turbocharger, which is smaller than that of production engines, negatively influences the fuel consumption rate as well. Considering these factors, the low fuel consumption rates aimed at for production 58/64 engines operating at different loads, including 123 grams per bhp hour at 85 percent of the fuel optimized (ecr) rating, should be reached and probably even lowered. M.A.N. estimates

◀ Circle 277 on Reader Service Card

# The name for reliability

# SULZER

A name that thrives on experience, on attention to those details that add up to a diesel engine of supreme overall economy.

On a consistent philosophy that combines experience of successful design with the needs of the future—meaning more economy without cutting reliability. On a service organization that responds with great speed and efficiency. On engines like the RLB, itself a byword for reliability. On our medium-speed Z/ZA 40 and AS/AT 25 engines that are operating reliably on heavy fuel oil like their low-speed brothers.

And the epoch-making RTA Superlongstroke, too, will be as reliable as Sulzer addition demands. With any Sulzer diesel engine—in the past, present and the future—you can be sure it is a result of a research and development programme finely tuned to market requirements. Indeed, our name depends on it.

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so I should like to know more about

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Diesel Engine Division  
Telephone 052 81 11 22, Telex 896165

MR

that the sfc of the 9-cylinder 9L58/64 engine will be 121 g/bhph.

The 3-cylinder test engine was operated from the very beginning on fuel with a viscosity of 7,000 sec Redwood 1/100 F.

In addition to high operating efficiency, the 58/64 engines will provide excellent waste heat recovery opportunities. Exhaust gas temperature downstream of the turbocharger will be 660 F over a broad operating range. In a number of applications, this means that the at-sea electrical load can be produced by the waste heat recovery system instead of an auxiliary generator, resulting in additional fuel savings.

For a free 8-page color brochure on the new L58/64 engine series, circle the Reader Service Card number listed above.

### M.A.N.-B&W HOLEBY

Circle 28 on Reader Service Card

M.A.N.-B&W Holeby in Denmark manufactures heavy fuel oil marine generator sets with outputs from 500 to 4,000 kw per unit at 720-750 rpm. As a member of the M.A.N.-B&W group of companies, Holeby's gensets are based upon 80 years of experience in diesel engine design, 70 years of experience in marine genset design, and 45 years of experience in genset operation on heavy fuel oil.

Holeby has extensive experience and continuing research and development in the diesel field. It manufactures four-stroke engines with power outputs from 450 to 5,500 bhp.

In addition to diesel engines, Holeby production includes spare parts and components such as crankshafts and connecting rods for the manufacture of M.A.N.-B&W diesels by licensees. It also manufactures fuel oil mixing units and other auxiliary equipment.

As a result of recent development projects, all types of Holeby engines can now be supplied in uprated four-valve versions that operate efficiently on the same heavy fuel oil used in the main propulsion engines. Holeby has termed this its Uni-Fuel Concept, which features simplified fuel oil system, simplified and cheaper bunkering, and the ability to operate on fuels up to 7,000 sec Redwood 1 at 100 F.

### MIRPLEES BLACKSTONE

Circle 29 on Reader Service Card

Mirrlees Blackstone, the British diesel engine manufacturer that is a wholly owned subsidiary of the Hawker Siddeley Group, has just entered the U.S. market with the construction of a spare parts, service, and sales facility in Houston. The facility will be fully stocked with a spares inventory to serve the ever-growing marine and industrial Mirrlees applications in the U.S.

The Mirrlees range of diesels are manufactured in two plants in

the U.K.—at Stockton, where in 1897 Mirrlees built the first British diesel engine (only the third in the world); and at Stamford, where the original Blackstone Company was established in 1837.

The range of advanced-technology engines produced in these factories covers horsepower from 180 to 11,680 bhp. The E and ESL MK2 series cover bhp outputs from 180 to 2,500 at crankshaft speeds up to 1,000 rpm. The turbocharged

and intercooled ESL MK2 can burn residual fuels up to 1,500 sec Redwood 1. The MB 190 model is a high-reliability engine built in 6- to 16-cylinder form, with power outputs of 850 to 2,864 bhp at 1,500 rpm.

The medium-horsepower range offered by Mirrlees is covered by the MB 275, a heavy-fuel diesel built in 6- to 16-cylinder configuration with power outputs of 1,600 to 6,166 bhp at speeds up to 1,000

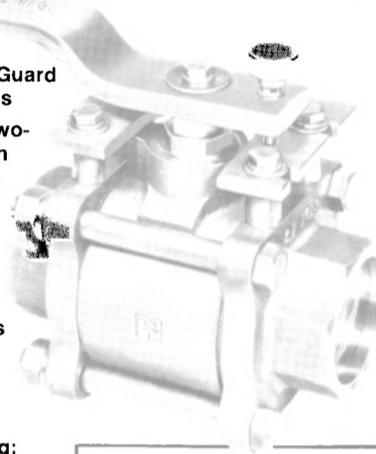
rpm. This engine was designed for low specific fuel consumption with heavy fuel burning capability.

The medium-speed Mirrlees K Major MK2 and MK3 cover the top horsepower range, with the MK 2 of 381-mm bore producing up to 9,600 bhp, and the MK3 of 400-mm bore producing up to 11,680 bhp. Both models, offered in a range from six to 16 cylinders, are designed to burn heavy fuel at speeds up to 600 rpm.

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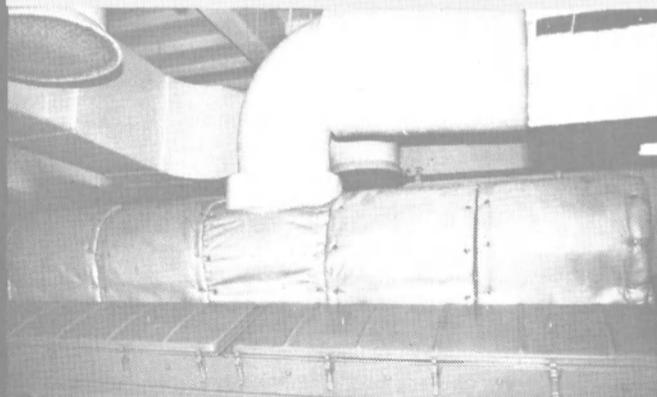
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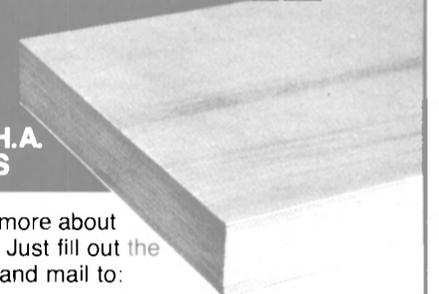


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Circle 114 on Reader Service Card

## Diesel Power Review

(continued from page 33)

### MTU

Circle 30 on Reader Service Card

MTU of North America, Inc., Greenwich, Conn., is the U.S.-based

subsidiary of MTU-Friedrichshafen of West Germany. The German parent company is jointly owned by Daimler-Benz AG and M.A.N. AG. This year MTU-Friedrichshafen celebrates its 75th anniversary of high-performance diesel engine development and manufacturing.

Further adding to MTU's worldwide service network, MTU of North America has appointed two product support dealers for engine

repairs and overhaul and personnel training. One of these dealers is The Boat Yard in Seattle, the other is Marine Diesel Service of Coral Gables, Fla.

The MTU diesel line covers a power output range of 440 to 10,000 bhp at rated speed between 1,000 and 2,400 rpm. Basic design features common to the series are: V-configuration, water cooling, exhaust gas turbocharging, and charge air cooling. All engines are

the result of the collective experience gained by Maybach, Mercedes-Benz, and M.A.N. in the development of cost-effective, high-performance diesels.

The model 20V 1163 TB 93 engine, introduced in 1983, is evidence of MTU's continued success in its engine development program, which focuses on increasing engine power and power concentration to open new powering possibilities, reducing fuel consumption throughout the entire speed range, extending operating range through higher mean effective pressures, and improving partial-load performance characteristics. MTU employs cylinder cutouts, cylinder charge transfer, and sequential turbocharging in some of its engines.

Power in the 1163 series has been increased from 349 to 496 bhp per cylinder, corresponding to an increase in mep from 305 to 426 psi. MTU's two-stage turbocharging is also employed in addition to the other systems mentioned. This allows overall engine dimensions to be kept almost constant, and results in a power-to-volume ratio of 11.7 bhp per cubic foot, and a weight-to-power ratio of 4.4 pounds per bhp with the 20V 1163 producing 9,920 bhp.

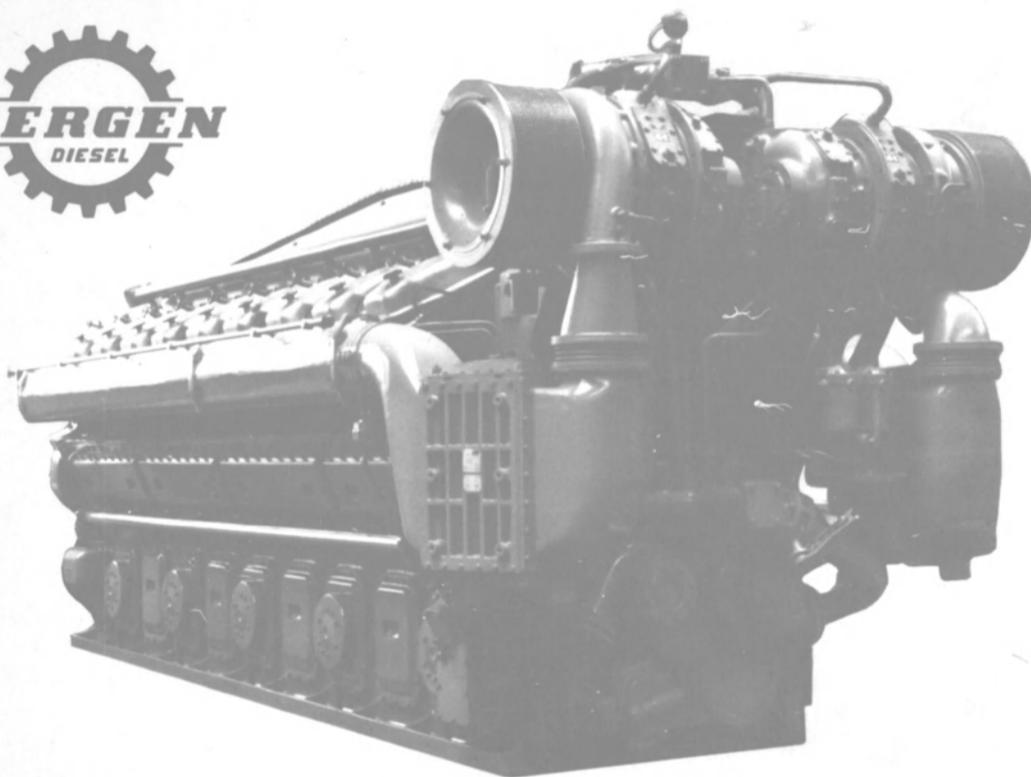
Output of the 396 series engines has also been increased. With a maximum rating of 2,570 bhp and a weight of 10,475 pounds, the 16V 396 penetrates a power range that could previously be served only by larger and heavier engines.

MTU's marine diesels are designed for a wide range of commercial and naval applications. These include continuous duty with a power range of 590 to 4,930 bhp, and medium duty with a power range of 640 to 5,425 bhp.

Light-duty engines have a power range of up to 10,000 bhp. Some of the advantages of MTU's compact engines include light weight, low volume, and decreased noise levels. In addition, they are prepackaged with accessories for fast, inexpensive installation of the complete power plant.

Electronic monitoring and control systems for diesel engines, gas turbines, marine transmissions, and combined propulsion systems complement the MTU product line. MTU electronics include monitor and control systems for unattended propulsion plants. Engine room control stands, bridge control posts, and control consoles are also available, as well as simulation systems for personnel training.

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### MWM-MURPHY

Circle 31 on Reader Service Card

MWM-Murphy, based in Milwaukee, is the U.S. subsidiary of Motoren-Werke Mannheim (MWM) of Mannheim, West Germany. MWM has more than a cen-

tury of diesel engine experience, with manufacturing facilities in Mannheim and Munich, West Germany; Madrid and Zafra, Spain; Sao Paulo, Brazil; and Milwaukee.

MWM's TBD603/604 series is comprised of four turbocharged/intercooled engines—an in-line six (TBD604L6), a V8 (TBD604V8), a V12 (TBD603V12), and a V16 (TBD603V16). The series has a common bore and stroke of 6.29 by 7.28 inches, respectively, and a displacement of 3.72 liters per cylinder.

Modifications to the turbocharging and fuel injection systems have combined to reduce fuel consumption and increase performance of the series. The maximum horsepower range of the TBD603/604 has been extended (with the V16) to 2,000 bhp at 1,800 rpm for rescue vessel and pleasure craft operation. Workboat application outputs have remained the same, however, with the maximum continuous rating remaining at 102 bhp per cylinder at 1,650 rpm. Fuel consumption has been reduced up to five percent, now reaching as low as 0.310 pounds per bhp hours. For speeds up to 1,500 rpm, these engines may be operated with marine diesel fuel per BS 2869 Class B2.

MWM large-bore engines are now available from Stewart & Stevenson Services, Inc. of Houston for applications requiring from 270 to 8,800 bhp. Series 440, 441, 444, 501, and 510 are offered as in-line and V-form models. Featuring a fuel consumption rate as low as 0.313 pounds per bhp hour at 750 rpm, these engines effectively use

#2 diesel fuel or heavy fuel up to 5,000 sec Redwood 1 at 100 F (CI-MAC 10).

The MWM 400 series is a four-stroke, direct-injection engine family available in diesel, natural gas, dual-fuel, intermediate, and heavy-fuel versions. The 400 is divided into three basic model classifications—the 440, 441, and the newer 444. The 440 and 441 are designed around a common bore and stroke (9.06 × 10.6). To maximize parts interchangeability, the 444 shares the same bore as the other family members; however, the stroke has been extended to 12.6 inches.

The 440 and 441 are offered in both naturally aspirated and turbocharged/intercooled models. The 440 denotes the in-line engines, available in six and eight cylinders, and the 441 designates the V-type engines offered in 12- and 16-cylinder models. Operating range is between 600 and 1,000 rpm on diesel fuel and 750–1,000 rpm on alternative fuels. Outputs vary based upon the type of fuel used.

The longer-stroke 444 is available in in-line six- and eight-cylinder models and has an operating speed up to 750 rpm. This model is designed for optimized performance on lower grades and heavy fuels up to 3,500 sec Redwood 1.

The 500 series, largest of the MWM product line, is divided into two separate engine families, the 510B and the 501. The 510 series represent the latest state-of-the-art in multi-fuel and heavy-fuel engines. The 510B is comprised of four basic turbocharged/inter-

cooled with a common 13-inch bore and 14.2-inch stroke—two in-line (six and eight cylinders) and two V-form (12 and 16 cylinders). Like the 400 series, the 510B has been designed to operate on a variety of fuels, with significant experience on the poorer grades, even fuels with viscosity up to 5,000 sec Redwood 1. Design characteristics of this family allow operating speeds between 600 and 750 rpm.

The 501 series is available as a turbocharged/intercooled, in-line six- and eight-cylinder engine only. Each shares a bore of 14.2 inches and stroke of 17.7 inches; operating speed is from 428 to 514 rpm. The 501 has been designed specifically for operation on diesel and poorer grade fuels; operation on natural gas and dual-fuel is not available. Output at 514 rpm for the six-cylinder model is 2,475 bhp, 3,300 bhp for the eight-cylinder unit.

compact, heavy-duty engine with a horsepower-to-weight ratio of 6.4 pounds per shp, establishing a new standard for the industry. The 8V 92TI marine propulsion engine was developed using only field-proven components and thoroughly tested by Penske's own dynamometer.

Today's Detroit Diesel and EMD engines incorporate the latest state-of-the-art design modifications, such as low smoke injectors, bypass blowers, high-output turbochargers, aftercoolers, and refined engine timing. More importantly, these features are incorporated into the reliable and affordable engine design that has gained worldwide recognition and offers unsurpassed application and standardization potential.

Penske field engineers are ready to survey equipment for refurbishment or replacement, train operators and technicians, and establish comprehensive preventive maintenance programs to guarantee optimum reliability and equipment life.

## PENSKE GM POWER

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Penske GM Power, Inc. represents Detroit Diesel Allison and Electro-Motive Division products that have survived the test of time and consistently provided the kind of value and dependability that produces results. The company is authorized to carry all Detroit Diesel engines and also offers the EMD 645 Series.

The Penske-engineered Detroit Diesel 8V92TI, a high-performance marine power package, is a

## PERKINS

Circle 34 on Reader Service Card

Perkins Engines, Inc. of Wayne, Mich., a leading supplier in North America of light and medium diesels in the 30-350 bhp range, has increased its ability to serve the marine and shipping industry by expanding into the heavy-duty marine diesel market. In March this year Perkins acquired Rolls-

(continued on page 36)



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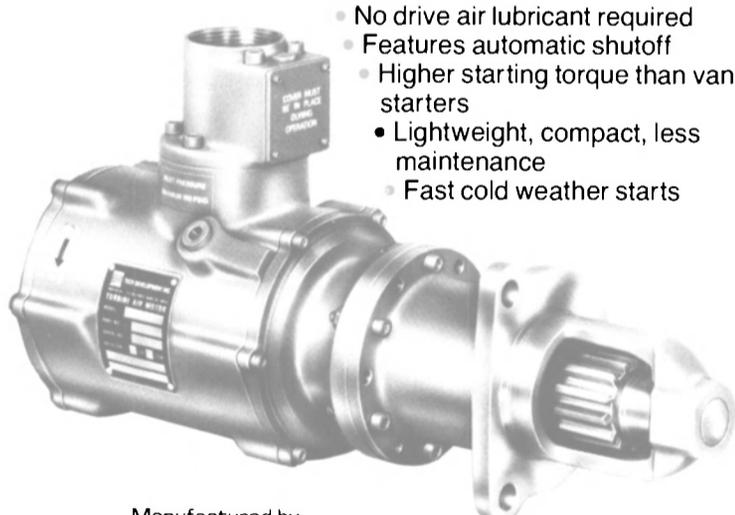


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## Diesel Power Review —Perkins

(continued from page 35)

Royce Diesel Division, thereby extending its range up to 1,200 bhp.

The combined Perkins/Rolls-Royce diesel line is used in a wide variety of marine industry equipment, including workboats, ships, dockside vehicles, and generator sets. In addition to the acquisition

of Rolls-Royce, Perkins added a small line of 3.5- and 5-bhp diesels, including a compact 3-kw portable generator suitable for marine applications.

Three series of Rolls-Royce engines—the CV, D, and C ranges—are suited for marine and generator set applications. These engines include six-, eight-, and 12-cylinder diesels providing from 145 to 1,200 bhp.

The CV range comprises 90-de-

gree V8 and 60-degree V12 engines, and is the most recent family of diesels developed by Rolls-Royce. They offer ratings of 550 and 950 bhp. Both engines are direct line injection, and feature turbocharging and charge cooling.

The D range is a 90-degree, V8 direct injection engine with 32.7-liter capacity. This engine features turbocharging, charge cooling, and has a power output of up to 980 bhp.

The C range includes six- and eight-cylinder engines of 12.2 and 16.2 liters capacity, respectively. Their output is from 145 to 400 bhp.

The top of the line of the Perkins marine diesels is a turbocharged, eight-cylinder engine—the TV8.540—that offers 350 bhp at 2,800 rpm. This engine weighs less than 1,700 pounds, and offers an outstanding power-to-weight ratio.

Foremost in the Perkins marine line is the Range 4 family of four high-performance, six-cylinder models. The model 240 provides 240 bhp in a six-cylinder engine.

Perkins supports its diesels with a worldwide network of 4,000 distributors, dealers, and parts outlets. The company also offers a variety of maintenance programs, including engine rebuilding and failure analysis courses.

### SACM

Circle 35 on Reader Service Card

SACM of France manufactures medium- and high-speed, four-stroke, direct-injection diesel engines in a range from 200 to 10,000 bhp. The company is a leader in the development of high-performance engines utilizing the RVR (reduced volumetric ratio) and Hyperbar turbocharging techniques, and in non-magnetic engine versions up to 2,880 bhp. SACM high-performance engines are widely used in Naval and commercial applications requiring compact size, light weight, and high specific power.

SACM's U.S. agent is the F.W. Donnelly Company of Houston.

It is SACM's philosophy to further the development of the performance qualities of its engine range without sacrificing the essential operational qualities, including low specific fuel consumption and ease of operation/maintenance. This development philosophy has resulted in the company's now well-known RVR turbocharging technique, which provides significantly more power than conventional high-performance engines while maintaining or slightly reducing the engine's thermal and mechanical stresses. Additional attractive features of the RVR engines include the wide ambient temperature range in which they may operate without power derating, the simple, single-circuit cooling system, and the elimination of condensed water formation in the air intercooler.

The Hyperbar engine features a further reduction of the RVR engine's volumetric ratio (7 to 9), while utilizing a higher pressure ratio turbocharger, additional combustion chamber, and regulation equipment. The resulting engine has a substantial increase in power beyond the RVR engine, and has the unique ability to maintain high constant torque at any speed. The Hyperbar engine's favorable power-to-weight ratio and

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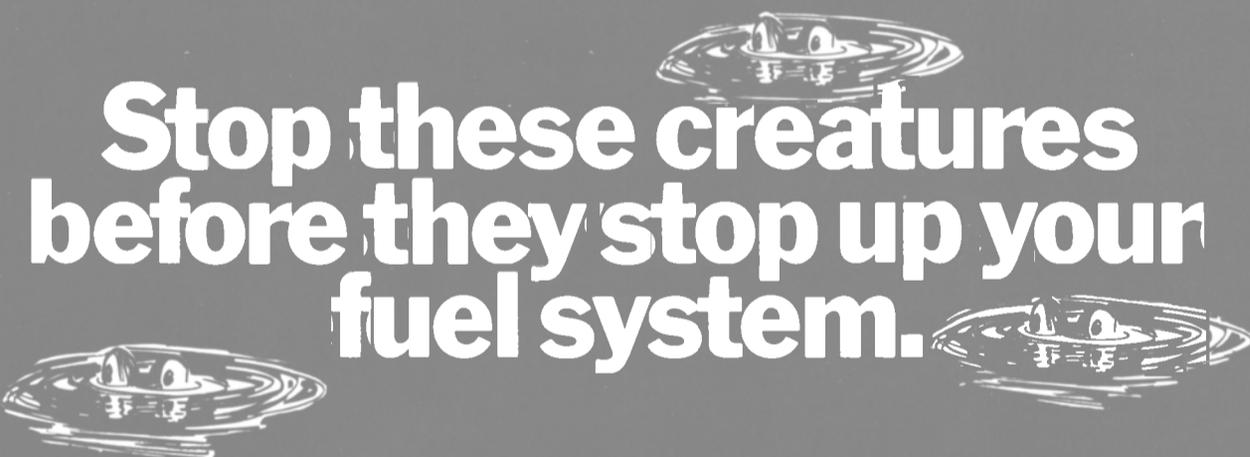
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wide-ranging torque possibilities make the engine ideal for high-speed craft.

SACM also remains active in development of its high-performance engine range as non-magnetic units for military applications. These engines utilize a maximum of non-magnetic materials for parts that are less highly stressed, while retaining magnetic materials for the more highly stressed parts that cannot be of non-magnetic material without sacrificing reliability.

### STORK-WERKSPoor

Circle 36 on Reader Service Card

Stork Werkspoor Diesel B.V., known as SWDiesel, with headquarters in Amsterdam, is the leading diesel engine manufacturer in the Netherlands, with a production program covering an output range from 300 to 16,200 kw (400 to 21,725 bhp). This program consists of five models of four-stroke, medium-speed, heavy-duty engines, all capable of operating on heavy fuel.

The recently introduced SW280 engine type, fully adapted to the demands of the present and future market, is offered in six-, eight-, and nine-cylinder in-line configurations, and in a 12-cylinder V-form version, with outputs ranging from 1,465 to 3,530 kw (1,965-4,735 bhp). Following its introduction, the SW 280 attracted much attention from the international marine world, resulting in the receipt of a large number of orders.

Designed using the most modern computer-aided design and testbed facilities, the SW280 has proved to be both a sales and operational success. All types have been installed for main propulsion, auxiliary power, and various other applications.

Special attention in Stork's research program was given to the reduction of fuel consumption, resulting in lower figures for the SW280, F/SW240, and DR210 engines. R&D on the well-known TM410 and TM620 engine types, of which more than 650 have been delivered, has also been successful in meeting market demands for reduced fuel consumption; a reduction in fuel consumption of up to eight percent can be achieved. On a number of 18TM410 engines, a specific fuel consumption as low as 185 grams per kw hour has been recorded under full-load conditions.

These reductions in consumption have been achieved without increasing the combustion pressure. Further reductions are foreseen in the near future. This will be achieved by some increase in the maximum cylinder pressure. Major improvements on these engines include the application of new high-efficiency turboblowers, and valve timing in injection systems to give higher injection pressures.

Operation on heavy fuel is one of the strongest points of SWDiesel engines. The poorest quality fuels have been tested in TM and SW engines. When installed as auxiliary engines, the SW models can use the same heavy fuel as the main engine.

Over the past few years, SWDiesel has set up offices in New Orleans, Seattle, and Washington, D.C. in an effort to expand its sales in the U.S. market. SWDiesel Gulf Inc. (Stork-Diesel) in New Orleans is a member of the SWDiesel Group.

During the past five years, SWDiesel has booked orders for ships under American management for more than 400,000 bhp, including 10 TM410 eight-cylinder engines ordered by the Quincy Shipbuilding Division of General Dynamics for installation in the five maritime prepositioning ships (T-AKX) being built for the U.S. Navy.

### SULZER

Circle 37 on Reader Service Card

Sulzer Brothers Limited of Winterthur, Switzerland, this year celebrating its 150th anniversary, is a world leader in diesel engine design, development, and production. Sulzer's latest series, the RTA superlongstroke engine, has now accumulated more than 36,000 hours of at-sea service experience (as of May 1 this year), in the 45 ships already delivered, and is well under way to proving its high reliability and low specific fuel consumption.

The outstanding fuel economy of RTA engines has been fully confirmed by the considerable testbed experience gained from 3,500 running hours in long-term optimization tests with 10 engines, which have been complemented by the more than 125 successful shop trials.

As a result, the RTA diesel en-

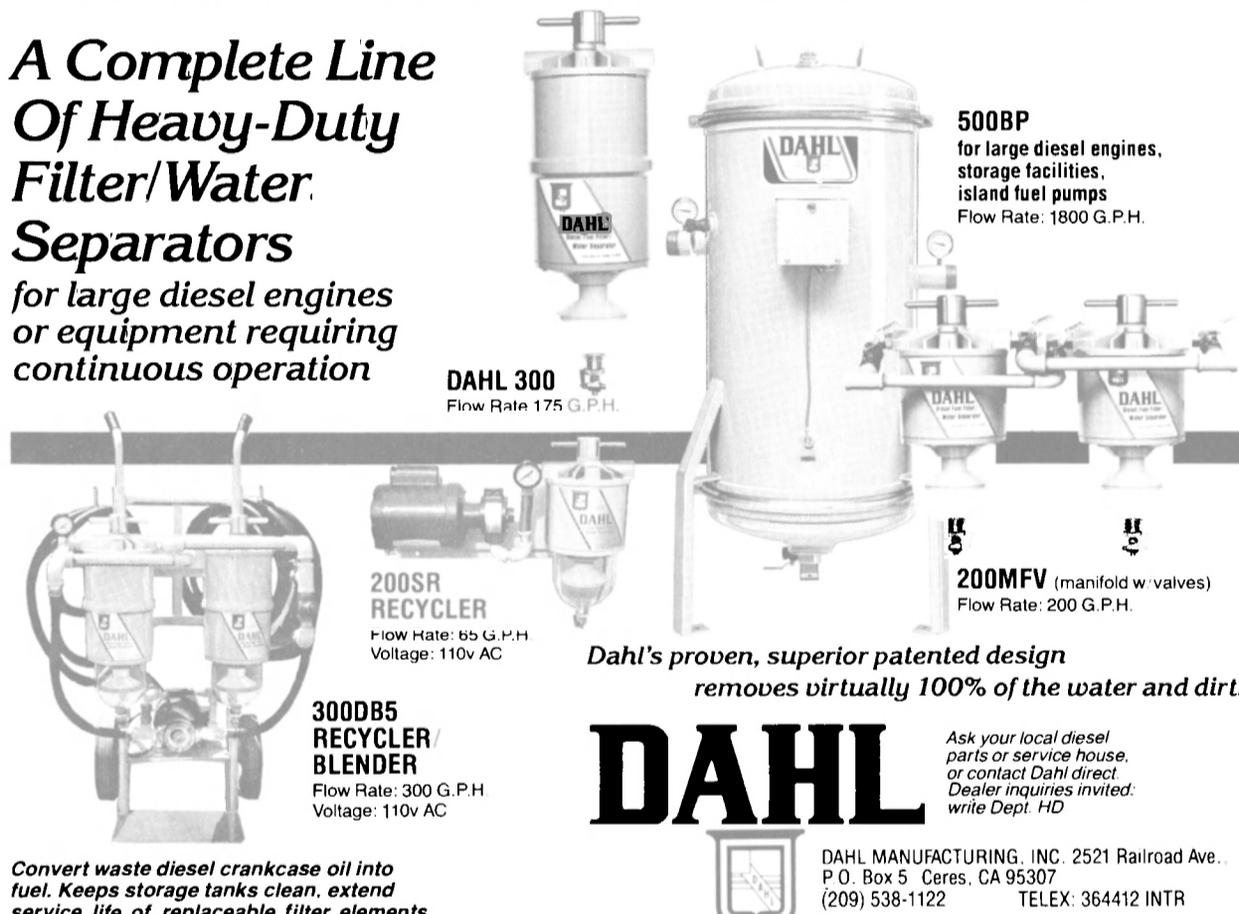
gine series is now able to offer even better optimum combinations of very low specific fuel consumption and low running speed that, together with the benefits derived from unique RTA design features, give: reduced brake specific fuel consumption from optimum engine tuning; better propulsive efficiency through lower engine speeds offered by the wider layout field; and closer optimization to ship requirements by increased overlap of the layout fields from the six RTA cylinder bore sizes.

The outstanding fuel economy of RTA engines can now be improved even further by incorporating the new Sulzer Efficiency Booster system. This recovers surplus exhaust gas energy and thereby directly raises engine brake thermal efficiency, up to a remarkable 53 percent maximum in the largest-bore engines, corresponding to a minimum specific fuel consumption

(continued on page 38)

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## Diesel Power Review—Sulzer

(continued from page 37)

tion of 117 grams per bhp hour for an RTA84 engine at 85-percent load, ISO-reference conditions. The exhaust energy available for conventional waste heat recovery is decreased slightly depending upon the individual rating. The overall result of the Efficiency Booster is

additional fuel savings of up to 3 g/bhph.

The very latest generation of BBC high-efficiency turbochargers, type VTR-4A, has ample spare capacity for meeting the design requirements of today's RTA engines. The Sulzer Efficiency Booster thus uses a concept devised by Brown Boveri to recover surplus exhaust gas energy and feed it directly to the engine crankshaft through an intermediate transmission. The integral power take-

off unique to the RTA design is ideal for this concept, allowing the compact Efficiency Booster unit simply to be flange-mounted directly onto the engine.

Delivery of RTA engines with Efficiency Booster systems depends upon the availability of the new VTR-4A turbochargers and the new power turbine modules from Brown Boveri and its licensees. Sulzer expects that the Booster will be available for RTA engines that are due for shop test-

ing from January 1985 onwards.

The output range (mcr) of the RTA series runs from 3,720 bhp at 196 rpm for the 4-cylinder RTA34 to 54,000 bhp at 90 rpm for the 12-cylinder RTA84.

For a free 26-page color brochure on the RTA engine series, circle the number above on the Reader Service Card in the back of this issue.

## TRANSAMERICA DELAVAL

Circle 38 on Reader Service Card

Transamerica Delaval's Engine and Compressor Division in Oakland, Calif., designs and manufactures the Enterprise R and RV medium-speed diesel engines, which have proved themselves in hundreds of thousands of operating hours, powering vessels ranging from 1,000-foot Great Lakes ore carriers to offshore workboats.

The R4 series comprises 6- and 8-cylinder in-line engines and V-form engines with 12, 16, or 20 cylinders. The bore is 17 inches and the stroke 21 inches (432 × 533 mm), and the output ranges up to 677 bhp per cylinder.

The latest development in the Enterprise line of marine diesels is the R5. Operating at 514 rpm, the R5 produces 850 bhp per cylinder with a bmep of 275. Bore and stroke are the same as the R4. Through selective redevelopment and design advances in critical engine parts, the R5 has achieved, compared with the R4, a 40-percent increase in bhp per cylinder, 40 percent more bhp per square foot of installed space, and a 3.5-percent decrease in fuel consumption.

The ability to burn heavy fuel oil reliably is paying off for a wide range of Enterprise-powered vessels. Three 36,500-dwt bulk carriers built by Livingston Shipbuilding for the Falcon Shipping Group are each powered by twin R4-V-12 direct-reversing engines, providing a total of 15,600 bhp. The ability to burn heavy residual fuels makes these unsubsidized vessels competitive with foreign-flag bulk carriers.

Four Enterprise R4-V16 diesels power the two 33,600-dwt tankers built by Bath Iron Works for the Falcon Group. These ships are chartered to the Military Sealift Command. Their R4-V16s, each rated at 7,360 bhp, are designed to operate on various fuels including cheaper, heavier grades with viscosities up to 3,500 sec Redwood 1.

Transamerica Delaval has complemented its Enterprise diesel line by signing a licensee agreement with the Dutch engine manufacturer, Stork-Werkspoor Diesel B.V. of Amsterdam. This agreement gives Transamerica the rights to the exclusive U.S. manufacture of the Enterprise/SWD TM 620 diesel. This engine, which operates at up to 430 rpm, is offered as a 9-cylinder in-line unit with an output of 16,650 bhp, and a V-configuration 12-cylinder unit rated at 22,200 bhp.

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## VOLVO PENTA

Circle 39 on Reader Service Card

Volvo Penta of America, Rockleigh, N.J., has introduced new configurations of its six-cylinder diesel engines. The new turbocharged/aftercooled version of the 5.48-liter six-cylinder engine is designated TAMD60C. Horsepower has been raised to 250 bhp at 2,500 rpm for the light-duty version, and 210 bhp at 2,500 for the medium-duty model. New this year is a continuous output rating of 177 bhp at 2,200 rpm.

The new Robert Bosch fuel injection pump is equipped with an aneroid smoke eliminator, and provides a specific fuel consumption of 156 grams per bhp hour at the 2,000-rpm continuous rating.

The latest configuration of Volvo's 6.73-liter, six-cylinder turbo/aftercooled engine is the TAMD70E, rated 300 bhp at 2,500 rpm. Also available is an intermediate rating of 270 bhp at 2,500 rpm, or 211 continuous bhp at 2,000 rpm. Both the TAMD60 and 70 are available with heat exchangers or in keel-cooled modes.

Higher horsepower with lower fuel consumption is the result of component redesign in the 9.6-liter TMD100C engine. A new turbocharger, in conjunction with a new injection pump and injectors, pistons, and liners, and a modified cylinder head results in 272 bhp at 2,000 rpm in the light-duty rating. The medium- and continuous-duty ratings are 258 bhp and 238 bhp, respectively, at 1,800 rpm. Specific fuel consumption has been improved to 153 grams per bhp hour.

Volvo's largest engine, the turbocharged and aftercooled 11.9-liter TAMD121C, has had a series of modifications that are designed to enhance its already substantial reputation for economy and longevity. The cylinder block has been reinforced in the liner ledge area to withstand higher outputs, while the crankshaft has been nitrided to resist fatigue. New cylinder heads with improved water flow support new injectors with improved spray patterns and higher pressures.

New pistons, liners, connecting rods, and turbocharger all contribute to the 121C's light-duty rating of 408 bhp at 2,000 rpm. Medium- and continuous-duty ratings are 387 bhp at 1,900 rpm and 367 bhp at 1,800 rpm. The engine uses 159 grams of fuel per bhp hour at the continuous rating.

A wide variety of transmissions and power takeoffs make both the TMD100C and the TAMD121C ideal power sources for fishing vessels or other boats where numerous PTOs are required.

## WARTSILA

Circle 40 on Reader Service Card

Wartsila Diesel, one of the world's leading manufacturers of medium-speed diesel engines, is

part of the Finnish Wartsila Group, with more than 17,000 employees and 35 production plants in five different countries.

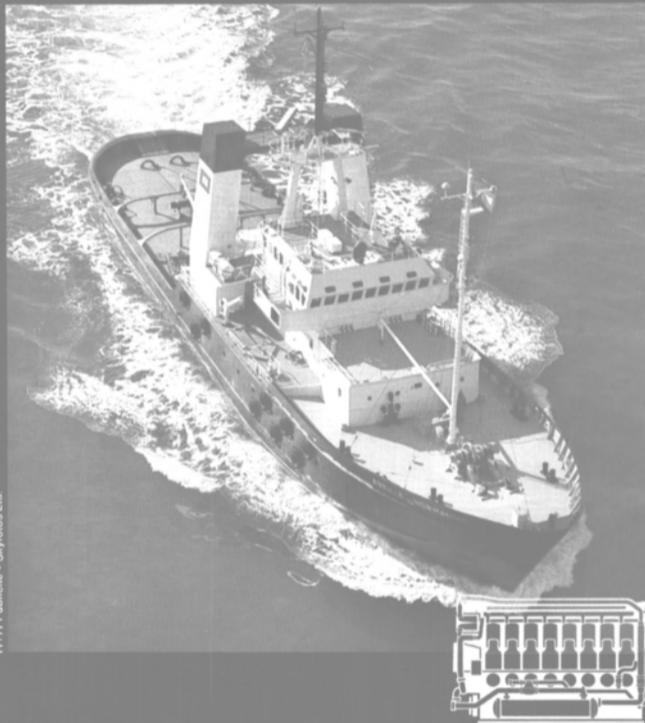
Wartsila Diesel is made up of the main factory in Vasa, Finland; the Trollhattan factory in Sweden; and the newest factory, Wartsila Power Singapore in Singapore. The company specializes in purpose-designed, heavy-fuel diesel engines. The primary objective in product development is to create diesel en-

gines with good economy and safe operation, even for the most demanding applications. As a result of these efforts, Wartsila today is a producer of two high-standard, medium-speed diesels designed and developed from the very beginning for the poorest quality fuels.

The heavy-fuel engine types are the Vasa 32 and Vasa 22HF, covering the output range of 800 to 9,060 bhp in the speed range from 720 to 1,200 rpm. The Vasa 22HF,

with a bore of 220 mm and stroke of 240 mm, is manufactured as in-line versions with four, six, or eight cylinders and V-form with 12 or 16 cylinders, covering the output range of 800 to 3,210 bhp at 1,000 rpm. The Vasa 32 has a bore of 320 mm and stroke of 350 mm, and covers the range of 2,010 to 9,060 bhp at 720 rpm. The in-line version is built with four, six, eight, or nine cylinders, and the  
(continued on page 40)

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## Diesel Power Review—Wartsila

(continued on page 39)

V-form with 12, 16, or 18 cylinders.

The main features of the Vasa engines are: starting, stopping, and running on heavy fuel over the entire load range, without any limitations; heavy fuel operation with the same safety and reliability as when operating on distillate

fuel; and total economy due to built-in serviceability, low fuel and lube oil costs, and low spare parts consumption.

Long-term service experience with the Wartsila heavy fuel engines has confirmed that the engines are capable of burning the lowest fuel qualities of the future. Today the entire Wartsila engine range can operate safely on fuel of up to 7,000 sec Redwood 1 at 100 F.

With more than 4,000 engines delivered to 45 countries, Wartsila Diesel has a great deal of experience for both main and auxiliary engines in a wide variety of applications. From passenger ferries, icebreakers, tankers, and fishing vessels to offshore rigs and supply vessels.

One of the most interesting U.S. installations with Wartsila engines is the semisubmersible drilling rig Henry Goodrich (MR/EN,

(11/15/83), ordered by Sonat Offshore Drilling Company. This rig is capable of drilling in the most severe arctic conditions in water depths up to 10,000 feet. With four 12-cylinder Vasa 32 generating sets giving a total output of 23,400 bhp, it is one of the most powerful drilling rigs in the world. It is also one of the first rigs with the option for heavy fuel.

Wartsila Diesel is represented through its own subsidiaries and agents in 30 countries. The company's after-sales service is based on a worldwide network of trained specialists. Operators and maintenance engineers are trained on-site and at the Wartsila factories. Since 1980, Wartsila Diesel has been represented in the U.S. by Wartsila Power Inc., with offices in New Orleans, Houston, and New York. On the U.S. West Coast, the company is represented by Southwest Marine, Inc. of San Diego.

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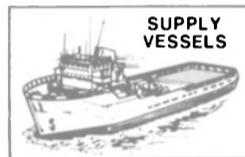
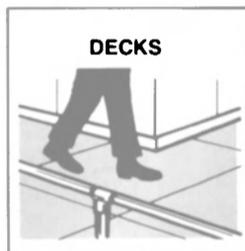
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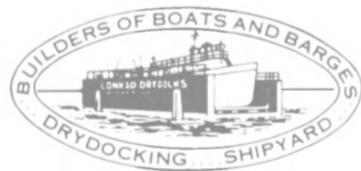
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## WAUKESHA

Circle 41 on Reader Service Card

Waukesha Engine Division of Dresser Industries, Waukesha, Wisc., has produced more than 40,000 horsepower of its new AT25 diesel since signing a license agreement with Sulzer Brothers Limited of Winterthur, Switzerland, several years ago.

This production follows a multimillion-dollar capital investment in plant renovation and new machine tools to build these heavy-duty, four-stroke, medium-speed diesels. They deliver from 1,140 to 4,800 bhp (metric) in in-line six- and eight-cylinder, and V-12 and V-16 cylinder configurations.

Waukesha's commitment to this product is also evident in the recently completed laboratory facilities built to accommodate the AT25. Here the engines are undergoing continued evaluation in an ongoing refinement program to increase output and maximize operating efficiency.

The AT25 is capable of operating on heavy, blended, and distillate fuels. This range is made possible through a design that incorporates oil-cooled injection nozzles, bore-cooled cylinder heads, exhaust valve rotators, two-piece pistons, and turbocharger washing equipment.

A rugged yet compact engine, the AT25 is conservatively rated and offers excellent access to components for ease of service. Quick-opening access covers are provided for such components as camshafts and mail bearings. A provision for fast removal of rocker arm covers facilitates valve adjustments. Water, lube oil, and fuel transfer pumps are located on the front of the engine for easy access. For maintenance, hydraulic tensioning of main bearing cap studs, cylinder head studs, and connecting rod studs insures precise preloading and cuts assembly time.

A high degree of parts interchangeability among models assures ease of maintenance. All pistons, piston rings, connecting rods, cylinder heads, cylinder liners, injection pumps, and nozzles are completely interchangeable among all models offered. Other components such as main bearings, camshaft segments, and piping components are common to models within the in-line or vee configurations.

### WICHMANN DIESEL

Circle 47 on Reader Service Card

Wichmann Diesel, Inc., of Kenner, La., offers a line of fuel saving low speed diesels from 1,140 to 4,220 hp, with engine speeds from 300 to 475 rpm.

Wichmann states specific fuel consumption for their line of diesels is one of the lowest in the world. Simplicity of design reduces both planned and corrective maintenance. In addition, any necessary maintenance requires less time than with more complex propulsion systems.

All engines are two-stroke. Models are available for reduction gear application or as a complete system directly connected to a Wichmann controllable pitch propeller.

Of in-line design, models are available in four to 10 cylinder configurations. They are loop scavenged, have no exhaust valves, require only standard instrumentation and controls. Other common features include water cooling, direct injection and turbocharging.

Spare parts are interchangeable throughout the entire Wichmann engine line providing ease of maintenance and a minimum spare parts inventory.

Free literature is available describing all Wichmann diesel engine models.

### YANMAR

Circle 48 on Reader Service Card

Yanmar Diesel Engine Company Ltd., of Osaka, Japan recently announced the formation of Yanmar Diesel Engine (U.S.A.), Inc., headquartered in Anaheim, Calif. The new company will be responsible for Yanmar's distributor-based and OEM engine marketing operations in the United States.

According to Tadao Yamaoka, president of Yanmar's worldwide operations, "The continued sales growth and expanded product lines geared to the U.S. market required a consolidation of our marketing and business operations in America."

With the establishment of Yanmar Diesel Engine (U.S.A.), the company's activities in the United States have been consolidated enabling Yanmar to provide close engineering, sales, service and parts support to their nationwide distributor-based sales and service network. The new company's cor-

porate officers include Yoshiaki Yano, president, and Shuji Honda, executive vice president.

Yanmar is best known as one of the world's leading manufacturers of small diesel engines. With capacities from five to 3,000 hp, the company now offers over 200 series of diesels for main and auxiliary power applications.

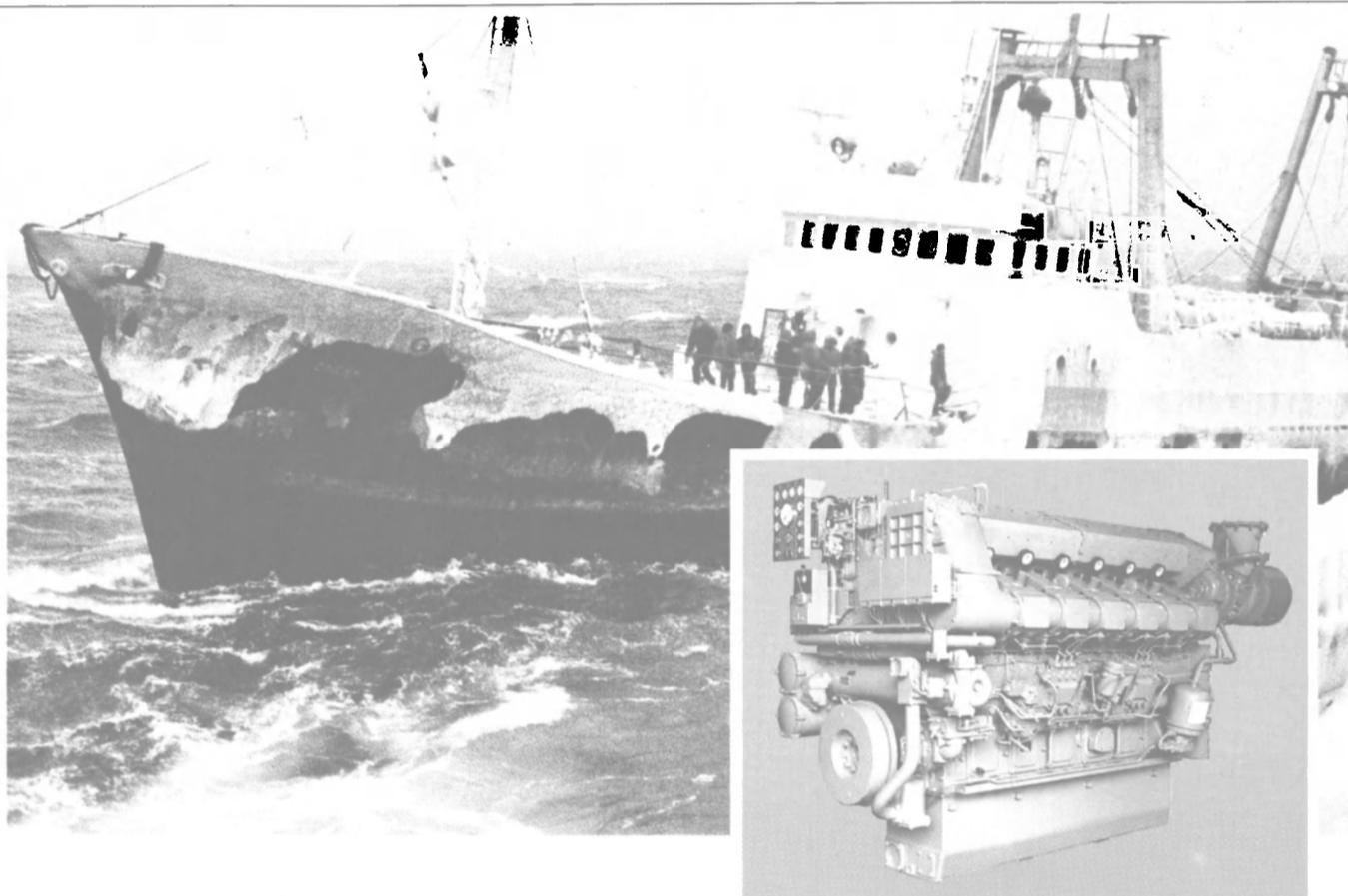
A series of four- and six-cylinder, naturally aspirated, turbocharged, and turbocharged/after-

cooled engines with a power range from 80 bhp to 175 bhp was recently introduced. There are five models in this line, which is designed for vessels of more than 40 feet. The company has also introduced new 44-bhp and 55-bhp engines, the JHE series. The 12-cylinder 12T26 series engines have a power output range of 2,600 to 3,000 hp at 700 rpm.

Yanmar's line of marine auxiliaries are designed to save space in

the engine room, while providing fuel-efficient auxiliary power. The company now has designed its own series of quiet, smooth-running diesel generator sets. Power generating capacities for Yanmar auxiliaries range from 2.4 kw to 2,000 kw.

Full color, illustrated brochures, including model details in tabular form, are available on Yanmar's full range of main and auxiliary marine diesel engines.



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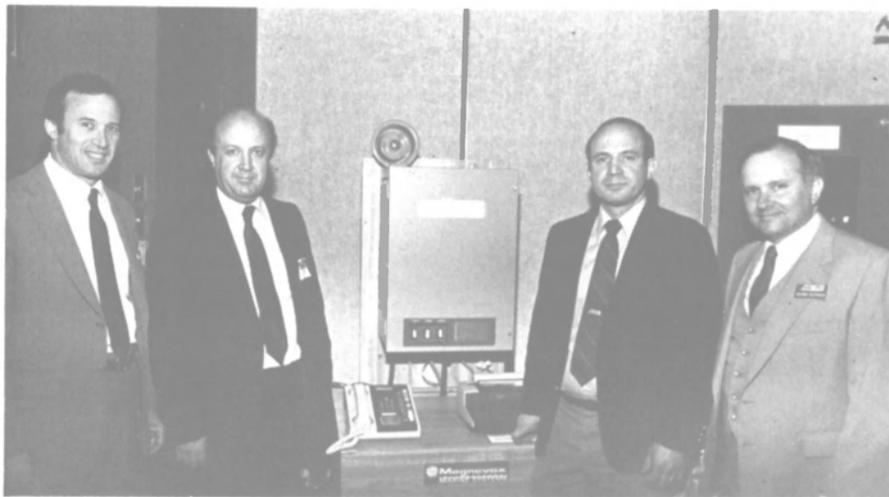
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P. A. Gaechter and Michael Etherington of Magnavox shown with Jack Provenzano and Gerald Gutman of Nav-Com Inc.

## Integrated Marine Electronic Systems Nav-Com Inc., Seminar—Washington, D.C.

Proving that the sum of the parts is greater than the whole is by no means an easy task. Yet this challenge was successfully undertaken during a two day private seminar recently sponsored by Nav-Com Incorporated in Washington, D.C.

Combining a morning of technical sessions with an afternoon of live demonstrations, Nav-Com—a wholly owned subsidiary of the Magnavox Government and Industrial Electronics Company—detailed the advantages of integrated communication, navigation, cargo loading, ballast control, and vessel management information systems.

The premise which served as the basis for most of the presentations was that a combination of equipment and/or data, when properly integrated and displayed, would yield more accurate and usable information . . . faster. This new information would, in turn, have a very positive effect on vessel operating efficiency and hence profitability.

### COMNET: INTEGRATING INTERNAL & EXTERNAL COMMUNICATIONS

While shoreside managers have long recognized the need for fast, versatile communications inside the office and around the world, ships officers continue to survive with only a collection of marginal communication tools.

For many vessels, internal communications needs are served by sound powered telephones, handheld radios, perhaps a few hailing/paging stations, possibly a watch alarm system and on some ships, the old voice tube. Not exactly state-of-the-art. More importantly, not very effective. It is hard to imagine that even today, using

the ship's look-out to call the next watch is common practice!

External communications have greatly improved since the Marisat organization introduced satellite communications to the Maritime Industry in 1976. Unfortunately, even though the services of the Marisat system have been absorbed and greatly expanded by today's Inmarsat organization, full advantage hasn't been made of the system's total capability.

The Comnet system introduced by Nav-Com during EXPOSHIP NORTH AMERICA last March provides a complete integration of internal and external communications devices. In its most comprehensive configuration, COMNET includes an electronic telephone system to suit any required number of extensions and outside trunks, a call logger, digital facsimile transceiver, hailing/paging system, Displayphones, MX-211A Inmarsat terminal, and a BUSISHIP vessel management work station. COMNET allows all outgoing and incoming SATCOM calls, as well as inter-vessel calls, to be routed automatically without operator intervention.

Circle 1 on Reader Service Card

### BUSISHIP: A FLEET MANAGEMENT INFORMATION SYSTEM

The BUSISHIP work station provided for live demonstration of medium speed data transmission through the MX 211A Inmarsat ship earth station. The work station was comprised of an IBM PC with 10 mega byte hard disk and digital cassette tape back-up, twelve inch monochrome video monitor, 120 character/second dot matrix printer, 256K read/write random access memory, 320 K mini-floppy disk and a 1200 BPS

internal modem. To improve the IBM PC's suitability for shipboard operations, the unit was ruggedized by Nav-Com and mounted neatly to the work station desk using computer designed vibration isolators. Voltage and transient protection was supplied by an uninterruptable power supply.

Attendees were able to observe data flow from shore-to-ship and ship-to-shore by watching an IBM PC adjacent to the BUSISHIP work station which served as the "office station". A variety of "In-House" developed application software was also exhibited. The combination of all the hardware and software elements integrated into one system by Nav-Com and supported by the world-wide network of Magnavox Service Representatives provided a "one stop" solution to the communications problems troubling many of the attendees.

Circle 2 on Reader Service Card

In addition to their own integrated systems, several of Nav-Com's major principals were invited to give similar technical presentations.

### AUTOLINK: AUTOMATED HF COMMUNICATIONS



Frank York (left) and Walter Kannapel (right) of Harris RF Communications.

Harris RF Communications introduced their RF-7100 Series Adaptive Communications System, marketed by the trade name AUTOLINK. Properly described as an HF radio with the ease of operation normally associated with satellite communications, the RF-7100 eliminates the need for a skilled operator to deal with the problems of propagation and congested channel conditions. The system features a microprocessor-controlled HF Radio Set designed to provide Automatic HF Link Establishment through the combined use of Receive Channel Scan, Selective Call, Link Quality Analysis and Radio Control techniques. To establish a link, the operator merely presses the CALL button, enters the desired selective call number, followed by ENTER. The

Adaptive Controller automatically selects the best channel.

Though not presently accepted by the FCC for maritime use, AUTOLINK is currently available for a variety of applications including point-to-point communication systems, tactical HF network broadcasts and computer-controlled frequency management systems.

Circle 3 on Reader Service Card

### COLOR GRAPHIC DISPLAYS



Roy Thompson (left) and James Atteridge (right) of Furuno.

Furuno's name has become synonymous with excellence in the marine electronics industry. For the last seven years, the National Marine Electronics Association has consistently bestowed Furuno products with honors. Their qualifications made them an excellent choice to address the advent of color graphic displays in marine electronics. Furuno offers a full line of color radars, sounders, current indicators, sonars and plotters.

Furuno's GD-2000 color video plotter attracted a great deal of on-lookers during the demonstration portion of the program. The unit features all the benefits of active color radar and Loran/Sat-Nav or Omega navigation systems combined on a single, high brightness 14 inch CRT. On one screen you can see a radar picture where the colors indicate returned echo strength, plus an electronic video plot of your navigation system input. Any chart area from 1.4 x 1.0 to 138 x 102 miles can be displayed.

In keeping with the program's concentration on the usefulness of integrated systems, Furuno was quick to reiterate their company's commitment to providing as much information as possible on compact, easy-to-read displays. All of their navigation aids are designed to facilitate easy interface with one another.

Also on display from the Furuno product line was the FCV-121 color video sounder. This unit permits split-screen display of dual frequencies, normal and expanded

scales, outputs from up to five other sounders or sonars, plus ship's speed and Sat-Nav or Loran position. Comprehensive information displayed at a single, centralized location, and in a format that is easier to use.

As an added inducement, attendees were advised that many Furuno products are offered on the G.S.A. schedule (contract number GS00K8401S0401) which provides "most favored customer" pricing to the Government sector.

Circle 4 on Reader Service Card

## INTEGRATED CARGO LOADING & BALLAST CONTROL



Walter Perlowski, Nav-Com, Inc., (left) and Runol Ohlsson, Kockumation AB, (right).

Kockumation of Malmo, Sweden is one of the world's leading innovators and producers in the field of automated marine equipment. Systems solutions are a key concept at Kockumation.

The presentation given by Kockumation at the Nav-Com Seminar centered around the NLM 200 level-gauging system. The NLM 200 provides the flexibility to choose the best sensor for each application. There is virtually no limit to the different types of sensors that may be required. A tailor-made, automated system is developed for each type of ship.

Level-gauging in cargo tanks is highly specialized. Sensors vary widely with the commodities being carried. For example, aboard chemical tankers, sensors in contact with cargoes are made of stainless steel. Performance must be independent of viscosity, temperature, foaming surfaces and reflectivity to provide maximum safety. Aboard crude oil or product carriers, Kockumation offers a Magnetic Float Gauge. This new technique is rugged enough to operate during tank washing and at sea without being damaged. In the miscellaneous vessel service tanks, a variety of pressure transmitters are used to sense levels of fuel oil, lube oil, freshwater and ballast.

The NLM 200 video display units

are compact for easy positioning at various points aboard ship. The clearly laid out panels provide continuous analogue information at up to 100 levels, along with alpha-numerical information on alarm levels, temperatures, weights, volumes and other vital data. All indicated levels can be corrected for trim and list at the push of a button.

For maximum safety and convenience, all tank levels can be transmitted to the Loadmaster B24 for on-line calculation of the vessel's stress and stability. By incorporating control of valves and pumps, the system can be extended to an integrated Cargo Handling System.

For those vessel operators wishing to employ Kockumation's expertise in calculating stress and stability but not wanting to purchase a dedicated loading instrument, Kockumation is now offering software for use with Nav-Com's BUSISHIP work station. The combination of two major marine electronics companies strengths provides a versatile, multi-purpose vessel management system which can be supported around the world!

Circle 5 on Reader Service Card

## BOWDITCH NAVIGATOR



Thomas King Jr., Bowditch Navigation Systems, Gary Franza, Nav-Com, Inc. and a representative of the U.S. Coast Guard (Left to right).

Introduced as one of the most significant advances in navigation, this automatic visual positioning aid does offer some unique capabilities. The Bowditch Navigator provides the bridge team with a continuous automatic display of the vessel's position on a standard nautical chart. As an integrated navigation system, the watch officer can select an operating mode of Loran, Satellite, Omega, Decca or Dead Reckoning and the vessel's position will be updated by that mode's incoming data.

The visual display of ship's position on the nautical chart is derived from an optical projection of a "microchart" onto the unit's

viewing screen. An extremely precise XY mechanism positions the microchart behind a cross hair on the view screen which represents the "own ship" position. These microcharts are permanently mounted in durable cassettes and are selected for a specific coverage area and scale in the same manner as a corresponding paper chart.

Passage planning features include manual entry of bearing fixes, waypoint sailing, and navigational hazard markings. If desired, course to steer information can be provided to an autopilot.

Circle 6 on Reader Service Card

## SUMMARY OF CURRENT SYSTEMS PROJECTS

As a summary to the technical session, Nav-Com re-emphasized the benefits of integrated systems by describing several projects for which their engineering services had been contracted. Their most

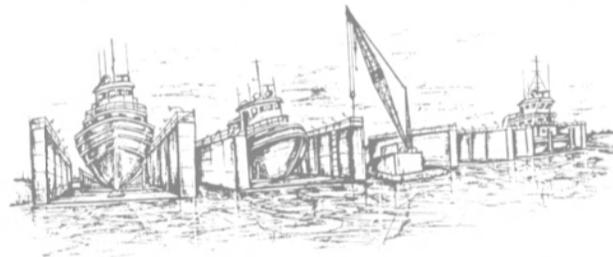
recent project involved the most sophisticated yacht ever built in the United States. Reading from an equipment list five pages long, nearly every element discussed during the seminar was included onboard the motor yacht "Grand Cru". In addition, a vessel monitoring system will check over 260 points throughout the vessel.

Jack Provenzano, Nav-Com's executive vice president and director of engineering, stated that the vessel could be operated, safely and efficiently by a crew of one.

Attendance of the seminar exceeded one hundred people with an equal split between the public and private sectors. The audience included senior executives from the U.S. Coast Guard, Federal Communications Commission, Department of Navy, U.S. Army Corps of Engineers, National Oceanographic and Atmospheric Administration, several naval architects, shipyards, and major merchant fleet operators.

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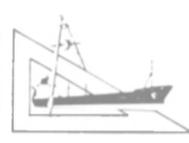
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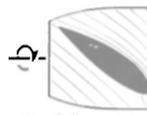
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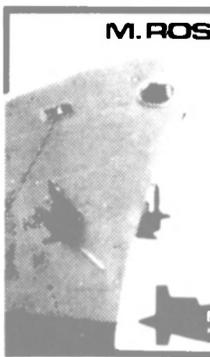
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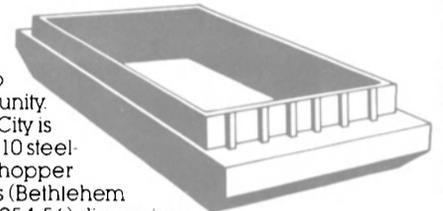
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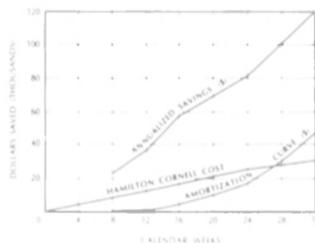
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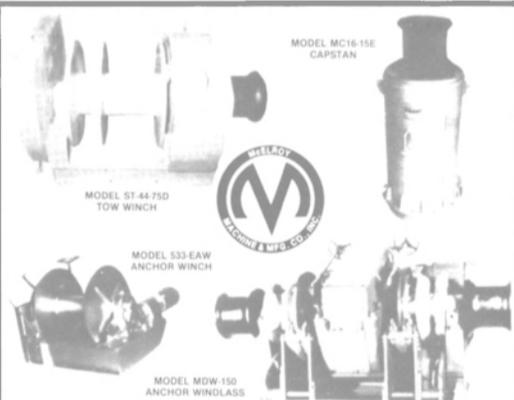
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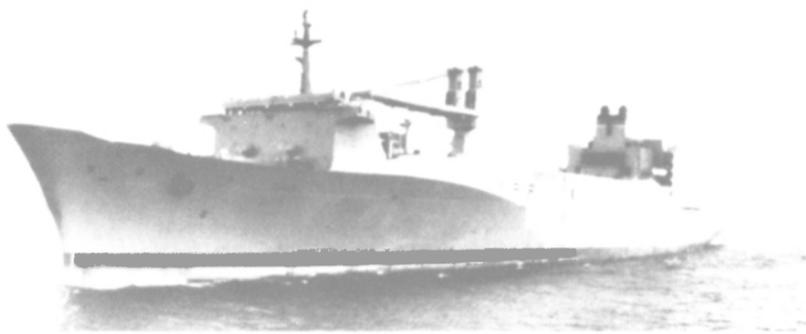
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## Fast Navy Supply Ship Capella Dedicated At Pennsylvania Shipbuilding

The first of the U.S. Navy's new class of fast supply ships, the USNS Capella, was dedicated recently at the Pennsylvania Shipbuilding Company's yard in Chester, Pa. U.S. Senator **Arlen Specter** (R-PA), was the keynote speaker; his wife, Philadelphia Councilwoman **Joan Specter**, dedicated the ship. Rear Adm. **Warren C. Hamm**, USN, Deputy Commander, Military Sealift Command, also spoke at the ceremony.

The dedication ceremony began with an invocation and concluded with the traditional breaking of a bottle of champagne on the ship's bow. Shipyard employees and their families attended, as did many local residents and invited guests.

The Capella is one of the Navy's largest and fastest auxiliary ships. With an overall length of 946 feet, beam of 105 feet 6 inches, depth of 66 feet 7½ inches, and draft of 36 feet 8 inches, the 24,000-dwt vessel is powered by a General Electric/Poster Wheeler steam turbine plant of 120,000 shp that gives her a service speed in excess of 33 knots. She carries tanks, armored personnel carriers, helicopters, and other wheeled equipment for an armored division of the U.S. Army. In one typical arrangement, she will carry 122 M-1 tanks, 183 helicopters of various sizes, and other assorted wheeled equipment.

Helicopters can land on and take off from two landing pads on the topmost deck, and can be stored in the space below it. Tanks and wheeled vehicles are loaded through a special door on each side of the ship. Each door is fitted with a 73- by 20-foot folding ramp that has a design capacity of 65 tons. These doors give access to 185,000 square feet of stowage area distributed over four decks that are connected by internal ramps.

The heavy duty, 35-ton cranes are fitted amidships to handle loads over the side of the ship, and two more, each of 50 tons capacity, are fitted aft for the same purpose and to serve four cargo holds that are arranged to carry both standard 20-foot and 35-foot containers and up to eight Sea Sheds—open-frame

cargo-carrying devices, 35 by 25 by 8 feet—that fit into the same space as three standard containers and are designed to carry outside and extra-heavy (up to 70 tons) loads. Each pair of cranes can also be worked in tandem to provide 70-ton lifts.

The Capella and her sister ships will be independent of port facilities, and can load and unload directly from or to floating causeways, barges, or other ships—a flexibility that can be extremely valuable in an emergency.

The Capella was built by Rotterdam Dockyard in the Netherlands in 1972 as the Sea-Land McLean. She was the first of a revolutionary new class of eight large container ships, known as SL-7s, built in Europe for Sea-Land Service, Inc. for operation in the U.S. foreign trade. At the time, these ships were the largest pure container ships ever built, with a capacity of 1,096 thirty-five foot boxes. What made them unique, however, was their speed. At 33 knots, they could cross the Atlantic in four days and operate a two-week sailing schedule comfortably. They are still the fastest commercial cargo ships of any size or type ever built.

The Capella and three sister ships—Algol, Antares, and Bellatrix—will be operated for the Military Sealift Command by Sea-Land Service under a three-year \$19.7-million contract just awarded by the Navy. Under the contract, Sea-Land will man, operate, and maintain the ships in a reduced operating status with a minimum crew aboard. Two of the vessels will be based at Jacksonville, Fla.; the other two will be berthed in Violet, La. They will be placed in full operating status for 30 days a year for training and exercises purposes.

Sea-Land sold the eight SL-7s to the Navy in 1982 for a total of \$271 million. The other four are currently being converted into fast supply ships, and are scheduled to be redelivered to the Navy between October 1985 and March 1986.

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227	LUFKIN INDUSTRIES, INC. . . . .	MARINE GEAR DRIVES
164	McALLISTER BROS . . . . .	TOWING SERVICES
114	McCAUSEY LUMBER . . . . .	SCAFFOLD PLANKS
268	M.A.N.-B&W DIESEL . . . . .	DIESEL GENERATORS
269	MAGNUS MARITEC . . . . .	MARINE COATINGS
178	MAIN IRON WORKS . . . . .	VESSEL CONSTRUCTION/REPAIR
157	MARINE EQUIPMENT CATALOG . . . . .	ANNUAL MARINE/NAVY CATALOG
270	MARLO COIL NUCLEAR COOLING, INC. . . . .	HEAT TRANSFER EQUIPMENT
113	MORAN TOWING & TRANSPORTATION . . . . .	TOWING SERVICES
280	MOSS POINT MARINE . . . . .	VESSEL CONSTRUCTION/REPAIR
272	NATIONAL MARINE SERVICE . . . . .	SHIPYARD SERVICE/TOWING SERVICES
126	NEWPORT NEWS SHIPBUILDING . . . . .	VESSEL CONSTRUCTION/REPAIR
109	PALMER PRODUCTS . . . . .	CHOCKING COMPOUND/NON-SLIP COATING
189	PHOENIX PRODUCTS . . . . .	MARINE LIGHTS
145	PITTSBURGH BRASS . . . . .	VALVES
140	S.A.C.M. . . . .	DIESEL ENGINES
273	SEACON . . . . .	SHIP REPAIR CONSULTANTS
110	SEAWARD INTERNATIONAL . . . . .	FENDERS
274	SELKIRK METALBESTOS . . . . .	EXHAUST/DUCT SYSTEMS
271	KARL SENNER, INC. . . . .	MARINE GEARS/PROPULSION SYSTEMS
276	SKINNER ENGINE COMPANY . . . . .	STEAM ENGINES
319	STANDARD COMMUNICATIONS . . . . .	MARINE RADIOS
277	SULZER BROTHERS LTD. . . . .	DIESEL ENGINES
278	SUPERIOR ENERGIES . . . . .	INSULATED EXHAUST COVERS
279	TECH DEVELOPMENT INC . . . . .	ENGINE AIR STARTERS
288	THOMAS MARINE . . . . .	VESSEL CONSTRUCTION/REPAIR
244	TODD SHIPYARDS . . . . .	VESSEL CONSTRUCTION/REPAIR
205	U.S. BORAX . . . . .	FUEL FUNGICIDE
119	VOLVO PENTA . . . . .	DIESEL ENGINES
281	WARTSILA DIESEL . . . . .	DIESEL ENGINES
282	WAUKESHA BEARINGS CORP. (THORDON) . . . . .	BEARINGS
179	WILDEN PUMP & ENGINEERING CO. . . . .	PUMPS
191	ZIDELL MARINE GROUP . . . . .	OCEAN BARGES

# BUYERS DIRECTORY

This directory section is an editorial feature published in every issue for the convenience of the readers of **MARITIME REPORTER/Engineering News**. A quick-reference readers' guide, it includes the names and addresses of the world's leading manufacturers and suppliers of all types of marine machinery, equipment, supplies and services. A listing is provided, at no cost for one year in all 24 issues, only to companies with continuing advertising programs in this publication, whether an advertisement appears in every issue or not. Because it is an editorial service, unpaid and not part of the advertiser's contract, MR/EN assumes no responsibility for errors. If you are interested in having your company listed in this Buyers Directory Section, contact John C. O'Malley at (212) 689-3266.

## AIR COMPRESSORS

Flexaust Company, 11 Chestnut St., Amesbury, MA 01913  
Squire Cogswell Company, 3411 Commercial Ave., Northbrook, IL 60062

## AIR CONDITIONING AND REFRIGERATION—REPAIR & INSTALLATION

Bailey Refrigeration Co., Inc., 74 Sullivan St., Brooklyn, N.Y. 11231  
Cospalich Refrigerator Co., Inc., 949 Industry Rd., Kenner, LA 70062  
Flakt AB, Box 8862, S-40272, Gothenburg, Sweden  
Marlo Coil/Nuclear Cooling, Inc., P.O. Box 171, High Ridge, MO 64049  
Mechanical Resources, Inc., 210 West Side Ave., Jersey City, NJ 07305  
Nance Industries, P.O. Box 1547, Beaumont, TX 77704-1547  
Stal Refrigeration AB, Bangsgatan 16, S 601 87 Norrköping, Sweden  
United Technologies Carrier Transcold, P.O. Box 4805, Syracuse, NY 13221

Unitemp Inc., 3590 Kennedy Rd., So. Plainfield, NJ 07080  
York Division, Borg-Warner Corp., P.O. Box 1592, York, PA 17405

## ANCHORS AND CHAIN

G.J. Warteboer Jr. B.V., Eemhavenstraat 4, P.O. Box 5003, 3008 AA Rotterdam, Netherlands  
Neplunia, Via Giovanni da Verrazzano, 12, 16165 Genova, Italy

## ANODES—Cathodic Protection

American United Marine Corp., 5 Broadway, Rte. 1, Sougus, MA 01906  
Engelhard Industries Division, 2655 U.S. Route 22, Union, NJ 07083  
Kaiser Chemical, Div., of Kaiser Aluminum & Chemical Corp., 300 Lakeside Dr., Rm. 1128 KB, Oakland, CA 94643  
The Platt Bros. & Co., Box 1030, Waterbury, CT 06721

## BASKET STRAINERS

North Star Marine & Industrial Products, Inc., 84 Wall Street, Farmingdale, NY 11735

Riley-Beard, P.O. Box 31115, Shreveport, LA 71130

## BEARINGS—Rubber, Metallic, Non-Metallic

Grant Manufacturing & Alloying, Inc., 600 Schoolhouse Rd., Souderton, PA 18964  
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062  
Lucian Q. Moffitt, Inc., P.O. Box 1415, Akron, Ohio 44309  
Norton Chemplast, 309-150 Dey Rd., Wayne, NJ 07470  
Thomson-Gordon Limited, 3225 Mainway, Burlington, Ontario, Canada L7M 1A6

Waukesha Bearings Corp., P.O. Box 798, Waukesha, Wisc. 53186

## BLASTING—Cleaning—Equipment

Apache Equipment, Inc., 10690 Shadow Wood Dr., Suite 112, Houston, TX 77043

Aqua-Dyne Inc., 2208 Karbach St., Houston, TX 77092

Atlantic Sandblasting & Coatings, Inc., 2700 Guy Verger Blvd., Tampa, FL 33605

Aurand, 1270 Ellis St., Cincinnati, OH 45223

Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989

Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England

CLEMCO, P.O. Box 7680, San Francisco, CA 94120

Complete Abrasive Blasting Systems, 18250 68th Avenue South, Kent, WA 98031

E.I. DuPont de Nemours & Co., Inc., Starblast Division, Room X39186, Wilmington, DE 19898

Rockwell International, Power Tool Division, 400 N. Lexington Ave., Pittsburgh, PA 15208

Schmidt Mfg. Inc., P.O. Box 37, Fresno, TX 77545

## BOILERS

B&D Marine and Industrial Boilers, Inc., P.O. Box 5702, North Charleston, SC 29406

Combustion Engineering, Inc., Windsor, Connecticut 06095

Forney Engineering Co., P.O. Box 189, Addison, TX 75001

Foster Wheeler Boiler Corp., 110 S. Orange Ave., Livingston, NJ 07039

Howe-Baker Engineers, Inc. (Econaflex Burners), Combustion Systems Div., P.O. Box 956, Tyler, TX 75710

Way-Wolff Associates Inc., 45-10 Vernon Blvd., Long Island City, NY 11101

## BOILER CLEANING

Asea Stal, 525 Executive Blvd., Elmsford, NY 10523-1296

## BROKERS

S. Danoff U.S.A. Ltd., 2050 Coral Way, Miami, FL 33145

Capt. Astad Company, Inc., P.O. Box 53434, New Orleans, La. 70153

ECO Inc., 1036 Cape St. Claire Center, Annapolis, MD 21401

Hughes Bros., Inc., 17 Battery Pl., New York, N.Y. 10004

## BRONZES—COMMEMORATIVE

Duramax Metals, Inc., 2401 Wesley Street, Portsmouth, VA 23707

## BUNKERING SERVICE

Belcher Company, Inc., 8700 West Flagler, P.O. Box 525500, Miami, FL 33152

Gulf Oil Trading Co., 535 Madison Ave., New York, NY 10022

National Marine Service Inc. (Transport Div.), 1750 Brentwood Blvd., St. Louis, MO 63144

## CARGO HANDLING EQUIPMENT

Alpha Technical Services, Inc., P.O. Box 446, Hamilton, OH 45012

MacGregor-Navire International, Box 8991, S-402 74 Göteborg, Sweden

MacGregor Navire U.S.A. Inc., 135 Dermody St., Cranford, NJ 07016

## CHOCKING SYSTEMS

Palmer Products Inc., P.O. Box 8, Worcester, PA 19490

Philadelphia Resins Corp., 20 Commerce Drive, Montgomeryville, Pa. 18936

## CLAMPS

Band-It Company, P.O. Box 16307, Denver, CO 80216

## CLOSURES—Marine

Cornell-Carr Co. Inc., 63 Main St., Monroe, CT 06468

Mock Manufacturing Inc., 777 Rulland Rd., Brooklyn, NY 11203

## CONDENSERS

Riley-Beard, P.O. Box 31115, Shreveport, LA 71130

## CONTROL SYSTEMS—Monitoring

American United Marine Corp., 5 Broadway, Rte. 1, Sougus, MA 01906

Argo Marine, 140 Franklin St., New York, NY 10013

ASEA, Inc. 4 New King St., White Plains, NY 10604

Autronica Marine USA, 280 Industrial Pkwy., Northvale, NJ 07647

Avering Corp., 7750 East Redfield St., Scottsdale, AZ 85260

Barringer Research, 304 Carlingview Dr., Rexdale, Ontario, Canada M9W5G2

Biospherics Inc., 4928 Wyaconda Rd., Rockville, MD 20852

Bowmar/ALI, Inc., 531 Main St., Acton, MA 01720

Cooper Energy Services, Mount Vernon, OH 43050

Eldred Corp., P.O. Box 100, Lynwood, WA 98036

Louis C. Eitzen Co., P.O. Box 1210, Glenwood Springs, CO 81602

Ergon, Inc., P.O. Drawer 1639, Jackson, MS 39205

Failsafe Motor/Generator Protector, Marine Safe Electronics Ltd., 101 Jar-din Dr., Unit 24/25, Concord, Ontario, Canada L4K 1B6

Fluidyne, a Div. of Electradota Inc., P.O. Box 11366, Santa Rosa, CA 95406

Grumman Aerospace, 111 Stewart Ave., Bethpage, NY 11714

ITT Mackay, 441 U.S. Highway #1, Elizabeth, NJ 07202

Indikon Corp., 26 New St., Cambridge, MA 02138

Kongsberg North America Inc., 400 Oser Ave., Hauppauge, NY 11738

Leslie Co., 401 Jefferson Rd., Parsippany, NJ 07054

Marine Moisture Control Co., 60 Inip Dr., Inwood, NY 11696

Maritime Protection A/S, Box 100, N-4620 Vagsbygd, Norway

Megasystems, Inc., 1075 N.W. 58th Street, Boca Raton, FL 33431

National Control Systems, Inc., 827 Hanley Industrial Court, St. Louis, MO 63144

Nav-Vue, Inc., P.O. Box 1175, Huntsville, TX 77340

Norske Telektron A/S, Drammensveien 126, Oslo 2, Norway

Offshore Technology Corp., 578 Enterprise St., Escondido, CA 92025

Pandel Instruments Inc., 2100 N. Hwy. 360, Grand Prairie, TX 75050

Propulsion Systems, Inc., 21213 76 Ave., Kent, WA 98032

Seaworthy Systems Inc., 36 Main Street, Essex CT 06426

Teleflex Inc., 771 First Ave., King of Prussia, PA 19406

Transamerica Delaval, Inc., Gems Sensors Division, Cowles Road, Plainville, CT 06062

Valmet Automation A.S., P.O. Box 130, N-3430, Spikkestad, Norway

Wesmar Marine Systems Div., 801 Dexter Ave. N., Box C19074, Seattle, WA 98109

## COUPLINGS

Camlock Flange Sales Corp., 60 Inip Dr., Inwood, NY 11696

SKF Steel, 20 Tower Lane, P.O. Box 745, Avon, CT 06001

## CRANES—HOISTS—DERRICKS—WHIRLEYS

American Hoist & Derrick Company (AMHoist), St. Paul, MN 55107

Appleton Marine, P.O. Box 2339, Appleton, WI 54913

ASEA Stal-Laval Inc., 525 Executive Blvd., Elmsford, NY 10523

Blohm & Voss Company, 55 Morris Avenue, Springfield, NJ 07081

Chester Hoist Division, Monogram Industries, P.O. Box 229, Lisbon, OH 44432

Grove Manufacturing Co., P.O. Box 21, Shady Grove, PA 17256

HIAB Cranes & Loaders Inc., R.D. 22 Interchange Place, York, PA 17404

Herz Equipment Rental Corp., 7 Entin Rd., Bldg # 2, Parsippany, NJ 07054

Machinexport, 35 Maslommovskaya Ul., 117330 Moscow, U.S.S.R.

Marine Travelift, Inc., 49 E. Yew St., Sturgeon Bay, WI 54235

National Crane Corp., 11200 North 148 St., Waverly, NE 68462

National Supply Company, 1455 West Loop South, Houston, TX 77027

J.D. Neuhaus, Hebezeuge, D5810, Witten Heven, West Germany

Superior-Lidgerwood-Mundy Corp., 1101 John Ave., Superior, WI 54880

## DECK MACHINERY—Cargo Handling Equipment

Argo Marine, 140 Franklin St., New York, NY 10013

Marine Technical Associates, 195 Patterson Avenue, Little Falls, NJ 07424

Markey Machinery Co., Inc., 79 S. Horton St., Seattle, Wash. 98134

Murdock Engineering Company, P.O. Box 2278, Irving, TX 75061

## DECKING—GRATING

International Grating, Inc., 7625 Parkhurst, Houston, TX 77028

Selby, Battersby & Company, 5220 Whiby Ave., Philadelphia, PA 19143

J.E. Steigerwald Co., Inc., 5515 Belair Rd., Baltimore, MD 21206

## DIESEL ACCESSORIES—CYLINDER LINERS

B & W Marine Service, 50 Broadway, New York, NY 10004

General Thermodynamics Corporation, 210 South Meadow Road, P.O. Box 1105, Plymouth, Massachusetts 02360

Golten Marine Co., Inc., 160 Van Brunt St., Brooklyn, NY 11231

Haynes Corporation, P.O. Box 179, Jackson, MI 49204

Van der Horst Corp. of America, 314 Penn Ave., Olean, NY 14760

## DIESEL ENGINE—Spare Parts & Repair

Golten Marine Co., Inc., 160 Van Brunt St., Brooklyn, NY 11231

## ELECTRICAL EQUIPMENT

Argo Marine, 140 Franklin St., New York, NY 10013

Jergens Inc., 19520 Nottingham Rd., Cleveland, OH 44110

Marine Electric RPD, Inc., 666 Pacific St., Brooklyn, NY 11217

Valad Electric Heating Corporation, 162 Wildey St., Tarrytown, NY 10591

Ward Leonard Electric Co., 31 South St., Mt. Vernon, NY 10550

Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, Ore. 97201

## EMULSIFICATION SYSTEMS

Cleanodan A/S, N. American Agents, American United Marine Corp., 5 Broadway, Route 1, Sougus, MA 01906

Fire-Brite, Hoffert Manufacturing Co., Inc., 3749 Progress Rd., Norfolk, VA 23502

## EQUIPMENT—Marine

American General/Levin Corp., 445 Littlefield Ave., So. San Francisco, CA 94080

Argo Marine, 140 Franklin St., New York, NY 10013

ASEA Stal-Laval Inc., 525 Executive Blvd., Elmsford, NY 10523

Band-It Division, Houdaille Industries, Inc., P.O. Box 16307, Denver, CO 80216

Thomas Coudon Associates, 6655 Amberton Dr., Baltimore, MD 21227

Fitz-Wright Suits Ltd., 17919 Roan Pl., Surrey, B.C., Canada V3S 5K1

Genstar Stone Products Company, Executive Plaza IV, Hunt Valley, MD 21031

Harvey's Commercial Marine Div., 2505 S. 252nd St., Kent, WA 98032

b.v. Holmatro Industrial Equipment, P.O. Box 33, 4940 aa Raamsdonksveer, Holland

Imperial Manufacturing Co., P.O. Box 4119, Bremerton, WA 98312

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

Kearfoot Marine Products, 550 South Fulton Ave., Mount Vernon, N.Y. 10550

Maritime Power Corp., 200 Henderson Street, Jersey City, NJ 07302

John P. Nissen, Jr. Company, Glenside, PA 19038

Stal-Laval Turbin AB, S-612 20 Finspong, Sweden

## EVAPORATORS

Alfa-Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024

Aqua-Chem Inc., P.O. Box 421, Milwaukee, WI 53201

MECO (Mechanical Equipment Company, Inc.), 861 Carondelet St., New Orleans, LA 70130

Riley-Beard, P.O. Box 31115, Shreveport, LA 71130

## FANS—VENTILATORS—BLOWERS

American United Marine Corp., 5 Broadway, Rte. 1, Sougus, MA 01906

Argo Marine, 140 Franklin St., New York, NY 10013

Gaylord Industries, Inc., P.O. Box 558, Wilsonville, OR 97070

Hartzell Fan, Division of Castle Hills Corp., 901 S. Downing St., P.O. Box 919, Piqua, OH 45356

Joy Manufacturing Company, 338 So. Broadway, New Philadelphia, OH 44663

Zidell Explorations, 3121 S.W. Moody St., Portland, Ore. 97201

## FENDERING SYSTEMS—Dock & Vessel

Hughes Bros., Inc., 17 Battery Place, New York, N.Y. 10004

InterTrade Industries, 15301 Transistor Lane, Huntington Beach, CA 92649

Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062

Samson Ocean Systems, Inc., 99 High St., Boston, MA 02110

Seaward International, Inc., 6269 Leesburg Ave., Falls Church, VA 22044

## FILTERS

Dahl Manufacturing, Inc., 2521 Railroad Ave., Ceres, CA 95307

Mueller Steam Specialty, P.O. Box 1569, Lumberton, NC 28359

Wm. W. Nugent & Co., P.O. Box 948, Skokie, IL 60076

## FINANCING—Leasing

A.G. Becker Paribus Inc., 2 First National Plaza, Chicago, IL 60670

Gulf Western Leasing Corp., 1500 City West Blvd., Suite 300, Houston, TX 77047

Yegen Marine, P.O. Box 25504, Ft. Lauderdale, FL 33320

## FIRE PROTECTION, DETECTION, & ALARM SYSTEMS

EEV, Inc., 7 Westchester Plaza, Elmsford, NY 10523

Gulf Publishing Company Video (Firefighting Videotape), P.O. Box 2608, Houston, TX 77001

Walter Kidde, Walter Kidde Dr., Wake Forest, NC 27586

Wormald Fire Systems, One Stanton St., Marinette, WI 54143

## FUEL OIL/ADDITIVES—Analysis & Combustion Testing

Ferrous Corporation, 910-108th N.E., P.O. Box 1764, Bellevue, WA 98009

Fuji Trading (America) Ltd., 17 Battery Place, New York, NY 10004

McTigue Industries Inc., 1615 9th Ave., Bohemia, NY 11716

U.S. Borax, 3075 Wilshire Blvd., Los Angeles, CA 90010

## FURNITURE

Bailey Carpenter & Insulation Co., 74 Sullivan Street, Brooklyn, N.Y. 11231

Comfort-Mate, Inc., 7988 NW 56th Street, Miami, FL 33166

## GALLEY EQUIPMENT

Argo Marine, 140 Franklin St., New York, NY 10013

Insinger Machine Tool Co., 6245 State Rd., Philadelphia, PA 19135

## GANGWAYS

Rampmaster Inc., 9825 Osceola Blvd., Vero Beach, FL 32960

## HATCH & DECK COVERS—Chain Pipe

Camlock Flange Sales Corp., 60 Inip Dr., Inwood, NY 11696

Hayward Marine Products, 900 Fairmount Avenue, Elizabeth, NJ 07207

Marine Moisture Control Co., 60 Inip Dr., Inwood, N.Y. 11696

MacGregor-Navire International, Box 8991, S-402 74 Göteborg, Sweden

MacGregor Navire U.S.A. Inc., 135 Dermody St., Cranford, NJ 07016

Mock Manufacturing Inc., 777 Rulland Rd., Brooklyn, NY 11203

J.E. Steigerwald Co., Inc., 5515 Belair Rd., Baltimore, MD 21206

## HEAT EXCHANGERS

# BUYERS DIRECTORY

(continued)

Bretagne ACB Corp., 344 Camp St., Suite 1000, New Orleans, LA 70130  
Carl G. Brimmekamp & Co., Inc., 102 Hamilton Ave., Stamford, CT 06902  
C.A.C.I., Inc., 1815 No. Fort Myer Dr., Arlington, VA 22209  
C.D.I. Marine Co., 5520 Los Santos Way, Suite 600, Jacksonville, FL 32211  
C.T. Marine, 18 Church Street, Georgetown, CT 06829  
Phillips Cartner & Co., Inc., 203 So. Union St., Alexandria, VA 22314  
Century Engineering, Inc., 32 West Rd., Towson, MD 21204  
Childs Engineering Corp., Box 333, Medfield, Mass. 02052  
John P. Colletti & Associates, P.O. Box 13378, Pittsburgh, PA 15243  
Crandall Dry Dock Engrs., Inc., 21 Pottery Lane, Dedham, Mass. 02026  
Crane Consultants Inc., 15301 1st Ave., So. Seattle, Washington 98148  
C.R. Cushing & Co., Inc., One World Trade Center, New York, N.Y. 10048  
Design Associates Inc., 14360 Chef Menleur Highway, New Orleans, LA 70129  
Designers & Planners, Inc., 1725 Jefferson Davis Highway, Suite 700, Arlington, VA 22202  
ECO Inc., 1036 Cape St. Claire Center, Annapolis, MD 21401  
Parker C. Emerson & Associates, 17935 Cardinal Drive, Lake Oswego, Oregon 97034  
Encon Management & Engineering Consultant Services, P.O. Box 7760, Beaumont, TX 77706  
Fleetweather Ocean Services, Inc., Rd. # 2, Box 260, Hopewell Junction, NY 12533  
Christopher J. Foster, Inc., 16 Sintsink Drive East, Port Washington, N.Y. 11050  
Friede and Goldman Ltd., 935 Gravier St., New Orleans, LA 70112  
GEOD Corporation, 73 Oak Ridge Road, NJ 07438  
Giannotti & Associates, Inc., 703 Giddings Ave., Suite U-3, Annapolis, MD 21401  
Gibbs & Cox, Inc., 119 West 31st Street, New York, NY 10001  
John W. Gilbert Associates, Inc., 66 Long Wharf, Boston, MA 02110  
The Glosten Associates, Inc., 610 Colman Bldg., 811 First Ave., Seattle, WA 98104  
Phillip Gresser Associates, Ltd., 3250 South Ocean Blvd., Palm Beach, FL 33480  
Morris Gurolnick Associates, Inc., 620 Folsom Street, Suite 300, San Francisco, CA 94107  
Hamilton Cornell Associates, Box 188, Snug Harbor Station, Duxbury, MA 02331  
J.J. Henry Co., Inc., Two World Trade Center—Suite 9528, New York, N.Y. 10048  
Hi-Test Laboratories, Inc., P.O. Box 226, Buckingham C.H., VA 23921  
Hoffman Maritime Consultants Inc., P.O. Box 186, Glen Head, NY 11545  
Intramarine, Inc., P.O. Box 53043, Jacksonville, FL 32201  
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073  
Capt. Ernest James, 2849 Beavercrest Dr., Lorain, OH 44053  
Janzen Engineering Co., 6655-H Ambermont Drive, Baltimore, Md. 21227  
J.L. Konopasek & Associates, 3523 Scrimshaw Dr., Jacksonville, FL 32217  
James S. Kroger & Co., Inc., 3333 Rice St., Miami, Fla. 33133  
Rodney E. Lay & Associates, 13891 Atlantic Blvd., Jacksonville, FL 32225  
Alan C. McClure Associates, Inc., 2600 South Gessner, Houston, TX 77063  
John J. McMullen Associates, Inc., 1 World Trade Center, New York, N.Y. 10048  
MacLear & Harris, Inc., 28 West 44 Street, New York, N.Y. 10036  
Fendall Marbury, 1933 Lincoln Drive, Annapolis, MD 21403  
Marine Consultants & Designers, Inc., 308 Investment Insurance Bldg., Corner E. 6th St. & Rockwell Ave., Cleveland, Ohio 44114  
Marine Design Inc., 401 Broad Hollow Road, Rte. 110, Melville, N.Y. 11746  
Marine Power Associates, 4475 Mission Blvd., Suite 235, San Diego, CA 92109  
Marine Technical Associates, Inc., 95 River Rd., Hoboken, NJ 07030  
George E. Meese, 194 Acton Rd., Annapolis, MD 21403  
Metritape Inc., P.O. Box 2366, Littleton, CO 80140  
R. Carter Morrell, 715 S. Cherokee, Bartlesville, OK 74003  
NKF Engineering Assoc., Inc., 8150 Leesburg Pike, Vienna, VA 22202  
Nelson & Associates, Inc., 1405 N.W. 167th Street, Miami, FL 33169  
New England Engineering & Marine Services, Rt. 2, Box 50, York, ME 03909  
Nickum & Spaulding Associates, Inc., 2701 First Ave., Seattle, WA 98121  
Northern Marine, P.O. Box 1169, Traverse City, MI 49685  
Ocean-Oil International Engineering Corporation, 3019 Mercedes Blvd., New Orleans, La. 70114  
PRC Guralnick, 5252 Balboa Ave., San Diego, CA 92117  
Pearlson Engineering Co., Inc., 8970 S.W. 87th Ct., Miami, Florida 33156  
S.L. Petchul, Inc., 1380 S.W. 57th Avenue, Fort Lauderdale, FL 33317  
Precision Systems Engineering, 8248 Eastgate Dr., Mt. Laurel, NJ 08054  
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 667 Mission St., San Francisco, CA 94105  
Schmahl and Schmahl, Inc., 1209 S.E. Third Ave., Fort Lauderdale, Florida 33316  
SEACOR Systems Engineering Associates Corp., 19 Perina Blvd., Cherry Hill, NJ 08003 (Publications Division at Cherry Hill location)  
STV/Sanders & Thomas, Inc., 1745 Jefferson Davis Hwy., Arlington, VA 22202  
Seaworthy Engine Systems, 36 Main Street, Essex, CT 06426  
Seaworthy Engine Systems, 17 Battery Place, New York, NY 10004  
George G. Sharp, Inc., 100 Church St., New York, N.Y. 10007  
Simmons Associates, P.O. Box 760, Sarasota, FL 33578  
R.A. Stearn, Inc., 253 N. 1st Ave., Sturgeon Bay, WI 54235  
J.F. Stroschein Associates, 666 Old Country Rd., Garden City, NY 11530  
Richard R. Taubler, Inc., 610 Carriage La., Dover, DE 19901  
Timsco, 622 Azalea Road, Mobile, AL 36609  
Tracor Hydronautics, Inc., 7210 Pindell School Rd., Laurel, MD 20707  
Uhlig & Associates, Inc., 8295 SW 188th St., Miami, FL 33157  
Vevey Engineering Works Ltd., CH-1800 Vevey, Switzerland, U.S. Rep. Carl G. Brimmekamp & Co., Inc., 102 Hamilton Ave., Stamford, CT 06902  
Thomas B. Wilson, Associates, 1258 North Avalon Blvd., Wilmington, CA 90744  
Yacht Design Institute, 9 Main St., Blue Hill, ME 04614

**NAVIGATION & COMMUNICATIONS EQUIPMENT**  
American Hydromath Co., Buckwheat Bridge Rd., Germantown, N.Y. 12526  
Anschutz & Co. GmbH, Postfach 6040, D-2300 Kiel 14, West Germany  
Alkinson Dynamics, Section 6, 10 West Orange Ave., South San Francisco, CA 94080  
CMC Communications Inc., 5479 Jetport Industrial Blvd., Tampa, FL 33614  
COMSAT World Systems, 950 L'Enfant Plaza, S.W., Suite 6151 Washington, D.C. 20024  
Cybernet International, Inc., 7 Powder Horn Dr., Warren, NJ 07060  
A/S Elektrisk Bureau, P.O. Box 98, N-1360 Nesbru, Norway  
Electro-Nav Inc., 840 Bond Street, Elizabeth, NJ 07201  
EPSCO Marine, 550 Wholesalers Parkway, Horsham, LA 70123  
Fleet Marine, 1820 N.E. 146th Street, North Miami, FL 33181  
Furuno U.S.A., 271 Harbor Way, S. San Francisco, CA 94080  
Harris Communications (RF Communications), 1680 University Avenue, Rochester, NY 14610  
Henschel Corp., 9 Hoyt Drive, Newburyport, MA 01950  
Hase McCann Telephone Company, Inc., 9 Smith Street, Englewood, NJ 07631  
Japan Radio Co., Ltd., Akasaka Twin Tower (Main), 17-22 Akasaka 2-

chome, Minato-ku, Tokyo 107, Japan  
King Radio Corporation, 400 North Rodgers Rd., Olathe, KS 66062  
Kongsberg North America Inc., 400 Oser Ave., Hauppauge, NY 11738  
Kongsberg Vapenfabrikk, Norcontrol Division, P.O. Box 145, Horten 3191, Norway  
Krupp Atlas-Elektronik, 1453 Pinewood St., Rahway, NJ 07065  
Lorain Electronics Corp., 2307 Leavitt Rd., Lorain, OH 44052  
Magnavox Navigation Systems, 2829 Maricopa Street, Torrance, CA 90503  
Magnum Distributors Inc., 1000 S. Dixie Hwy. #3, Pompano Beach, FL 33060  
Nav-Com, Inc., 9 Brandywine Drive, Deer Park, NY 11729  
Navidyne Corp., 11824 Fishing Point Drive, Newport News, VA 23606  
Perko Inc. (Lights), P.O. Box 6400D, Miami, FL 33164  
Racal-Decca Marine, Inc., 4200 23rd Avenue West, Seattle, WA 98199  
Radar Devices, Inc., 2955 Merced Street, San Leandro, CA 94577  
Radio-Holland USA, Inc., 6033 South Loop East, Houston, TX 77033  
Raytheon Marine Co., 676 Island Pond Road, Manchester, N.H. 03103  
Raytheon Ocean Systems Company, Westminster Park, Risho Avenue, East Providence, RI 02914  
Raytheon Service Co., 103 Roesler Rd., Glen Burnie, MD 21061  
Rivertronics, P.O. Box 247, Godfrey, IL 62035  
Robertson Auto Pilot, 400 Oser Ave., Hauppauge, NY 11738  
Selesmar S.p.A., Casella Postale 9, 50020 Montagnana Val Di Peso, Firenze, Italy  
Servo Corporation of America, 111 New South Road, Hicksville, NY 11802  
Simrad, Inc., 2208 N.W. Market St., Suite 600, Seattle, WA 98107  
Sperry Corporation, Great Neck, NY 11020  
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009  
Texas Instruments, Inc., P.O. Box 405, 3438, Lewisville, TX 75067

**OILS—Marine—Additives**  
Gulf Oil Company—U.S. (Domestic Oils), 909 Fannin Street, Houston, TX 77001  
Gulf Oil, New York District Sales Office (Domestic), 433 Hackensack Avenue, Hackensack, NJ 07601  
Gulf Oil Trading Co., 535 Madison Ave., New York, NY 10022  
Mobil Oil Corp., 150 East 42 Street, New York, NY 10017  
Shell Oil Co., 1 Shell Plaza, Houston, Texas 77002  
Texaco, Inc. (International Marine), 135 East 42nd St., N.Y., N.Y. 10017

**OIL/WATER SEPARATORS**  
Alfa Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024  
Biospherics Incorporated, 5001 Forbes Blvd., Lanham, MD 20801  
Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989  
Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England  
Centrico, Inc. (Westfalia Separators), 100 Fairway Court, Northvale, NJ 07647  
Dahl Manufacturing, Inc., 2521 Railroad Ave., Ceres, CA 95307  
Hyde Products, Inc. 810 Sharon Dr., Westlake, OH 44148  
Microphor, Inc., P.O. Box 490, Willis, CA 95490  
Marine Moisture Control Co., 60 Inip Dr., Inwood, NY 11696  
National Fluid Separators, Inc., 1239 Hanley Industrial Court, St. Louis, MO 63144  
PACE Maine Systems, Div. of St. Louis Ship, 611 E. Marceau St., St. Louis, MO 63111  
Phoenix Oil Refiner Co., Inc., 330 Hill Ave., Nashville, TN 37210

**PAINTS—COATINGS—CORROSION CONTROL**  
American Abrasive Metals, 460 Coit Street, Irvington, NJ 07111  
Ameron, 4700 Ramona Blvd., Monterey Park, CA 91754  
Argo Marine, 140 Franklin St., New York, NY 10013  
Bareco, 6910 East 14th St., Tulsa, OK 74112  
A.W. Chesterton Co., Middlesex Industrial Park, Rt. 93, Stoneham, MA 02180  
Chugoku Marine Paints (U.S.A.) Inc., 1290 Ave. of Americas, New York, NY 10104  
CLEMCO, P.O. Box 7680, San Francisco, CA 94120  
"CONSOL" manufactured by Contact Paint & Chemical Co. Inc., 200 S. Franklinton Rd., Baltimore, MD 21223  
Dampney Company, Inc., 85 Paris St., Everett, MA 02149  
Devco Marine Coatings Co., P.O. Box 7600, Louisville, KY 40207  
Drew Ameroid Marine, One Drew Chemical Plaza, Boonton, NJ 07005  
E.I. Dupont de Nemours & Co., Inc., Nemours Bldg. Rm. N-2504-2, Wilmington, DE 19898  
Esgard, Box 2698, Lafayette, LA 70502  
Eureka Chemical Company, 234 Lawrence Avenue, So. San Francisco, CA 94080  
Glidden Coatings & Resins, Architectural & Maintenance, 925 Euclid Ave., Cleveland, OH 44115  
Grow Group, Inc., 200 Park Ave., New York, NY 10017  
Hempel Marine Paints, Inc., Foot of Currie Ave., Wallington, NJ 07057, 2425 Fountainview, Suite 340, Houston, TX 77057, P.O. Box 10265, New Orleans, LA 70181  
International Paint Company, Inc., 2270 Morris Avenue, Union, NJ 07083  
Jaegle Paint Co., Inc., 1912 Darby Rd., Haverstown, PA 19083  
Jotun Marine Coatings Inc., 840 Key Hwy., Baltimore, MD 21230  
Magnus Maritec International Inc., 150 Roosevelt Pl., P.O. Box 150, Polesides Park, NJ 07650  
Norton Chemplast, 309-150 Dey Rd., Wayne, NJ 07470  
Palmer Products Inc., P.O. Box 8, Worcester, PA 19490  
Pile-Gard\* Manufactured by Osmose-Marine Div., P.O. Drawer 0, Griffin, GA 30224  
Products Research & Chemical Corp., 5454 San Fernando Rd., Glendale, CA 91203  
Seaguard, 4030 Seaguard Ave., Portsmouth, VA 23705  
Selby, Battersby & Company, 5220 Whiby Avenue, Philadelphia, PA 19143  
Sermatech International, 4401 SermeTel Dr., Moss Point, MS 39563

**PETROLEUM SUPPLIES**  
Shell Oil Co., 1 Shell Plaza, Houston, Texas 77002

**PIER REPAIRS**  
Acquatic Marine Systems, Inc., P.O. Box 326, Williamsville, NY 14221

**PIPE-HOSE—Cargo Transfer, Clamps, Couplings, Coatings**  
Cajon Company, 9760 Shepard Rd., Macedonia, OH 44056  
Camlock Flange Sales Corp., 60 Inip Dr., Inwood, NY 11696  
Crowford Fitting Company, 29500 Salon Rd., Salon, OH 44139  
Hydro-Craft, Inc., 1821 Rochester Industrial Dr., Rochester, MI 48063  
Knights Piping Inc., 5309 Industrial Rd., Pascagoula, MS 39567  
Metropolitan Plumbing Supply Corp., 5000 Second St., Long Island City, NY 11101  
Penco Div./Hudson Engineering Co., One World Trade Center, Suite 3000, New York, NY 10048  
Selkirk Metalbestos, Box 19000, Greensboro, NC 27419  
Stauff Corporation, 21-31 Industrial Park, Waldwick, NJ 07463

**PLASTICS—Marine Applications**  
Hubeva Marine Plastics, Inc., 390 Hamilton Ave., Bklyn, N.Y. 11231

**PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines**  
American Lohmann Corp., 1415 Chestnut Ave., Hillside, NJ 07205  
Aquamaster, 4125 9th Ave., Seattle, WA 98107  
Arcco Steel/Advanced Materials Div., 703 Curtis St., Middletown, OH 45043  
Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, La. 70150  
Bergen Diesel Inc., 2110 1-10 Service Rd., Kenner, LA 70062  
Bird Johnson Company, 110 Norfolk St., Walpole, Mass. 02081  
Bombardier, 1051 Dickson, Montreal, Quebec, Canada H1N 2H7  
Burmeister & Wain Alpha Diesel AS, DK-1400 Copenhagen K, Denmark  
Capitol Gears, 349 N. Hamline Ave., St. Paul, Mn. 55104  
Caterpillar Engine Division, 100 N.E. Adams, Peoria, IL 61629  
Cincinnati Gear Co., 5657 Wooster Pike, Cincinnati, OH 45227  
Call Industries Inc. (Fairbanks Morse Engine Div.), 701 Lawton Avenue, Beloit, WI 53511  
Columbian Bronze Corporation, 216 No. Main Street, Freeport, NY 11520  
Combustion Engineering, Inc., Windsor, Connecticut 06095  
Daihatsu Diesel (USA) Inc., 180 Adams Ave., Hauppauge, NY 11788

Deutz Corp., 7585 Ponce de Leon Circle, Atlanta, GA 30340  
Diesel Marine International, Ltd., c/o NORSHIPCO, P.O. Box 2100, Norfolk, VA 23501  
Elliott Company, 1809 Sheridan Ave., Springfield, OH 45505  
General Electric Co., Diesel Power Products, 2901 E. Lake Rd., Erie, PA 16531  
General Motors, Electro-Motive Division, LaGrange, IL 60525  
George Engine Company, Inc., Lafayette, LA  
Goltzen Marine Co., Inc., 160 Van Brunt St., Brooklyn, NY 11231  
Harbormaster, 36 Hancock St., Quincy, MA 02171  
Isotta Fraschini S.p.A., c/o Italian Aerospace Industries (U.S.A.), Inc., 1235 Jefferson Davis Hwy., Suite 500, Arlington, VA 22202  
KHD Canada Inc., 180 Rue de Normandie, Boucherville, Quebec J4B 5S7 Canada  
KaMeWa, P.O. Box 1010, S-68101, Kristinehamn, Sweden  
KaMeWa, 1800 West Loop So., Suite 1620, Houston, TX 77027  
Krupp Mak Diesels, Inc., 4329-33 Di Paolo Center, Glenview, IL 60025  
Lips Propellers, 3617 Koppens Way, Chesapeake, VA 23323  
Lufkin Industries, Inc., P.O. Box 749, Lufkin, TX 75901  
M.A.N.-B&W Diesel, 2, Ostervej, DK-4960 Holeyb, Denmark  
MTU of North America, One E. Putnam Ave., Greenwich, CT 06830; 10450 Corporate Dr., Sugarland, TX 77478; 2945 Railroad Ave., Morgan City, LA 70203; 180 Nickerson St., Seattle, WA 98109; 1730 Lynn St., Arlington, VA 22209  
MWM-Murphy Diesel, 12 Greenway Plaza, Suite 1100, Houston, TX 77046  
Mapeco Products, Inc., 20 Vesey St., New York, NY 10007  
Maritime Industries Ltd., 6307 Laurel St. Burnaby, B.C., Canada V5B3B3  
Michigan Wheel, 1501 Buchanan Ave., S.W., Grand Rapids, MI 49507  
National Marine Service Louisiana, Inc., 222 Bayou Rd., Belle Chasse, LA 70037  
Omnithruster Inc., 9515 Sorensen Ave., Santa Fe Springs, CA 90670  
Penske GM Power, Inc., 600 Parsippany Road, Parsippany, NJ 07054  
Inland Water Propulsion Systems, Inc., 580 Walnut St., Cincinnati, OH 45201  
Propulsion Systems, Inc., 21213 76 Ave. So., Kent, WA 98032  
SACM (Societe Alsacienne De Constructions Mechaniques De Mulhouse) 1, Rue De La Fonderie, Boite Postale 1210, 68054 Mulhouse Cedex, France  
Schottel of America, Inc., 8375 N.W. 56 St., Miami, FL 33166  
Karl Senner, Inc., P.O. Box 10055, New Orleans, LA 70181  
Skinner Engine Company, P.O. Box 1149, Erie, PA 16512  
Stewart & Stevenson Services, Inc., P.O. Box 1637, Houston, TX 77251-1637  
Sulzer Brothers, Dept. Diesel Engines, CH-8401 Winterthur, Switzerland  
Tech Development Inc., 6800 Poe Ave., P.O. Box 14557, Dayton, OH 45414  
Transamerica DeLaval Inc., Engine & Compressor Div., 550 85th Ave., Oakland, CA 94621  
Transamerica DeLaval, Inc., Turbine & Compressor Div., P.O. Box 8788, Trenton, N.J. 08650  
Turbine Specialties, Inc., P.O. Box 207, West State Street Road, Salina, KS 67401  
Turbine Specialties/Gulf Coast, Inc., 1900 Industrial Blvd., Harvey, LA 70058  
Ulstein Trading Ltd. A/S, N-6-65, Ulsteinvik, Norway  
Voith Schneider America, 159 Great Neck Rd., Ste 200, Great Neck, NY 11021  
Volvo Penta of America, P.O. Box 927, Rockleigh, NJ 07647  
WABCO Fluid Power, an American-Standard Company, 1953 Mercer Rd., Lexington, KY 40505  
Wartsila Power Inc., 5132 Taravella Rd., P.O. Box 868, Marrero, LA 70072  
Waukesha Engine Division, Waukesha, WI 53187  
Welco Industries, Inc., 9027 Shell Rd., Cincinnati, OH 45236  
ZF of North America, Inc., 3225 Commercial Avenue, Northbrook, IL 60062  
ZF of North America, Inc. (Motive Power Corporation, P.O. Box 365, Mineola, NY 11501)

**PUMPS—Repairs—Drives**  
Argo Marine, 140 Franklin St., New York, NY 10013  
Jim's Pump Repair, 48-55 36th St., Long Island City, NY 11101  
Megator Corporation, 562 Alpha Drive, Pittsburgh, PA 15238  
Penco Div./Hudson Engineering Co., One World Trade Center, Suite 3000, New York, NY 10048  
Sims Pump Valve Co., Inc., 1314 Park Ave., Hoboken, NJ 07030  
Transamerica DeLaval, Pyramid Pump Div., P.O. Box 447, Monroe, NC 28110  
Vita Motivator Company, 200 West 20th St., New York, NY 10011  
Warren Pumps Division, Bridges Avenue, Warren, MA 01083  
Wilden Pump & Engineering Co., 22060 Van Buren St., P.O. Box 845, Colton, CA 92324

**REFRIGERATION—Refrigerant Valves**  
Bailey Refrigeration Co., Inc., 74 Sullivan St., Brooklyn, N.Y. 11231  
Port Refrigeration Div., 157 Perry St., New York, NY 10014

**ROLLING SYSTEMS**  
Hilman, Inc., 2604 Atlantic Ave., Wall (Belmar), NJ 07719

**ROPE—Manila—Nylon—Hawsers—Fibers**  
American Mfg. Co., Inc., Willow Avenue, Honesdale, Pa. 18431  
Atlantic Cordage Corp., 60 Grant Avenue, Carteret, NJ 07008  
DuPont Co., KEVLAR Aramid Fiber, Room G-15465, Wilmington, DE 19898  
Norton Chemplast, 309-150 Dey Rd., Wayne, NJ 07470  
Samson Ocean Systems, Inc., 99 High Street, Boston, Mass. 02110  
Tubbs Cordage Company, P.O. Box 709, Orange, CA 92666  
Wall Industries, Inc., P.O. Box 560, Elkin, NC 28621

**RUDDER ANGLE INDICATORS—STEERING**  
Hy-Drive America Corp., 3629 Vernon Blvd., Long Island City, NY 11106  
Marine Drive Systems, 519 Raritan Center, Edison, NJ 08817  
Robertson, 135 Fort Lee Rd., Leonia, NJ 07605

**SAFETY EQUIPMENT**  
Wormald Fire Systems, One Stanton St., Marinette, WI 54143

**SANITATION DEVICES—Pollution Control**  
Argo Marine, 140 Franklin St., New York, NY 10013  
Davit Sales Inc., P.O. Box 232, Jefferson Valley, NY 10535  
Envirovac Inc., 1260 Turret Dr., Rockford, IL 61111  
FAST Sewage Systems, Div. of St. Louis Ship, 611 East Marceau St., St. Louis, MO 63111  
Marine Moisture Control Co., Inc., 60 Inip Dr., Inwood, L.I., N.Y. 11696  
National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48105

**SCAFFOLDING EQUIPMENT—Work Platforms**  
McCausey Lumber Co., 7751 Lyndon, Detroit, MI 48238  
Patent Scaffolding Co., One Bridge Plaza, Fort Lee, NJ 07024  
Trus-Joist Corp., P.O. Box 60 Boise, ID 83704

**SCUTTLES/MANHOLES**  
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

**SHAFT SEALS, REVOLUTION INDICATOR EQUIPMENT**  
Bird-Johnson Co., 100 Norfolk St., Walpole, MA 02081  
Crone Packing Company, 435 Regina Dr., Clarksburg, MD 20734  
EG&G Sealol, Engineered Products Div., Marine Products Group, Warwick, RI 02888  
Norton Chemplast, 309-150 Dey Rd., Wayne, NJ 07470  
Penco Div./Hudson Engineering Co., One World Trade Center, Suite 3000, New York, NY 10048

**SHIPBREAKING—Salvage**  
The Boston Metals Co., 313 E. Baltimore St., Baltimore, Md. 21202  
Fred Devine Diving & Salvage, Inc., 6211 N. Ensign, Swan Island, Portland, OR 97217  
Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, Ore. 97201

**SHIPBUILDING EQUIPMENT**  
Pearlson Engineering Co., P.O. Box 8, Kendall Branch, Miami, FL 33156  
Total Transportation System Inc., 813 Forrest Dr., Newport News, VA 23606  
Total Transportation Systems (International) A/S, Bjornegarden, P.O. Box 248, N 5201, Os, Norway

**SHIPBUILDING STEEL**  
Arcco Steel Corp., 703 Curtis St., Middletown, Ohio 45042  
Bethlehem Steel Corp., Martin Tower, Bethlehem, PA 18018  
Tilne, P.O. Box 729, Albany OR 97321  
United States Steel Corp., Christy Park Plant, 2214 Walnut St., McKeesport, PA 15132

Welded Beam Company, P.O. Box 280, Perry OH 44081  
**SHIPBUILDING—Repairs, Maintenance, Drydocking**  
 Alabama Maritime Corp., P.O. Box 3026, Mobile, AL 36652  
 Amsterdam Drydock Company, Post Box 3006, 1003 AA, Amsterdam, Holland  
 Arsenale Triestino-San Marco Shipyard, Trieste, Italy, U.S. Rep. Marine Technologies & Brokerage, 33 Rector St., New York, NY 10006  
 Asmar Shipyards Co., Astilleros y Maestranzas de la Armada, Prat 856, Piso 14, Casilla 150-V, Valparaiso, Chile, S.A.  
 Astilleros Balboa, S.A., c/o Jackson Marine Corp., 17 Battery Place, New York, NY 10004  
 Atlantic Dry Dock, P.O. Box 276, Ft. George Island, Jacksonville, FL 32226  
 Atlantic Marine Inc., P.O. Box 138, Ft. George Island, Jacksonville, FL 32226  
 Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, La. 70150  
 Bath Iron Works Corp., 700 Washington St., Bath, ME 04530  
 Bay Shipbuilding Corp., 605 North 3rd Ave., Sturgeon Bay, WI 54235  
 Bender Shipbuilding & Repair Co., Inc., P.O. Box 42, Mobile, AL 36601  
 Bethlehem Steel Corp., Martin Tower, Bethlehem, PA 18018  
 Blohm & Voss Company, 55 Morris Avenue, Springfield, NJ 07081  
 Burmeister & Wain Skipsvaerft A/S, P.O. Box 2122, Refshaleoen-1015 Copenhagen K-Denmark  
 Burrard Yarrow Corporation, P.O. Box 86099, North Vancouver, B.C., Canada  
 Caneco Shipyard, Rua Carlos Seidl, 714, Caju, 20.931, Rio de Janeiro, RJ, Brazil

**Cantieri Navali Riuniti, Via Cipro, 11, 16100 Genova, Italy**  
 Carrington Slipways Pty. Ltd., Old Punt Rd., Tomago NSW Australia 2322  
 Conrad Industries, P.O. Box 790, Morgan City, La. 70380  
 Curaçao Drydock Company Inc., 26 Broadway, Suite 741, New York, NY 10004  
 Daewoo International (America) Corp., 437 Madison Ave., New York, NY 10022  
 Daewoo Shipbuilding & Heavy Machinery Ltd., Ayangri, Changsung-PO, Koje-Kun, Kyungnam, Korea  
 Davie Shipbuilding Ltd., P.O. Box 130, Levis, Quebec, Canada G6V6N7  
 Dorbyl Ltd., Military Road, 1 Industrial Sites, West Bank, 5201 East London, Republic of South Africa  
 Dravo Marine Equipment Company, Neville Island, Pittsburgh, PA 15225  
 Dubai Drydocks, P.O. Box 8988, Dubai, United Arab Emirates—U.S.A. Agents: Keppel Marine Agencies Inc., 26 Broadway, New York, NY 10004, 6240 Richmond Ave., Houston, TX 77057  
 Eastern Marine, Inc., P.O. Box 1009, Panama City, FL 32401  
 Equitable Shipyards, Inc., P.O. Box 8001, New Orleans, LA 70182  
 FMC Corp., Marine & Rail Equipment Div., 4700 N.W. Front Ave., Portland, Oregon 97208  
 Far East Livingston Shipbuilding Ltd., 31 Shipyard Rd., Jurong Town, Singapore 2262  
 Genstar Marine, 10 Pemberton Ave., No. Vancouver, B.C., Canada V7P 2R1  
 Gladding-Hearn Shipbuilding Corp., 1 Riverside Ave., Somerset, MA 02725  
 Gollen Marine Co., Inc., 60 Van Brunt St., Brooklyn, NY 11231  
 HBC Barge, Inc., Grant Building, Pittsburgh, PA 15219  
 Halter Marine, Inc., P.O. Box 29266, New Orleans, LA 70189  
 Hoboken Shipyards, Inc., 1301 Hudson St., Hoboken, NJ 07030  
 Hong Kong United Dockyards Ltd., P.O. Box 534, Kowloon Central Post Office, Kowloon, Hong Kong  
 Hyundai Mipo Dockyard Ltd., 456 Cheonha-Dong, Ulsan, Korea  
 I.N.M.A. S.p.A., 19100 La Spezia, v. le S. Bartolomeo 362, Italy  
 Jakobson Shipyard Inc., P.O. Box 329, Oyster Bay, NY 11771  
 Jeffboat, Inc., Jeffersonville, Ind. 47130  
 Keppel Shipyard Limited, 325 Telok Blangah Road, P.O. Box 2169, Singapore 0409  
 Koch Ellis Barge & Ship Service, P.O. Box 9130, Westwego, LA 70094  
 Kone Corp., P.O. Box 6, SF-05801, Hyvinkaa, Finland  
 Leevac Corporation, P.O. Box 2607, Morgan City, LA 70381  
 Paul Lindenau GmbH & Co., Schiffswerft u. Maschinenfabrik, D-2300 Kiel-Friedrichsort, West Germany  
 Lockheed Shipbuilding and Construction Co., 2929 16th Avenue, S.W., Seattle, Wash. 98134  
 M.A.N. GHH Sterkrade, P.O.B. 110240, D-4200 Oberhausen 11, West Germany  
 McDermott, Incorporated, 1010 Common Street, New Orleans, LA 77227  
 Main Iron Works, Inc., P.O. Box 1918, Houma, LA 70361  
 Marinette Maine Corporation, Marinette, WI 54143  
 Jos. L. Meyer GmbH & Co., P.O. Box 2990 Papenburg 1, West Germany  
 Mitsubishi Heavy Industries, Ltd., 5-1, Marunochi 2-chome, Chiyoda-ku, Tokyo, 100 Japan  
 Monark Boat Co., P.O. Box 210, Monticello, Ark. 71655  
 Moran Shipping Agencies, 602 Sawyer, Suite 200, Houston, TX 77007  
 Moss Point Marine Inc., P.O. Box 1310, Escatawpa, MS 39552  
 Nashville Bridge Company, P.O. Box 239, Nashville, TN 37202  
 National Marine Service (Shipyard Division), P.O. Box 38, Hartford, IL 62048  
 National Steel & Shipbuilding Corp., San Diego, Calif. 92112  
 Neorion Shipyards Syros Ltd., Syros, Greece—U.S.A. Agents: Keppel Marine Agencies Inc., 26 Broadway, New York, NY 10004, 6420 Richmond Ave., Houston TX 77057  
 Newport News Shipbuilding & Dry Dock Co., 4101 Washington Ave., Newport News, Va. 23607  
 North Florida Shipyards, P.O. Box 3863, Jacksonville, FL 32206  
 O.A.R.N. (Officine Allestimento-Riprazioni Navi), P.O. Box 1395, Genoa, Italy 16100  
 Overseas Shipyards, Inc., 21 West St., New York, NY 10006  
 Pennsylvania Shipbuilding, P.O. Box 442, Chester, PA 19016  
 Port Allen Marine Service, P.O. Box 108, Port Allen, LA 70767  
 Promet (PTE) Ltd., 27 Pandam Rd., Jurong Industrial Estate, Singapore 22  
 Promet Marine Services Corp., 242 Allens Ave., Providence, RI 02905  
 Puerto Rico Drydock & Marine Terminals, Inc., P.O. Box 2209, San Juan, Puerto Rico 00903  
 Rauma-Repola, 26100 Rauma 10, Finland  
 Samsung Shipbuilding & Heavy Industries Co., Ltd., Samsung Main Bldg. 250, 2Ka, Taepyeong-ro, Chung-ku, Seoul, Korea  
 St. Louis Ship, 611 East Marceau St., St. Louis, MO 63111  
 Savannah Shipyard Co., P.O. Box 787, Savannah, GA 31402  
 Schiess Defries, Postfach 111146, Schiess-Str. 61, D-4000 Dusseldorf 11, West Germany  
 Service Machine Group, Inc., P.O. Box 2664, Morgan City, LA 70381  
 Southbay Boat Inc., P.O. Box 13308, San Diego, CA 92113  
 Southern Oregon Marine Engineering and Construction, P.O. Box 1220, Coos Bay, OR 97420  
 Southwest Marine, Inc., P.O. Box 13308, San Diego, Ca 92113  
 Swiftships Inc., P.O. Box 1908, Morgan City, LA 70380  
 Tampa Shipyards Inc., P.O. Box 1277, Tampa, Fl. 33601  
 Thomas Marine, 37 Bransford St., Patchogue, NY 11772  
 Todd Shipyards Corp., 1 State St. Plaza, New York, N.Y. 10004  
 Tracor Marine, P.O. Box 13107, Port Everglades, Fla. 33316  
 Union Dry Dock & Repair Co., Foot of Pershing Road, Weehawken, N.J. 07087  
 Verolme Estaleiros Reunidos Do Brasil S.A., Rua Buenos Aires, 68, Rio de Janeiro—RJ—Brazil  
 Vickers Cockatoo Dockyard Pty. Ltd., P.O. Box 162 Milsons Point, N.S.W. 2061, Australia

**SHIPPING—PACKING**  
 Pilolage Consultants, Inc., P.O. Box 2046, New Hyde Park, NY 11040  
**SILENCERS**  
 Riley-Beard, P.O. Box 31115, Shreveport, LA 71130  
**SMOKE INDICATORS**  
 Robert H. Wager Co., Inc., Passaic Avenue, Chatham, N.J. 07928  
**STUFFING BOXES**  
 Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062  
 Smith-Meeker Engineering Co., 157 Chambers Street, New York, NY 10007

**SURVEYORS AND CONSULTANTS**  
 Francis B. Crocco, Inc., P.O. Box 1411, San Juan, Puerto Rico 00903  
 Frank Jeffrey & Assoc., 5201 Westbank Exp., Suite 206, Marrero, LA 70073  
 M.A. Stream Associates, Inc., 400 Second Ave. W., Seattle, WA 98119  
**TANK CLEANING**  
 Butterworth Inc. (USA), 3721 Lapas Dr., P.O. Box 18312, Houston, TX 77223-9989  
 Butterworth Systems (UK), 123 Beddington Lane, Croydon CR9 4NX, England  
 Gamajet Equipment Div., Sybron Chemicals Inc., 121 S. Maple Ave., So. San Francisco, CA 94080  
 Penco Div./Hudson Engineering Co., One World Trade Center, Suite 3000, New York, NY 10048  
 Petrochemical Services, Inc., 3820 Dauphine St., New Orleans, LA 70117  
**TANK LEVELING INDICATORS**  
 Kongsberg North America Inc., 400 Oser Ave., Hauppauge, NY 11738  
 Marine Moisture Control Co., 60 Inip Dr., Inwood, NY 11696  
 Metal Goods Manufacturing Company, 309 W. Hensley Blvd., Bartlesville, OK 74003  
 Metritape, Inc., P.O. Box 2366, Littleton, MA 01460  
 Salwico Inc., 5 Marine View Plaza, Hoboken, NJ 07030  
 Transamerica Delaval, Inc., Gems Sensors Division, Cowles Road, Plainville, CT 06062  
**TOWING—Barges, Vessel Chartering, Lighterage, Salvage, etc.**  
 Bay-Houston Towing Co., 805 World Trade Bldg., Houston, Texas 77002  
 Bulkfleet Marine Corporation, 1800 West Loop So., Houston TX 77027  
 Curtis Bay Towing Co., Mercantile Bldg., Baltimore, Md. 21202  
 Henry Gillen's Sons Lighterage, 21 West Main St., Oyster Bay, N.Y. 11771  
 James Hughes, Inc., 17 Battery Pl., New York, N.Y. 10004  
 International Transport Contractors Holland B.V., 5 Kenaupark, P.O. Box 21, Haarlem, Holland  
 McAllister Bros., Inc., 17 Battery Pl., New York, N.Y. 10004  
 McDonough Marine Service, P.O. Box 26206, New Orleans, La.  
 Midland Affiliated Co., 580 Walnut St., Cincinnati, OH 45201  
 Moran Towing & Transportation Co., Inc., One World Trade Center, Suite 5335, New York, N.Y. 10048  
 National Marine Service, Transport Div., 1750 Brentwood Blvd., St. Louis, MO 63144  
 Suderman & Young Co., Inc., 918 World Trade Bldg., Houston, Texas 77002  
 Turecamo Coastal & Harbor Towing Corp., One Edgewater St., Clifton, Sloten Island, N.Y. 10305  
**VALVES AND FITTINGS**  
 Camlock Flange Sales Corp., 60 Inip Dr., Inwood, NY 11696  
 Clow Corporation, 1375 Magnolia Ave., Corona, CA 91720  
 Dover Corporation, Norris Division, P.O. Box 1739, Tulsa, OK 74101  
 Elliott Manufacturing Co., Inc. (Remote Valve Operating Equipment), P.O. Box 773, Binghamton, NY 13902  
 Hayward Marine Products, 900 Fairmount Avenue, Elizabeth, NJ 07207  
 Jamesbury Corp., 640 Lincoln Street, Worcester, MA 01605  
 Marine Moisture Control Co., 60 Inip Dr., Inwood, N.Y. 11696  
 Metropolitan Plumbing Supply Corp., 50-09 Second Street, Long Island City, NY 11101  
 Newmans Inc., 7500 E. Reading Pl., Tulsa, OK 74101  
 Pittsburgh Brass Manufacturing, Sandy Hill Rd., R.D. 6 Box 387-A, Irwin, PA 15642  
 Stacey/Fetterolf Corp., P.O. Box 103, Skippack, PA 19474  
 Stockham Valves & Fittings, Box 10326, Birmingham, AL 35202  
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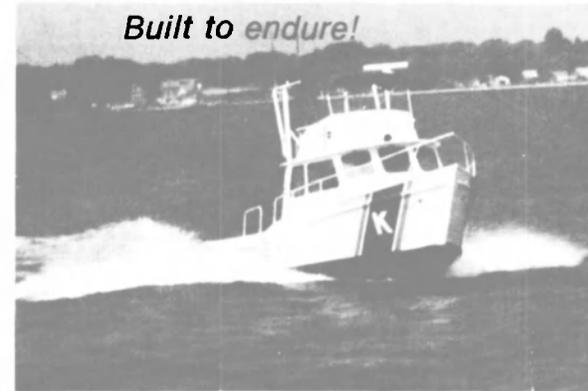
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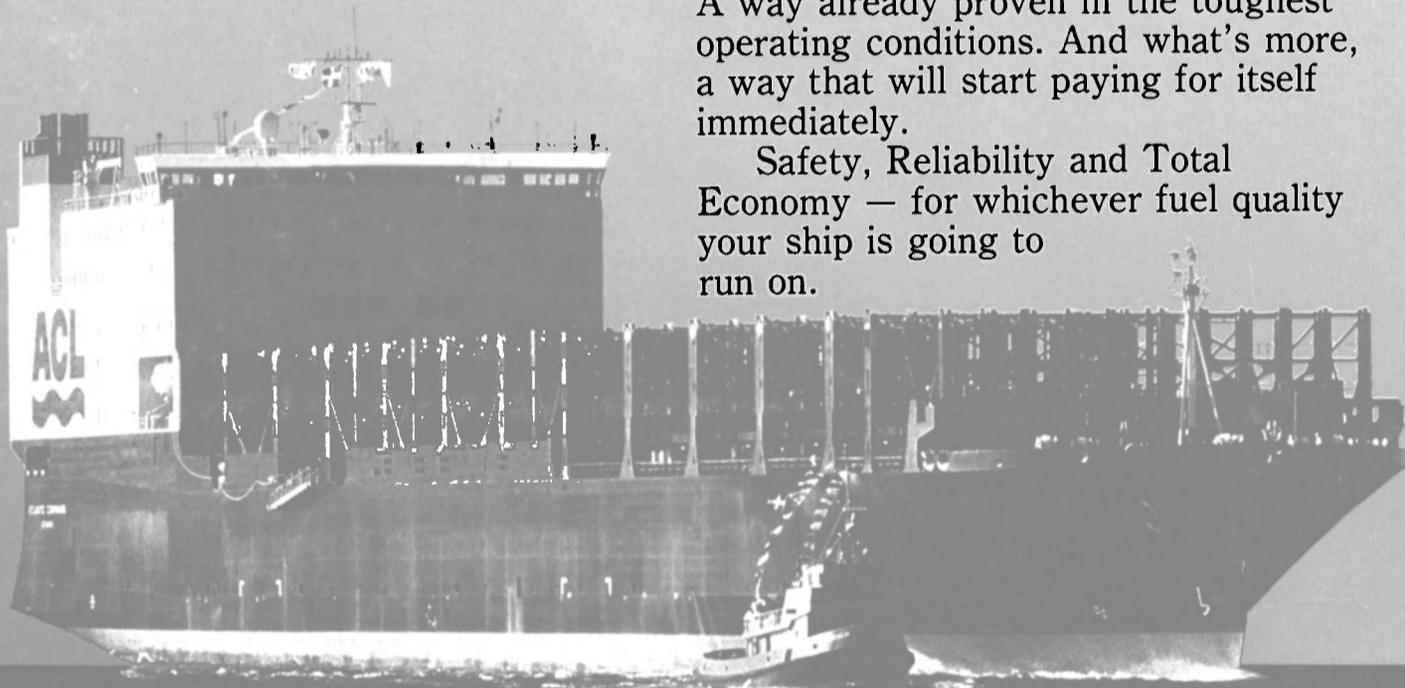
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