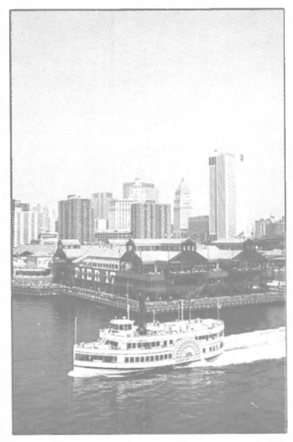
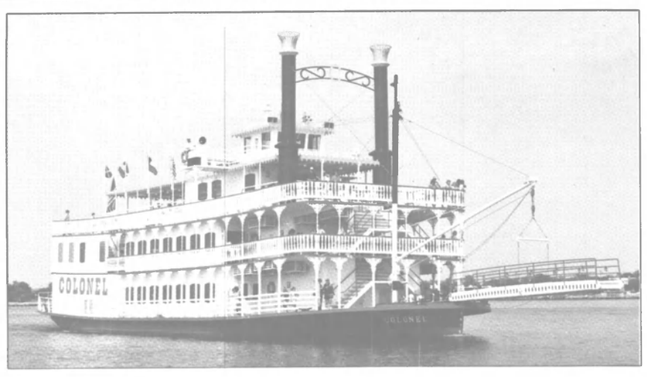
MARITIME REPORTER
AND
ENGINEERING NEWS





OUTSTANDING INLAND/OFFSHORE VESSELS & RIGS OF 1985

JANUARY 1, 1986 ISSUE

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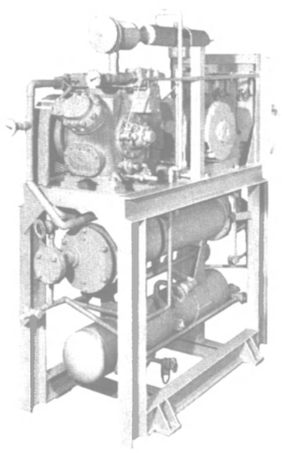
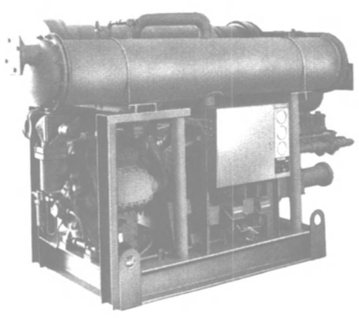
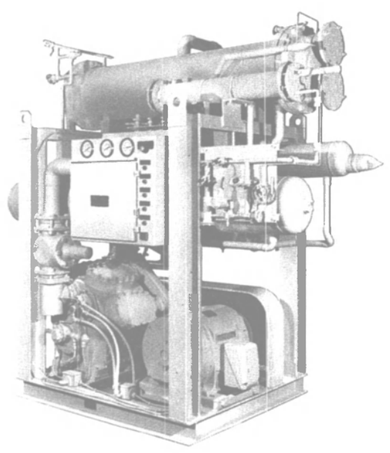
More than 1,000 YORK MARINEPAKS Installed for use *on both Merchant and Naval Vessels*



SHIP STORES
CONDENSING UNITS



WATER CHILLING
SYSTEMS



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Circle 342 on Reader Service Card

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ON THE COVER

COVER PHOTOS: clockwise from top center: ***USCG 1301*** *(Bollinger);* ***Andrew Fletcher*** *(Offshore Shipbuilding);* ***Doc Tide*** *(Bender Shipbuilding);* ***Colonel*** *(Moss Point Marine);* ***Catamarin*** *(Nichols Brothers);* ***TWR*** *(Marinette Marine). Center:* ***Catalina Express*** *(Westport Shipyard).*

Todd Unit Merges With Aro Corporation To Form Wholly Owned Subsidiary

Todd Shipyards Corporation, headquartered in New York City, has announced that Todd Acquisition Corporation, its wholly owned subsidiary, has filed a Certificate of Ownership and Merger of Todd Acquisition with and into The Aro Corporation and making Aro a wholly owned subsidiary of Todd Shipyards. The merger followed the purchase by Todd Acquisition of more than 94 percent of Aro's outstanding common stock pursuant to a tender offer.

Todd Shipyards, the nation's largest independent shipbuilder and ship repair company, operates yards in or near Seattle, Los Angeles, San Francisco, Galveston, and New Orleans.

Bethlehem Steel Selects Delaval R5 Engines For Two New Navy Vessels

Two 16-cylinder "Enterprise" R5 medium-speed engines burning heavy fuel will provide the main propulsion for each of two new oceanographic research ships now under construction by Bethlehem Steel Corp., Sparrows Point, Md.

The contract with Transamerica Delaval, Inc., Oakland, Calif., includes the four R5-V16 variable-speed, direct-reversing engines rated at 12,500 horsepower each, two combining reduction gear assemblies and supporting auxiliary equipment. The ships, designated T-AGS-39 and -40, will be operated by the Military Sealift Command in a fleet support role for the U.S. Navy, replacing older vessels.

The selection of the heavy-fuel engines is indicative of the Navy's recent emphasis on greater fleet fuel efficiency and lower fuel costs. Deliveries of the engine sets are scheduled for July and November of this year.

The R5 is Delaval's latest line of diesel/heavy fuel and dual fuel engines, producing up to 850 bhp per cylinder on inexpensive heavy fuel oil at 514 rpm. Transamerica Delaval is the wholly owned subsidiary of Transamerica Corp. of San Francisco.

For more information on Transamerica Delaval's 16-cylinder R5 engines,

Circle 20 on Reader Service Card

Wilton-Fijenoord Wins $13.6-Million Conversion

Wilton-Fijenoord b.v., Schiedam, Netherlands, has won an extensive conversion order for the Baltic Ferry and Nordic Ferry from Townsend Thoresen.

The 6,455-ton vessels will be converted to combined passenger/cargo ships for service between Zeebrugge, Belgium, and Felixstowe, England. The work comprises completely new accommodations for 650 passengers.

The order, valued at 40-million Dutch Guilders (approximately $13.6 million), will give work to both the company's Repair and Newbuilding Departments, and will be executed prior to the start of the 1986 passenger season.

Marine Design Awarded $400,000 Navy Contract For Ship Design Support

Marine Design Technologies, Inc. of Cherry Hill, N.J., has been awarded a $400,000-plus indefinite Quantity/Requirements Contract (Lot II) to provide the Supervisor of Shipbuilding, Conversion and Repair, USN, Groton, Conn., with Alteration Development Support (ADS). These services will include engineering disciplines for the Development of Ship Selected Record Drawings and Data (SSR), ship-checking and developing Supplementary Alteration Drawings (SAD).

The Regional Contracting Center, Philadelphia, Pa., is the contracting activity.

Jonathan Corp. Awarded $9.9-Million Navy Contract

Jonathan Corporation, Norfolk, Va., is being awarded a $9,913,143 cost-plus-award-fee contract for the phased maintenance program of USS Saginaw (LST-1188). Work will be performed in Norfolk, Va., and is expected to be completed in June 1990.

Elliott White Gill Names Lirette Sales Manager

Byron A. Lirette has been named sales manager for Elliott White Gill thrusters and will be responsible for all White Gill sales outside of Europe and the United Kingdom. Previously a field engineer for Thruster Systems, covering the Gulf Coast, he will make the Elliott office in the New Orleans area the sales headquarters for thrusters.

A native of Louisiana, Mr. **Lirette** holds a B.S. in petroleum engineering from Nicholls State University. Prior to joining Elliott he was with Union Carbine at Taft, La. In his 11 years with the Elliott Company, he has held positions in technical sales and engineering.

Elliott Company, a subsidiary of United Technologies, Inc., is a manufacturer of turbomachinery, tools, pumps, and thrusters. Its Tool and Pump Division manufactures thrusters at its Dayton, Ohio, facility. Elliott also manufactures White Gill thrusters at its U.K. facility on the Isle of Wight.

Effective the first of this month, sales headquarters for White Gill thrusters will move to the Elliott office in Harahan, La. The address is: Elliott Company, 5901 Jefferson Highway, Harahan, La. 70123, phone (504) 733-2108.

For further information on Elliott White Gill thrusters,

Circle 25 on Reader Service Card

Free Brochure On Modular Bathrooms For Marine Use

A free brochure on fiberglass modular marine bathrooms manufactured by the Frenkin Corporation is now available from Jamestown Metal Marine Sales, Inc., Boca Raton, Fla., a distributor of the units.

According to the publication, the seamless fiberglass construction of the bathrooms allows design versatility unmatched by other processes. These units can be molded with close tolerances according to the needs of the vessel being built or refurbished. One door, double door units or other designs are possible in any configuration or color. Knockdown versions may also be supplied for refurbishing existing bathrooms. Hardware packages can include Coast Guard and Navy approved heat lamp, ventilator, sink, toilet, plumbing, medicine cabinet, shower rod or other bathroom accessories.

The brochure provides specifications, technical data, black-and-white photographs and drawings on the modular marine bathrooms.

The corrosion-resistant units are U.S. Navy and Coast Guard approved.

For a copy of the free brochure offered by Jamestown Metal Marine Sales, Inc., or the fiberglass modular marine bathroom units,

Circle 26 on Reader Service Card

Avondale Yard Awarded $300-Million Navy Contract To Build Two More LSDs

Avondale Industries, Inc. recently announced that the U.S. Navy has ordered two additional LSD (Landing Ship Dock) class ships from its New Orleans-based shipyards division. Avondale said the order, worth $300 million, brings to five the number of LSDs the company is building for the Navy.

The five ships will be delivered over a two-year period from 1988 to 1990. Construction has already begun on the first ship.

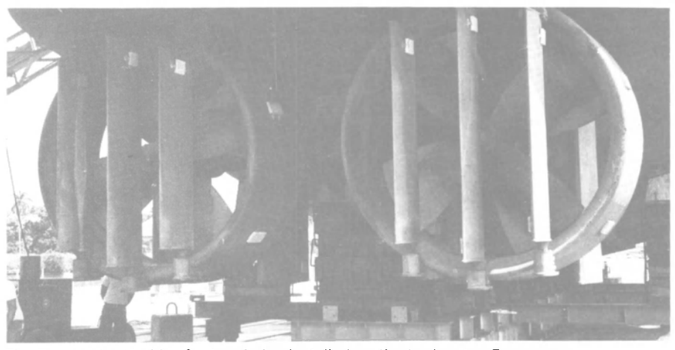
The LSD is designed to transport men or material. The ships Avondale will build are 610 feet long with an 84-foot beam. Each is equipped with a helicopter landing deck.

Avondale Industries is an employee-owned company comprised of seven divisions recently purchased from Ogden Corporation. It is primarily involved in marine and modular construction, metals recycling and industrial production. With 1984 sales of $1.2 billion, Avondale is among the largest employee-owned corporation in the U.S.

PROPULSION UPDATE

First U.S.-Built Twin-Screw Towmaster Rudder System On Tug —New Literature Offered

The first U.S.-built twin-screw Towmaster® Rudder System has been placed in service on the new tug Esperanza, commissioned recently for service in the Panama Canal.



The Towmaster Rudder System being installed on the harbor tug Esperanza.

Towmaster Rudder System

(continued)

The Towmaster Rudder System, now built in the U.S. by the Michigan Wheel Corporation of Grand Rapids, Mich., under license from Burness, Corlett & Partners, Ltd., permits a vessel to make a 180° turn in less than half the space required by a similar vessel fitted with conventional propeller and rudder.

The Towmaster Systems is designed for a ducted propeller and involves the use of triple rudders, and permits increased thrust as well as maneuverability.

Michigan Wheel has exclusive domestic rights to manufacture and sell the new system, which has been installed on numerous foreign-built vessels since the British marine engineering firm introduced it.

The Esperanza was built by Houma Fabricators Inc., Houma, La. The 99-foot harbor tug, owned by the Panama Canal Commission, has twin 1,500-hp General Motors EMD diesels and is rated at 90,000 pounds of foward bollard pull and 72,000 pounds of reverse bollard pull.

For more information and free new literature offered by Michigan Wheel,

Circle 24 on Reader Service Card

UCC/Rucker Introduces Space-Saving Filters —Literature Available

New tank-mounted UCC Multiflow suction or return filters are said to provide space saving and filter protection, and incorporate patented, quick-change disposable elements. Multipass testing to ISO 4572 standards has resulted in elements rated at 25 to 40 microns, with efficiencies to 96.8 percent.

Four sizes offer flow capacities to 132 gallons per minute, with mechanical or electrical condition indicators and NPT port threads. Working temperatures range from minus 20 to 212° F, maximum operating pressure is 100 pounds per square inch. A bypass valve, with opening pressures of 3 psi for suction lines and 29 psi for return lines, prevents damage or collapse of the element.

For further details and free literature,

Circle 22 on Reader Service Card

M.A.N.-GHH Completes Floating Dock For Iran

A 28,000-ton floating drydock was launched recently at the Nordenham/Blexen, West Germany, dock construction yard of M.A.N.'s Machinery, Plant and Systems Division (M.A.N.-GHH) on the Weser River. The dock had been ordered by Iran for the Persian Gulf Shipyard Project (PGSP) at a contract price of approximately $18 million.

Immediately after launching the dock, named Dolphin, was taken over by an oceangoing tug. Suitable stiffeners for heavy seas were installed in the dock, which was rated and designed in GHH's Dock and Shipbuilding Department. It is classed by Lloyd's Register of Shipping, which also approved the design and surveyed the construction.

The Dolphin will be a major piece of equipment in a new shipyard to be completed soon at Bandar Abbas on the Persian Gulf under the PGSP project. It is the seventh floating drydock built by M.A.N.-GHH since 1976 for customers in the Middle East. Former docks delivered to Kuwait, Qatar, and Saudi Arabia are all working to the owners' full satisfaction.

The Dolphin has an overall length of about 787.4 feet, length over keel blocks of 754.6 feet, outer width of 172 feet, clear inner width of 134.5 feet, depth to upper deck of 58.4 feet, and immersion depth over keel blocks of 27.9 feet.

Sidewheeler Andrew Fletcher is authentic replica of the steam-powered vessels that flourished in New York Harbor and environs at the turn of the century.

Unique Sidewheeler Replica Craft Completed By Offshore Shipbuilding

Offshore Shipbuilding of Palatka, Fla., has delivered the paddlewheel passenger vessel Andrew Fletcher, a replica of the steam-driven sidewheelers that flourished at the turn of the century. The new vessel, however, is powered by two Detroit Diesel engines driving the port and starboard paddlewheels by means of hydraulic pumps and hydraulic motors, the latter attached directly to each of the axle shafts of the paddlewheels. With an overall length of 125 feet, beam of 46 feet, depth of 9.6 feet, and mean draft of 5.7 feet, the vessel is U.S. Coast Guard certified to carry 400 passengers. She is managed by Seaport Line and operates out of a refurbished pier at South Street Seaport in New York City.

Control is accomplished by operating a lever built into each pump that regulates the direction and volume of the pump flow. The paddlewheels are independent of each other and may be operated one forward and one reverse, providing precise maneuvering. The rudder aft is controlled by a separate hydraulic cylinder powered by a motor-driven pump. Both of the paddlewheels and the rudder are operable from the pilothouse and from control stations on the upper deck, port and starboard, for safe maneuvering when docking and undocking.

The historic steam paddlewheelers had only a limited need for electric power for lighting, and this was provided by a small dynamo that was driven by a vertical, single-cylinder steam engine. The electric plant of the Fletcher is considerably larger due to the need for power for air conditioning, refrigeration, heating, and cooking, as well as the many lights and modern navigation and communications equipment. Elecric power is provided by three Delco generators driven by Detroit Diesel engines. Power is distributed through a modern-design switchboard in the engine room.

For generations, sidewheelers were a highly practical and popular form of propulsion for steamboats plying the waters of New York Harbor, the Hudson River and Long Island Sound. It all began with Robert Fulton, who attained his goal by placing a paddlewheel on each side of the hull of his pioneer vessel in 1807. From then through 1971, there was always a sidewheeler in New York, and in bygone days there was a great fleet of them.

Considerable effort was expended on the Andrew Fletcher towards recreating the flavor of the colorful and charming sidewheelers that flourished in the Port of New York at the turn of the century. From her tall smokestack with its brass whistle, to her twin two-deck-high paddlewheels, the vessel provides a unique ambiance recalling an earlier, more gracious era.

The well-known marine artist, **William G. Muller,** was commissioned to help in the design of the vessel, drawing from his expertise on American sidewheeler architecture and from personal experience gained from his youthful employment aboard the last of the great Hudson River sidewheelers. Reproductions of historical paintings by the artist, depicting some of New York's notable sidewheeler steamboats, decorate portions of the Fletcher's interior.

For additional information on the Andrew Fletcher's operations and availability, contact Seaport Line, 19 Fulton Street, New York, NY 10038; (212) 406-3434.

Operated by Seaport Line in New York City, vessel was christened by **Leise Isbrandtsen** of the well-known shipping family. Looking on are (L to R): **Tony Bucknole,** general manager of Offshore Shipbuilding; **William Muller,** marine artist who worked on design of the vessel; and **Jacob Isbrandtsen,** founder and a trustee of the South Street Seaport Museum.

ANDREW FLETCHER
Major Suppliers

Main engines (2)	Detroit Diesel
Paddlewheel motors (2)	Hagland-Manathan
Paddlewheel pumps (2)	Sunstand
Main generators (2)	Detroit/Delco
Switchboard	Power Panels
Engine controls	Hydrokinetics
Steering system	SSI
Air compressors	Quincy
Fire & bilge pumps	Flow Max
Air conditioning	Carrier
In-port generator	Detroit/Delco
Radar	Furuno
Radio	Horizon
P.A. & intercom systems	Audio Environments
Galley equipment	Basic Leasing
Electric system	Beacon Electric
Rescue boat	Durocraft

ABS Elects John Borum Senior Vice President

John F. Borum, vice president, Operations Division of American Bureau of Shipping (ABS), was recently elected senior vice president at the semiannual meeting of the board of managers of the ship classification society. The announcement of the election was made by **William N. Johnston,** chairman and president.

Mr. **Borum** joined ABS in 1958 as a surveyor in Newport News, Va. Later that year he was transferred to Japan, and in 1963 was appointed senior surveyor for the Kure, Japan district. In 1967 he was appointed principal surveyor. Five years later he was transferred to Yokohama as principal surveyor and 1973 he was transferred to Genoa, Italy, as principal surveyor for the Mediterranean and Middle East Area. In 1978 he returned to ABS headquarters in New York and was elected assistant vice president. In 1982 he was elected vice president, Operations Division.

McElroy Anchor Winch Delivered For McCall Boat —Literature Available

McElroy Machine & Manufacturing Company of Gulfport, Miss., recently delivered a Model 533 HAW anchor winch to Gulf Craft, Inc. of Patterson, La. The winch will be installed on the soon to be delivered Caleb McCall, under construction for McCall Boat Rental of Cameron, La.

The hydraulically operated winch features aluminum frame and drum, drum brake with stainless or brass fasteners. The hydraulic gear motor is heavily zinc coated, all adding up to a highly corrosion-resistant piece of equipment.

For free literature on McElroy winches and other deck equipment,

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The Allison gas turbine. Now you see it.

An Allison Gas Turbine will get to the scene and back in a hurry. The concept is simple. When a high power-to-weight ratio is needed for fast marine propulsion, use an Allison high power-to-weight ratio gas turbine.

The Allison 501-KF creates more than 4,300 horsepower and the 570-KF produces 6,445 horsepower. Both engines have been proven time and again in the most adverse environments. That's not all. The new 571-KF will soon be available with 7,694 horsepower. And Allison marine engines are marinized and constructed to withstand even the

most rigorous maritime uses.

An Allison Gas Turbine is easily maintained. As a division of GM, Allison has a worldwide parts and service network which means you get the security, the reliability and the technology of GM. Plus we have 50 years as an experienced military contractor.

For more information about Allison Marine Systems, write to Allison Gas Turbine Division, General Motors Corporation, P.O. Box 420 Speed Code U6, Indianapolis, Indiana 46206-0420, USA. Telex 276400.

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Now you don't.

OUTSTANDING INLAND/OFFSHORE VESSELS AND RIGS OF 1985

A portfolio of some important inland and offshore shallow-draft vessels and rigs built during 1985—selected for their high standards of design or performance

ANDREW FLETCHER
Offshore Shipbuilding

The passenger vessel Andrew Fletcher was delivered during 1985 by Offshore Shipbuilding of Palatka, Fla. Designed for inland waters, the new vessel is being operated on corporate and other charters as well as excursion trips by Seaport Line out of a newly refurbished pier at South Street Seaport in New York City. She is approved by the U.S. Coast Guard for carrying 400 passengers, and is registered under Chapter T Rules for passenger vessels.

Propulsion is by two side paddlewheels, each driven by a GM Detroit Diesel engine via hydraulic pump and hydraulic motor. The hydraulic system has cross-connectors, with an automatic control valve in the event of an engine failure. Direction of rotation of the paddlewheels is controlled from the pilothouse or port and starboard stations by reversing the speed and flow direction of the pumps. Because of the midship location of the paddlewheels port and starboard as well as a steering rudder aft, the vessel has a high degree of maneuverability.

For further information on the Andrew Fletcher's operations, contact Seaport Line, 19 Fulton Street, New York, NY 10038; (212) 406-3434.

ANDREW FLETCHER
Major Suppliers

Main engines (2)	Detroit Diesel
Paddlewheel motors (2)	Hagland-Manathan
Paddlewheel pumps (2)	Sunstand
Main generators (2)	Detroit/Delco
Switchboard	Power Panels
Engine controls	Sheridan Bellows-Hydrokinetics
Steering system	SSI
Air compressors	Quincy
Fire & bilge pumps	Flow Max
Air conditioning	Carrier
In-port generator	Detroit/Delco
Radar	Furuno
Radio	Horizon
P.A. & intercom systems	Audio Environments
Galley equipment	Basic Leasing
Electric system	Beacon Electric
Rescue boat	Durocraft

BAY QUEEN
Blount Marine

Blount Marine Corporation of Warren, R.I., early this year completed the dinner/cruise vessel Bay Queen, designed to accommodate dinner dances, luncheons, private charters, Bay Island cruises, and other day and evening tours on Narrangansett Bay.

Owned by Blount Leasing Corporation, the new Bay Queen is operated by Rentacruise, Inc., also of Warren. She replaces the Bay Queen built in 1984, which has been sold to interests in Toledo, Ohio, and renamed Arawana Queen.

The new vessel is powered by two Detroit Diesel 8V92 engines and has two 99-kw Detroit/Delco generators. Admeasuring just under 100 tons, she can attain a speed of 11 knots.

Capable of seating more than 450 at dinner, the Bay Queen is certified by the U.S. Coast Guard to carry a maximum of 600 passengers. With an overall length of 145 feet, beam of 32 feet 4 inches, and depth of 9 feet 4 inches, the vessel has two fully enclosed decks and a third open deck that provides unrestricted viewing. The bridge deck, which has exterior seating, also affords passengers a panoramic view.

The vessel can accommodate two separate charter groups simulta-

BAY QUEEN
Major Suppliers

Main engines (2)	Detroit Diesel
Propellers	Columbian
Generators (2)	Detroit/Delco
Engine controls	Morse
Steering system	Wagner
Pumps	Marlo & Tabsco
Air compressor	Detroit Diesel
Coatings	International
Electric cable	Anixter
Electric panels	Square D
Air conditioning	Carrier
Windows	Kearfott
Radar	Furuno
Depth sounder	Datamarine
Compass	Ritchie
VHF radio	Regency
Searchlight	ITT Portable Lights

Photos on page 12, clockwise from top left: **Oriole** (Aluminum Boat); **Independence** (Halter); **Sandy Hook** (Gladding-Hearn); and the **General Jackson** (Jeffboat).

exterior seating, also affords passengers a panoramic view.

The vessel can accommodate two separate charter groups simultaneously, and provides a second deck embarkation point made possible by a Blount-designed bow landing system. For passenger entertainment, a stage and dance floor are installed on the second deck.

CATALINA EXPRESS
Westport Shipyard

The fiberglass passenger vessel Catalina Express has been delivered by Westport Shipyard, Inc. of Westport, Wash., to Catalina Channel Express Lines for service between Los Angeles and Catalina Island. The owner, already operating other Westport-built craft, serves Avalon and Two Harbors on the resort island in southern California. The new boat can carry 149 passengers at speeds of up to 30 knots.

Main propulsion is provided by two Detroit Diesel 12V92TA engines, each rated 850 bhp at 2,100 rpm, driving Michigan Wheel propellers via Twin Disc/Niigata reduction gears. A 25-hp Wesmar bow thruster aids in dockside maneuvering. Electric power is provided by a 12-kw Northern Lights generator set. Spencer Fluid Power supplied the hydraulic system, which is arranged so that an additional hydraulically driven generator can be added to the system.

The deckhouse and interior arrangements include airline type seating in the main cabin. A VIP lounge is installed aft in the wheelhouse, and the top deck has open seating.

The vessel's navigation electronics, suppled by Kettenburg Marine, include two Furuno radars, Wagner autopilot and rudder angle indicator, MicroLogic Loran C, Impulse depth sounder and speed log, and Ritchie compass.

CATALINA EXPRESS
Major Suppliers

Main engines (2)	Detroit Diesel
Reduction gears (2)	Twin Disc/Niigata
Propellers (2)	Michigan Wheel
Engine controls	Amot Controls
Steering system	Wagner
Bow thruster	Wesmar
Generator	Northern Lights
Fuel filters	Racor
Pumps	Lovett & Cascade
Hydraulic system	Spencer Fluid Power
Radars (2)	Furuno
Loran C	MicroLogic
Autopilot & r-a indicator	Wagner
Depth sounder & speed log	Impulse
Compass	Ritchie
VHF radio	Standard
Halon system	Automatic Sprinkler
Hatches	Bomar

CATAMARIN
Nichols Bros.

Nichols Bros. Boat Builders of Freeland (Whidbey Island), Wash., last year completed the 85-foot catamaran named Catamarin for Harbor Carriers of San Francisco, a subsidiary of Crowley Maritime. The owner is using the 30-knot, 400-passenger vessel in commuter and charter service between San Francisco and points in Marin County across the Bay. She was the third in a series of catamarans built by Nichols based on designs originated by International Catamarans Pty. Ltd. of Australia. The yard holds the exclusive license for production of these craft in North America.

Main propulsion for the Catamarin is provided by twin KHD Deutz B/AM 816 diesels, driving Coolidge propellers via Reintjes WVS 832 reduction gears supplied by Karl Senner, Inc. of New Orleans. Electric power is provided by two 50-kw generators supplied by Alaska Diesel Electric of Seattle.

Other companies that supplied equipment included Harris Electric and PSI for electronics, Systems Engineering for propulsion controls,

(continued)

Circle 168 on Reader Service Card ➔

Outstanding

(continued)

Hough Marine for the steering system, Cascade Machinery and Pacific Pump for pumps, and Fisheries Supply Company for lifesaving gear and marine hardware.

The Haller Company supplied valves, North Coast Electric motor starters, Hardware Specialties for wiring and light fixtures, Everett Steel for anchor and rope, Pacific Coast Marine for doors, and Alaskan Copper and Brass for piping.

Nichols Bros. last year signed a sublicense agreement with Atlantic and Gulf Boatbuilding of Fort Lauderdale, Fla., for construction of a catamaran of the Australian design. The 72-foot vessel for Bottom Time Adventures will contain staterooms and be used for overnight trips to the Bahamas on diving expeditions.

CATAMARIN
Major Suppliers

Main engines (2)	Deutz
Reduction gears	Reintjes
Propellers	Coolidge
Engine controls	Systems Engineering
Steering system	Wagner
Generators	Northern Lights
Motor starters	Allen Bradley
Weathertight doors	Pacific Coast Marine
Coatings	International
Radars	Furuno
VHF radios	Raytheon
Depth sounder	Ross

CHALLENGER 27
Boston Whaler

Boston Whaler, Inc. of Rockland, Mass., continues to expand its presence in the commercial market with the introduction of the Challenger 27. This model follows a smaller 25-foot version, where aluminum topsides are joined to Whaler's fiberglass-reinforced hulls.

The Challenger's superstructure was designed by C. Raymond Hunt Associates of Boston, and built by Gladding-Hearn Shipbuilding of Somerset, Mass. Boston Whaler completes the vessel with the installation of engines, electronics, and other gear to suit individual owners' requirements.

Challenger hulls are the proven 27-foot design, more than 200 of which are currently in offshore use. Extra fiberglass has been added to strengthen the boat for commercial and military service. Like other Boston Whalers, the Challenger uses a foam core method of construction providing 8,000 pounds of reserve buoyancy, even with all compartments flooded.

The cockpit floor, cabin assembly, and bulkheads are constructed of $\frac{3}{16}$-inch 5086 aluminum. Roof structures are $\frac{1}{4}$-inch aluminum plate, reinforced to accept radars and mast assemblies. Painted aluminum surfaces are finished with International's Interthane.

Electronics aboard the Challenger include a Furuno 803D radar, Furuno FCV 501 color video sounder, two Raytheon Ray 78 radios, Northstar 800 Loran C, a Datamarine S200 DL digital depth finder, and a Datamarine S100KL speed log.

The specially built outboards were supplied by Johnson Motors, and utilize a 160-cubic-inch powerhead mated to a heavy-duty lower gear case. Propellers are 15- by 16-inch stainless steel, which have been double-capped. Engines turn at

CHALLENGER 27
Major Suppliers

Main propulsion units (2)	Johnson Motors
Radar	Furuno
Loran C	Northstar
SSB radio	Raytheon
Depth sounder & speed log	Datamarine
Coatings	International

5,500 rpm at full throttle and cruise at 4,400 rpm. Horsepower of each engine is 105. Optional power plants for the Challenger 27 include OMC Seadrives, Mercruiser V-8 inboards, and Volvo Penta diesels.

Cruising speeds range from 22 to 27 knots, and the boat has a top speed of 38 knots. Standard fuel capacity is 173 gallons in one centerline tank, providing an operating radius of 200 miles. Additional fuel can be carried in two 70-gallon wing tanks.

COLONEL
Moss Point Marine

Designed to provide historical excursions and dinner cruises on Galveston Bay, the 152-foot sternwheeler Colonel was delivered by Moss Point Marine, Inc. of Escatawpa, Miss., to the Colonel Museum, Inc. of Galveston, Texas.

The Colonel has a beam of 40 feet and depth of 8 feet 6 inches. She is powered by two Caterpillar 3408 diesel engines, each with an output of 365 bhp at 1,800 rpm. They drive stainless steel propellers via Caterpillar 7221 reverse/reduction gears. The EMI electrohydraulic steering system has control stations at three locations. Maneuvering is enhanced by a Propulsion Systems bow thruster.

To provide for passenger comfort year-round, 56 tons of Carrier air conditioning and heating equipment is installed. Electric power for the air conditioning and other ship's services is provided by Caterpillar 3306 diesels driving two Delco 135-kw generators.

The Colonel can accommodate up to 500 passengers for dinner, and is outfitted with catering facilities, bars, dance floors, and bandstands. Her two main salons, the Galveston Room and the Texas Room, each seat 250 diners and can host two separate parties. Large windows afford unobstructed views, while allowing more passengers to use them. The vessel also has a large, open promenade deck at the upper level.

The new sternwheeler is operated by New Orleans Paddlewheels (Texas) Inc., whose parent company operates the Creole Queen in New Orleans.

COLONEL
Major Suppliers

Main engines (2)	Caterpillar
Reduction gears	Caterpillar
Steering system	EMI
Bow thruster	PSI
Generators (2)	Cat/Delco
Air conditioning/heating	Carrier

FARALLON
Bollinger Shipyard

Bollinger Machine Shop & Shipyard, Inc. of Lockport, La., recently delivered the patrol boat Farallon (WPB-1301), first of 16 vessels of the Island Class the yard is building under an $80-million contract awarded by the U.S. Coast Guard. These boats will be used for offshore patrol work involving law enforcement, surveillance and boardings, and when necessary, search and rescue.

Bollinger offered the Coast Guard a design that had been developed by Vosper-Thornycroft (UK) Ltd. Differences between the original Vosper design and the USCG vessels include the deckhouse and internal configuration, which were altered to meet CG requirements.

Built with a steel hull and aluminum deck and superstructure, the Farallon has an overall length of 110 feet, beam of 21 feet, and depth of 7.3 feet. She is powered by twin Paxman Valenta 16-cylinder diesel engines, each rated 3,000 bhp continuous and 4,000 bhp sprint. However, they will be rack-limited to 2,900 bhp. The 32 engines for the Island Class vessels, plus 16 spare engines, are being supplied through Paxman's U.S. distributor, Alco Power Inc.

These boats have a continuous operating speed of 26 knots. The main propulsion engines drive through ZF reverse/reduction gears. Electric power is provided by two 99-kw generators driven by Caterpillar 3304T diesel engines.

(continued)

Outstanding

(continued)

The superstructure features both open and enclosed steering positions, and a separate communications center. The sophisticated electronic gear is mostly government-furnished. Commercial equipment includes: a Raytheon radar with ARPA and a Raynav 750 Loran C; a Tracor model 11 Omega receiver; and Sperry gyrocompass, autopilot, and doppler log. Also aboard are Sunair HF transceivers and receiver, two Triton and one Regency VHF transceivers. The MF/HF direction finder was supplied by Sitex.

Accommodations are arranged with one section aft of the engine room, and the galley, mess, and petty officers and crew quarters forward of it. Officers' cabins are in the deckhouse. Above the weather deck is one level of superstructure with the wheelhouse above it. Manning calls for two officers, two petty officers, and 12 enlisted men (with space for two more).

Major Suppliers

Main engines (2)	Paxman
Reverse/reduction gears	ZF
Generators	Caterpillar
Boarding boat	Avon
Davit	Appleton
Radar & Loran C	Raytheon
Omega receiver	Tracor
VHF radios	Triton (2) & Regency
Autopilot, gyrocompass & doppler log	Sperry
Direction finder	Sitex

GENERAL JACKSON
Jeffboat

Jeffboat, Incorporated of Jeffersonville, Ind., at mid-85 delivered the sternwheeler General Jackson to Opryland USA Inc. of Nashville, Tenn. The 274-foot vessel can accommodate up to 700 passengers for banquet seating and more than 1,000 for theater-style presentations.

The showboat, named for the first steamboat to operate on the Cumberland River, will cruise from Opryland, linking that entertainment complex with downtown Nashville. The sternwheeler makes daily excursions to the Old Hickory and Cheatam Dams on the Cumberland River, offering passengers the experience of an authentic southern steamboat trip. The cruises include entertainment, meals, and sightseeing from the large open deck areas.

With a beam of 62 feet, the vessel is constructed with four decks. Main and upper decks provide access to the theater and banquet room. The theater auditorium is two decks high with a balcony at the mid-level. Below the theater in the hold is a storage area with a scissors lift to transport chairs and tables utilized during the banquet/theater arrangement. Elegant fixtures, bright Persian carpeting, and brass railings create a turn-of-the-century atmosphere.

The Texas Deck incorporates a gift shop, cocktail lounge, snack bar, and crew quarters. The Hurricane Deck is designed as a passenger observation area and is fitted with a steam caliope.

The propulsion system of the General Jackson is a stern paddlewheel driven through a three-stage Morse reduction unit. The diesel-electric plant consists of two Caterpillar 3512 diesels driving KATO 4P6-1825 alternating-current generators, which then drive variable-speed General Electric DC motors through silicon-controlled rectrifiers. Ship's service power is also provided by GE's SCR system.

The power system for the specialized electronic equipment aboard the vessel incorporates a KATO model 25L16060 motor-generator set. This power specifically serves the theater audio equipment, entertainment system, and computers for lighting controls.

An EMI model DE25 electrohydraulic steering system with pilothouse controls located at three stations on the bridge will steer the vessel through three flanking rudders and three monkey rudders. To assist in maneuvering, a Michigan/Jastram model 20 200-hp bow thruster is installed.

The General Jackson, at 1,500 grt, is the second largest sternwheeler in the world, the largest being the Jeffboat-built Mississippi Queen.

GENERAL JACKSON
Major Suppliers

Main engines (2)	Caterpillar
Reduction gears	General Electric
Steering controls	EMI
Bow thruster	Michigan-Jastram
Generator	CAT/KATO
Engine monitoring	Tracor Marcon
Air compressors	Quincy
Pollution control system	FAST
Radar	Furuno
Radio	Raytheon
Telephone system	Mitel
Searchlights	Carlisle & Finch
Air horn	Kahlenberg
Capstan	New England Trawler
Chiller equipment	Turbo Pak

GULF SERVICE
Quality Shipyards

The first of Zapata Gulf Marine Corporation's "super-size" anchor-handling tug/supply vessels, the Gulf Service, was delivered recently by Quality Shipyards in Houma, La. With an overall length of 222 feet, beam of 46 feet, and depth of 20 feet, the U.S.-flag vessel is one of the biggest in the offshore marine service industry.

The vessel's innovative "father/son" propulsion plant features four Stork-Werkspoor diesels of two different sizes for maximum power, fuel efficiency, and reliability. The engines are SWDiesel's 8SW280 models, each developing 3,200 bhp at 1,000 rpm; and two 6SW280 models, each with an output of 2,400 bhp at 1,000 rpm. When needed for heavy-duty anchor-handling and towing duties, the full output of 11,200 bhp will be used. During normal supply functions, the vessel will operate on only two engines, reducing fuel consumption to the equivalent of a 3,000-bhp supply boat.

The vessel is fitted with controllable-pitch propellers in nozzles, and a 720-hp bow thruster powered by a Detroit Diesel 16-V-92 engine. Twin Becker rudders are operated independently for better maneuverability and station-keeping.

The Gulf Service is powered and equipped to moor new-generation semisubmersible rigs as far north as 60 degrees latitude in the Bering Sea. Certified to Ice Class A by the American Bureau of Shipping, she is built with special ice-strengthening said to exceed that of any other anchor-handling tug/supply vessel under the U.S. flag.

The anchor-handling system minimizes rig mooring time and enables the vessel to transfer the rig's mooring system. The vessel's system includes chain lockers and pendant storage reels, with the capacity to store more than 12,000 feet of 3-inch anchor chain and 12,000 feet of 2½-inch pendant wire.

The towing winch is a Fritz-Culver low-pressure, hydraulic, double-drum waterfall type, with 586,000 pounds of line pull at stall, and a capacity for 5,900 feet of 2½-inch cable on each drum. Other deck machinery includes two 10-ton electrohydraulic tuggers above deck and two 5-ton units below deck, and two 10-ton hydraulic capstans.

GULF SERVICE
Major Suppliers

Main engines (4)	Stork-Werkspoor
Reduction gears	Reintjes
Propellers & bow thruster	Berg
Stern bearings	Johnson
Rudders	Becker
Engine controls	WABCO
Generator engines	Detroit
Keel coolers	Johnson
FO & LO centrifuges	Mitsubishi
Fire pumps	Worthington
Fire monitors	Skum
Deck cranes	Fassi
Radars (2)	Furuno
Loran C	Micrologic
Autopilot & gyrocompass	Sperry
SatNav	Racal-Decca
Depth sounder	Datamarine
Searchlights	Carlisle & Finch
Running & navigation lights	Aqua Signal
Air horns	Kahlenberg

"HARVEST 'A' RIG"
McDermott Shipyards

McDermott Shipyards in New Iberia, La., at mid-85 completed construction of a specialized, twin-packaged drilling rig for Helmerich & Payne International Drilling Company, for contract drilling on Texaco's Harvest "A" platform in

(continued)

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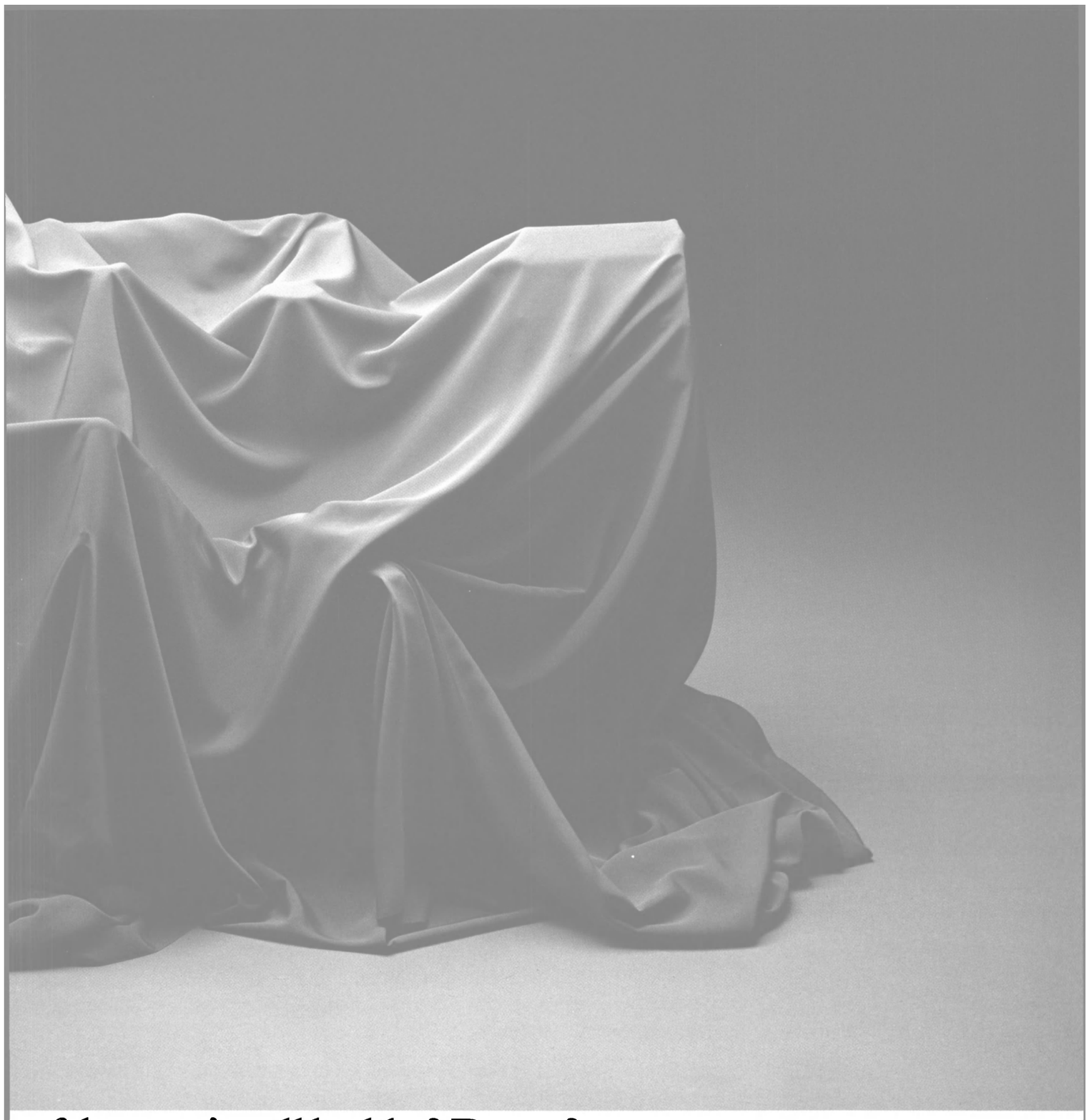

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Outstanding

(continued)

the Santa Maria Basin offshore California. The rig was disassembled at the McDermott yard and shipped to the West Coast by rail.

The ability to disassemble a rig in modules small enough to ship by rail represents an advantage for the owner and adds a flexibility lacking in typical modular rig packages. As these packaged rigs can be broken down into smaller components than conventional modules, they can be shipped by rail or truck. The smaller packages can be handled without the heavy equipment modules require; the ordinary lifting equipment available on platforms can handle them. On the other hand, if using heavy-lift equipment is desirable, the packages can be consolidated to make full use of the lifting capacity available.

The complete rig can be assembled with approximately 50 lifts using platform-mounted, material-handling cranes to lift packages of 40 tons or less, and about 10 lifts, depending upon completeness of package consolidation, using a derrick barge to lift units of up to 500 tons.

The Helmerich & Payne rig was designed by Hudson Engineering, a McDermott subsidiary located in Lafayette, La. The complete structure, which weighs about 1,000 tons, was designed to meet criteria for the Zone 4 seismic area and 100-year storm, as defined by API RP2A. Subassemblies are equipped with individual lifting eyes, and are bolted together using more than 3,000 bolts made of steel meeting these seismic and storm requirements.

INDEPENDENCE
Halter-Moss Point

The rocket booster recovery vessel Independence, built by the Moss Point, Miss., shipyard of Halter Marine, Inc., was delivered at mid-85 to Lockheed Space and Operations Company, for whom the vessel was constructed under a contract from Lockheed Shipbuilding. The 200-foot Independence will perform the key role in the recovery of rocket boosters launched from Vandenberg Air Force Base in California as part of the space shuttle program.

Main propulsion is provided by two Cummins KTA50-M diesel engines, each rated at 1,250 bhp at 1,850 rpm, driving Lips propellers via Niigata reverse/reduction gears and Halter shafting. Two other Cummins diesels, model KTA19-M, power the Elliot White Gill bow and stern thrusters.

The vessel is fully equipped to handle all necessary diving requirements; in addition to complete diving equipment, she is fitted with air refilling systems and a hyperbaric decompression chamber. As a safety percaution, the bow and stern thrusters will be used for propulsion when divers are in the water.

Exceptionally complete electronics systems for navigation and communications have been installed. These include Magnavox satellite navigation and Loran systems, Dec-

INDEPENDENCE
Major Suppliers

Main engines (2)	Cummins
Reduction gears (2)	Niigata
Propellers (2)	Lips
Engine controls	Wabco
Shafts	Halter
Shaft brakes	Mathers
Keel coolers	Fernstrum
Bow & stern thrusters	Elliot White Gill
Generators	KATO
Generator engines	Cummins
Firefighting system	Goulds
Emergency generator	Cummins
Towing winch & anchor windlass	HBL
Satnav & Loran systems	Magnavox
Position plotter	Decca
Radars (2)	Krupp Atlas
Echo depth sounder	Simrad
Auto direction finder	Simrad
Weather facsimile recorder	Alden
Speed log system	Junger
Satcom system	Magnavox
HF/SSB radio	King
VHF radio	Texas Instruments
Aircraft UHF transceiver	Magnavox
General-purpose receiver	Harris
Aircraft VHF radio	Narco
CB radio	General Electric
Hand-held VHF radio	Repco
Lifeboat radio	ITT Mackay

ca position plotter, two Krupp Atlas radars, Simrad depth sounder and ADF, Alden weather facsimile recorder, Junger speed log, Magnavox satellite communications system, King HF/SSB radio, and Texas Instruments VHF radio.

The divers aboard the Independence will be retrieving partially submerged rocket boosters for reuse on later missions. The boosters separate after the space shuttle has reached a certain altitude and float down to the ocean on parachutes. Divers will quickly connect special air hoses to the boosters and, using powerful air compressors aboard the vessel, purge the boosters of any water and refloat them.

MISSOURI RIVER QUEEN
Marine Builders

The 600-passenger excursion vessel Missouri River Queen was delivered by Marine Builders, Inc. of Utica, Ind., to **Richard Lynn** of Kansas City, Mo. The new boat is operating daily excursion trips along the Missouri River in the Kansas City area.

The vessel has an overall length of 95 feet, beam of 31 feet, depth of 6½ feet, and draft of 3½ feet. Main propulsion is provided by two Cummins NT855M diesel engines, each rated 290 bhp at 1,950 rpm, driving Columbian Bronze four-bladed, stainless steel propellers via Twin Disc reduction gears.

The engines are cooled by Fernstrum Gridcoolers mounted on the hull. The engine controls, designed by Marine Builders, feature full pilothouse instrumentation including low oil pressure, high water temperature, and gear oil pressure alarms. Steering controls are located on each wing of the bridge as well as in the wheelhouse.

Electric power is provided by two 85-kw I.E.C. model G415GAD generators driven by Cummins 6BT5.9GC diesel engines.

MISSOURI RIVER QUEEN
Major Suppliers

Main engines (2)	Cummins
Reduction gears	Twin Disc
Propellers	Columbian
Engine controls	Marine Builders
Stern coolers	Fernstrum
Generators	I.E.C./Cat
Air compressor	Energaire
Radar	Furuno

ORIOLE
Aluminum Boats

The 115-foot crew/utility vessel Oriole, built by Aluminum Boats, Inc. of Crown Point, La., was delivered recently to A&P Boat Rentals of Cut Off, La. The all-aluminum, triple-screw boat can haul 63 persons, 30 long tons of cargo, and 12,000 gallons of rig water. She can also fight off-ship fires using a 700-gpm monitor mounted aft. When not carrying rig water, the vessel can haul up to 80 tons of cargo on her spacious aft deck.

The Oriole has a beam of 24 feet and depth of 9½ feet. She is powered by three Detroit Diesel 12V71TI engines developing a total of 1,530 bhp. They drive Federal 36-inch propellers via Twin Disc MG-514 reverse/ reduction gears with a ratio of 2.5:1. Two Delco 40-kw generators driven by Detroit 3-71 diesels provide electric power for ship's service and wheelhouse electronics.

Compressed air for starting the main and generator engines, and for the Morse engine control system, is provided by two Qunicy 208 VAC units. A Crane/Deming pressure set supplies the galley, heads, shower, drinking fountain, and deck and en-

(continued)

Outstanding

(continued)

gine room taps. A Raritan masserator sanitation system is installed for pollution control.

The pilothouse is equipped with two electro-hydraulic steering stations, with one facing aft for backing down on rigs. Stainless steel hydraulic tubing is used throughout the boat.

The off-ship firefighting system, unusual for a crewboat, consists of a keel-cooled Detroit Diesel 3.53 engine driving a Hale 700-gpm pump at 150 psi feeding an Elkhart 292 monitor. A feature of this system is its portability; when not in use the monitor can be stowed to avoid damage during cargo-handling operations. It features an easy-on/easy-off coupler to allow quick response to any emergency.

Main engines (3)	Detroit Diesel
Reduction gears (3)	Twin Disc
Propellers (3)	Federal
Generators (2)	Delco
Generators engines (2)	Detroit
Engine controls	Morse
Air compressors (2)	Quincy
Sanitary system	Raritan
Fire pump	Hale
Fire monitor	Elkhart
Radars (2)	Furuno
Loran C	Sidex/Koden
SSB radio	Motorola
Gyrocompass, autopilot & rudder angle indicator	Sperry
Depth sounder	Datamarine

OTTO CANDIES
Halter-Lockport

The Lockport, La., shipyard of Halter Marine, Inc. recently delivered the innovative triple-screw tug Otto Candies, first of two ordered by Otto Candies, Inc. of Des Allemands, La. The 140-foot, $5-million vessel, described as a go-anywhere, do-anything tug, combines conventional and azimuth drive technology in one boat.

The Otto Candies, with outboard Niigata Z-Peller drive units and conventional center-line propeller, all in nozzles, will provide her owner with both domestic and international towing capabilities. This design allows for routine engine maintenance even when carrying payloads by shutting down either outboard engine while running the center-line engine. In any condition, the vessel can continue under way with excellent maneuverability.

With the outboard Z-Pellers in nozzles, the joystick control may be moved forward, aft, port, or starboard and the vessel will respond almost instantly in any direction. This system will allow for the handling of tremendous loads in the tightest of spots, eliminating the need for multiple tugs in many offshore applications.

The Candies tugboat has a beam of 42 feet, depth of 20 feet, and loaded draft of 19 feet. She is powered by three GM Electro-Motive Division 16-645 E6 diesels with a total output of 5,850 bhp at 900 rpm. The centerline engine has a Reintjes WAV-2250 reduction gear supplied by Karl Senner, Inc. of New Orleans.

The towing winch is a Markey TDSDS-36 driven by a GM Detroit Diesel 8V-92 engine. The hydraulic windlass was also supplied by Markey. The firefighting system includes a 2,000-gpm pump and two monitors—a 1,000-gpm unit with local control and a remote-controlled 1,000-gpm unit. Fuel capacity is approximately 85,000 gallons and fresh water 35,000 gallons. Accommodations are provided for a crew of 14.

Without the house top, the Otto Candies at launching weighed 500 tons; a comparable conventional tug would weight some 150 tons less at this stage. The difference is Ice Class "C" construction and a heavier stern that contribute to both stability and versatility.

Major Suppliers

Main engines (3)	Electro-Motive
Propellers	Niigata
Reduction gear	Reintjes
Generators (3)	Detroit Diesel
Towing winch & windlass	Markey
Towing winch engine	Detroit
Air compressors (2)	Quincy
Fuel oil pumps (2)	Viking

OUACHITA
Twin City Shipyard

The 3,850-cubic-yard trailing hopper dredge Ouachita was completed in late 1985 by Twin City Shipyard (TCS) in St. Paul, Minn.,

Main engines (2)	Deutz KHD
Reduction gears	Philadelphia Gear
Propellers	Lips
Shaft bearings	Waukesha
Steering system	Wagner
Bow thruster	Schottel
ECR & bridge consoles	Continental Electric
Dredge console	Noltec
Generators	Caterpillar
Hydraulic system	Rexroth
Ventilation fans	Hartzell
Ventilation cowls	Winel
Switchboards	General Electric
Dredge instrumentation	Observator
Dredge pump & jet pump	Mobile Pulley
Pumps	Ingersoll Rand, M.P. Pumps & Roper
Wastewater treatment	Omnipure
Bilge o/w separator	Hyde Products
Fuel oil purifier	Alfa-Laval
Plate cooler	Tranter
Deck cranes	Appleton
Winches	Intercontinental
Halon system	Chemetron

and delivered to Gulf Coast Trailing Company of Kenner, La., a joint venture of T.L. James & Company, Hollandsche Aanneming Maatschappy, and Dredging International.

The new dredge has a BP length of 278 feet, beam of 55 feet, depth of 24.5 feet, and draft of about 21.3 feet. Main propulsion is provided by two Deutz KHD S/BV16M628 diesels, each rated 4,270 bhp at 1,000 rpm, driving Lips propellers via Philadelphia Gear reduction gears. A Schottel bow thruster is installed to enhance maneuvering. The steering system was supplied by Wagner Engineering, and shaft bearings by Waukesha. Caterpillar generators provide electric power.

Designed by TCS, the Ouachita was constructed using the latest modular and zone construction techniques. Modules weighing up to 125 tons are fabricated in the yard's large erection hall, moved out by hydraulic walkers, and lifted into place using a heavy-lift Ring Horse crane.

Twin City has become one of the leading U.S. shipyards in the design and construction of hopper dredges and dump scows, in addition to its standard line of hopper barges, deck barges, and Portabarges™.

RACE POINT
Eastern Marine

Eastern Marine, Inc. of Panama City, Fla., recently delivered the passenger/vehicle ferry Race Point to the Fishers Island Ferry District, Fishers Island, N.Y. Designed by the naval architecture and marine engineering firm of SAS Designers in Mobile, the ferry has an overall length of 162 feet, beam of 33 feet, depth of about 10 feet, and loaded draft of approximately 7.5 feet.

Main engines (2)	Caterpillar
Reduction gears (2)	Twin Disc
Propellers (2)	Columbian
Propeller shafts (2)	Armco
Bow thrusters (2)	PSI
Bow thruster engines	Detroit Diesel
Generators (2)	Detroit
Switchboard	Marine Electric
FW & SW pumps	Peabody Barnes
Bilge, ballast & fire pumps	Gorman-Rupp
Bilge & ballast pump	Burk
Air compressor & air horn	Kahlenburg
Heating system	Aldrich Boiler
Windows & ports	Kearfott
Radar	Furuno
Depth sounder	Datamarine
Radiotelephone	Regency
Intercom system	Hose-McCann

The Race Point is powered by twin Caterpillar 3412T diesel engines each with an output of 540 bhp at 1,800 rpm, driving Columbian propellers via Twin Disc MG 518 reverse/reduction gears and Armco Aquamet 22 stainless steel propeller shafts. Two PSI bow thrusters are driven by Detroit 6-71 diesels. Electric power is produced by two 20-kw generators powered by Detroit 2-71 engines.

The vessel will operate primarily between Fishers Island and New London, Conn. in all types of weather. She meets all the applicable regulations of the U.S. Coast Guard, the Public Health Service, and the Environmental Protection Administration, as well as New York State rules for operation on lakes, bays, and sounds. The ferry has a capacity of four 35-ton trucks or a mixture of smaller trucks and cars, and a maximum of 250 passengers. Diesel fuel capacity is 10,000 gallons, and 500 gallons of fresh water. Speed when half loaded is approximately 11 knots.

Eastern Marine is engaged in the design and construction of cruise

(continued)

Outstanding

(continued)

vessels, ferries, inland and offshore tugs, barges, offshore support vessels, commercial fishing boats, and specialized military and other government vessels.

ROWAN GORILLA III
Marathon

Built by the Vicksburg, Miss., yard of Marathon LeTourneau for Rowan Companies, Inc. of Houston, the drilling rig Rowan Gorilla III left Belle Chasse, La., in 1985 under tow of the 22,000-bhp oceangoing tug Smit London for the 2,000-mile trip to offshore Nova Scotia, Canada. During the voyage the tug received propulsion assistance from the operation of the rig's twin 112-inch propellers in Kort nozzles driven by eight electric motors with 6,800-hp total output.

The new unit is the third in a series of the largest self-elevating jackups built by Marathon LeTourneau Offshore Company for Rowan. They are of a new and heavier class intended to drill up to 30,000 feet in water depths up to 328 feet in any ice-free hostile environment in the world. In less hostile environments, they are capable of drilling in water depths of more than 400 feet.

These 15,000-ton rigs require twice the amount of fabricated steel used in the previously largest jackups. At 297 feet by 292 feet, the Gorilla Class rigs are nearly 40 percent bigger than the Marathon 116 Class jackups.

ROWAN GORILLA III
Major Suppliers

Electrical parts	Argo International
Bearing staves	Argo Marine
Steel plate & structurals	Bethlehem
Aerofin coil	Buffalo Forge
Choke Manifold, BOP and diverter valves	Cameron Iron Works
Diesel engines	Caterpillar
Propellers & shafts	Coolidge
Hospital equipment	Dean Steel
Chemicals	Drew
Chemicals	Eureka
Electrical cable	L.F. Gaubert
Transformers & SCR's	General Electric
Cathodic protection	Global Cathodic
Electrical parts	GTE
Radio equipment	Gulf Radio (distributor)
Bulk system	Halliburton
Fans	Hartzell
Telephone system	Hose McCann
Coatings	International Paint
Hydraulic hose	Koomey
Electrical parts	Krotos
Cranes, winches, skidder gear elevating unit motors & components, fabricated structures, steel plate	Marathon
Stuffing boxes	Lucian Moffitt
Derrick	Lee C. Moore
Monitoring system	MSI
SCRs	National Supply
Engine coolers	O&M Manufacturing
Mufflers	Riley-Beaird
Hear exchanger	Ross (Boston Metals)
Alloy bars	Timken
Antifreeze	Tri Tex Marine
Steel plate, structurals & bars	US Steel
Survival capsules	Whittaker
F-O filters	Winslow
Pumps	Houston Systems, Lovejoy, Marlow, Peerless, Roper, S&N Pumps

SANDY HOOK
Gladding-Hearn

The Sandy Hook Pilots Association of New York and New Jersey recently took delivery of the 64-foot dispatch boat Sandy Hook. The all-aluminum, twin-screw vessel was built by Gladding-Hearn Shipbuilding/The Duclos Corporation of Somerset, Mass., and designed by C. Raymond Hunt Associates of Boston with a deep "V" hull.

The new vessel is powered by two M.A.N.-B&W D2452 V-12 diesel engines, each developing 545 bhp at 1,800 rpm, providing a top speed of 24 knots and cruising speed of 20 knots. The power train includes Columbian Tetradyne propellers, Armco Aquamet-22 shafting, and L&S Marine reverse/reduction gears with a ratio of 2:1.

Topside, the Sandy Hook has a spacious midships cabin divided into pilothouse and salon areas. Both are electric baseboard heated and fully air conditioned with Marine Air Systems equipment. In the well-equipped pilothouse, the center helm has a vertically mounted, 30-inch destroyer type wheel controlling a Hynautic hydraulic steering system. Lexan skylights over the helm area and double-hung windows in the aft bulkhead provide added ventilation when the air conditioning is not in use.

The salon area provides a roomy and comfortable space for commuting pilots. Six reclining chairs on a raised platform occupy the starboard side, and two more are located forward on the port side. Windows and ports in the salon are of tinted glass.

Below-deck quarters offer accommodations for 10, with six bunks in the midships area and four bunks forward. There are two toilet compartments, one of which includes a shower, located between the berthing spaces.

On deck, walkways from the engine room forward, as well as handrails from the cabin doors forward, are hot-water-heated for safety in winter weather. Hull guards include Johnson 7-inch-diameter fendering and slanted strakes of D-section rubber.

SANDY HOOK
Major Suppliers

Main engines (2)	M.A.N.-B&W
Reduction gears	L&S Marine
Propellers	Columbian
Shafting	Aquamet
Generators	Northern Lights
Engine controls	Cobelt
Bow thruster	Hynautic
Separators	Racor
Pumps	Jabsco
Air compressor	SpeedAire
Lights	Aqua Signal
Coatings	International
Fendering	Johnson
Radars (2)	Furuno
Loran C	Northstar
VHF radio	Shipmate
Fathometer	Raytheon

SANTA CRUZ
Hope/Progressive

The 67-foot patrol boat Santa Cruz de la Sierra was delivered during 1985 by the Hope/Progressive shipyard in Houma, La. The diesel-powered vessel, ordered by the Naval Forces of the Republic of Bolivia, was built under contract with Napco International of Minneapolis, an international marketing firm that supplies a full line of defense-related products to the U.S. Government and the governments of more than 60 countries around the world.

Hope/Progressive is an established group of companies specializing in fabrication of offshore structures, oilfield equipment, and living quarters modules, and in construction of high-performance aluminum vessels.

Main propulsion for the Bolivian Navy boat is provided by twin Detroit Diesel engines driving Michigan propellers via Twin Disc reduction gears. The alarm system was provided by E.M.T. Electronics. Electric power is supplied by two generators driven by Detroit engines.

SANTA CRUZ
Major Suppliers

Main engines (2)	Detroit Diesel
Reduction gears	Twin Disc
Propellers	Michigan
Alarm system	E.M.T. Electronics
Generators	Detroit/Delco
Air conditioning	Carrier
Radar	Furuno
VHF/FM & loudhailer	Cybernet
S-P telephones	Hose-McCann
Coatings	Glidden

Electronics include Furuno radar, Cybernet VHF/FM radio, Impulse depth sounder, Cybernet loudhailer, and Hose-McCann sound-powered telephones. The coatings system is by Glidden, and air conditioning by Carrier.

SPEED TIDE
Bell Halter

Tidewater Marine Service, the marine subsidiary of Tidewater, Inc. of New Orleans, recently took delivery of the Speed Tide, a 110-foot Surface Effect Ship (SES) on long-term charter from the vessel's owner and builder, Bell Halter, Inc., also of New Orleans.

As this vessel represents a new dimension in offshore support services for Tidewater, its performance will be closely monitored and evaluated in order to determine the feasibility of adding equipment of this type to the Tidewater fleet in the future. The new vessel will work in the Gulf of Suez for the Gulf of Suez Petroleum Company, a joint venture of Egypt's national company and Amoco.

The Speed Tide's principal characteristic is that it is air-supported, with catamaran type, rigid side hulls. A cushion of air trapped between the side hulls and flexible bow and stern seals lifts a large part of the side hulls clear of the water to reduce drag, thereby producing greater efficiency and higher speed. The lower parts of the side hulls remain in the water to aid in stability and maneuverability.

SPEED TIDE
Major Suppliers

Main engines (2)	Detroit Diesel
Reduction gears (2)	ZF
Propellers (2)	Kahlenberg
Lift engines	Detroit Diesel
Lift fans	Bell (design)
Bow & stern seals	Bell-Avon
Engine controls	WABCO
Steering controls	Sperry/Huber
FO separators	Westfalia
Air compressor	Quincy
Pumps	Crane Deming/Crown/Goulds/Myers
Anchor winch	Beebe
Navigation lights	Aqua Signal
Spotlight	Carlisle & Finch
Radars (2) & gyrocompass	Sperry
SSB radios (2)	Stevens
VHF radios (2)	Sailor
Depth finder	Morrow
Loudhailer	Raytheon
Deck lights	Hubbell

The SES is powered by twin Detroit Diesel 16V149TIB engines that develop 1,650 bhp each and produce a cruising speed of 33 knots. The two Detroit 8V92 lift fan engines each have an output of 350 bhp and create the air cushion for the vessel.

The Speed Tide will deliver support crews and supplies to drilling rigs and production platforms within a 50-mile radius in the Gulf of Suez, consuming roughly the same amount of fuel as a conventional crewboat on a per-mile basis.

"TWR CLASS"
Marinette Marine

The first of 10 Torpedo Weapons Retrievers (TWR) under contract at Marinette Marine Corporation in Marinette, Wisc., departed the shipyard recently for delivery to the U.S. Navy's Naval Sea Systems Command in Charleston, S.C.

The TWR Class is an entirely new design developed by Marinette in cooperation with the Navy to meet stringent mission requirements. The new vessels will replace the aging TWRs now in service. They are used by the Navy for recovering spent torpedoes, missiles, small drones, and mobile targets fired during weapons systems tests of all submarines and surface combatant ships. The new TWRs will be capable of staying on station for a week in support of these tests; the smaller existing boats have to return to base at night and return to the test site the next day.

The new TWR is 120 feet long with a beam of 25 feet, depth of 12 feet, and an approximate displacement of 213 tons. The vessel is all-steel construction with 2,000 bhp of propulsion power on twin shafts driving fixed-pitch propellers. It has a design speed of 16 knots, range of 1,700 nautical miles, and accommodations for a crew of up to 18 men.

WEAPONS RETRIEVER
Major Suppliers

Main engines (2) & reduction gears	Caterpillar
Propellers	Kahlenberg
Generators (2)	Caterpillar
Switchboard	Conselect
Radar	Canadian Marconi
Loran C & plotter	EPSCO Marine
SatNav system	Magnavox
Gyrocompass	Sperry
Radio direction finder	Furuno
Depth indicator	Raytheon
Speed log	Datamarine
Searchlights	Carlisle & Finch
Bridge-to-bridge VHF radio	Intech
Announcing system	Marine Electric

WALTER D. JOHNSON
Keith A. Record

The 42-foot, 50-ton pushboat Walter D. Johnson, built by the Keith A. Record shipyard of Portland, Ore., for Johnson Bros. Corportion, is performing a demanding job on the Columbia River—that of spotting bridge construction barges in tight quarters and rapid river currents.

For this tough assignment, the Minnesota-based owner selected twin Cummins KT19-M diesel engines for main propulsion. Each of these six-cylinder turbocharged engines develops 510 bhp at an intermittent rating of 2,100 rpm. Most pushboats of this size do not have this much horsepower, but the owner wanted reliable propulsion, with plenty of power in reserve, for the variety of bridge-building functions it is performing, including construction of cofferdams, maneuvering crane barges, and transporting cement trucks on a service barge. Johnson has a $16-million contract to build a 3,365-foot-long bridge across the Columbia River at Umatilla, Ore.

The vessel has a beam of 18 feet, depth of 7 feet, and operating draft of 6 feet. Operator eye level in the pilothouse is 25 feet above the waterline. Each Cummins engine drives a stainless steel propeller supplied by HDF Propellers of Seattle. Air controls are American Standard, and the hydraulic steering system, making use of Parker cylinders, valves, and pumps, was supplied by Western Fluid Power of Portland.

The main engines are cooled by a Fernstrum keel cooling system that is mounted on the sides of the hull. Fuel filters are by Racos and mufflers by Harco. A 20-kw Northern Lights generator was supplied by Alaska Diesel Electric of Seattle. Rodgers Marine Electronics of Portland supplied the Raytheon radar, Standard depth sounder and VHF radio, and Horizon loudhailer. Other suppliers, all in Portland, included Apollo Marine Services, electrical components; Western Metals, aluminum windows; and Devoe paints.

OUTSTANDING CONVERSIONS

A review of some notable conversions of inland/offshore vessels featured during 1985.

HARVEY TROJAN
Avondale-Harvey

The Harvey Quick Repair Division of Avondale Shipyards in Harvey, La., during 1985 completed an extensive overhaul and re-engining of the 121-foot oceangoing tug Harvey Trojan. Originally delivered by Halter Marine in 1974 as the Abdon Martin, the vessel is now owned by the Harvey Gulf International.

A major part of the conversion was the replacement of the two original engines with twin Stork-Werkspoor 6SW280 diesels driving four-bladed, stainless steel propellers in Kort nozzles via Reintjes WV3400 reduction gears with a ratio of 5.053:1. The gears were supplied by Karl Senner, Inc. of New Orleans when the tug was built. The overhauled engine controls had been supplied by WABCO Fluid Power, an American Standard company, and the steering system by Sperry/Vickers.

The entire hull was blasted and painted, inside and out, the stern roller was overhauled, and the bow fenders were replaced. For heavy-duty towing jobs in the Gulf of Mexico or worldwide, the tug is fitted with an Intercon 225 double-drum towing winch with a bollard pull of 280,000 pounds. Other deck equipment includes an HBL anchor windlass, Carlisle & Finch searchlights, and Kahlenberg air horn. Fuel oil capacity is 120,000 gallons and potable water 15,000 gallons.

In addition to the new SWDiesel main engines, the vessel has two 100-kw generators driven by Detroit Diesel 8V-71 engines. These units were supplied by George Engine Company of Harvey.

The entire electronics array was replaced with new equipment. This includes two Anritsu ARM112A radars, Furuno LC-80 and Texas Instruments T1900 Loran C, Magnavox satellite navigation system, Simrad depth sounder, Sperry gyrocompass and autopilot, Ritchie magnetic compass, two Stephens SEA112 SSB radios, and two Sailor RT144 VHF radios. All electronics were supplied and installed by Bibbons & Rice of Morgan City, La.

DOC TIDE/DAROL TIDE
Bender Shipbuilding

Bender Shipbuilding & Repair Company of Mobile, Ala., during 1985 redelivered two offshore supply vessels, the Doc Tide and the Darol Tide, to Tidewater Marine

(continued)

Outstanding

(continued)

Services of New Orleans after completing extensive conversions.

The vessels were lengthened 16 feet to accommodate new liquid mud tanks and chain lockers, making the new overall length 216 feet. Each vessel was fitted with a more efficient, 55-inch Bird-Johnson 35/3S/FP bow thruster that develops 16,050 pounds of thrust. Fritz Culver supplied new releasable cable stops.

A GM Detroit Diesel 4V-71 engine was installed to drive the four Mission Viking liquid mud pumps. Each pump can transfer 850 barrels per hour. Bender also carried out routine drydocking and repairs for the two supply boats.

Besides its well-known new-construction capabilities, the Mobile yard is a leading ship repair facility, with three floating drydocks capable of lifting up to 18,000 tons.

New Equipment Added

Bow thrusters	Bird-Johnson
Mud pumps	Mission Viking
Mud pump engine	Detroit Diesel
Cable stops	Fritz Culver

COLUMBIA / AMERICAN BEAUTY
Marco-Seattle

As a result of the move to trawling in the North Pacific fishing fleet, two of 1985's more complete conversions were performed by the Marco-Seattle shipyard. A pair of Marco-built combination crabbers built in 1979, the 122-foot Columbia and the 123-foot American Beauty were modified extensively for their new fisheries roles.

Work completed on the Columbia included a pair of new Marco WT266 MarTrawl winches and the IntelliTrawl computerized trawling system, fabrication of a stern ramp and 10-inch recessed roller, 8-foot-wide net flat, trawl door pockets, box-type stern gantry, net reels, and hydraulic stern ramp gates.

Along with extensive hydraulic and electrical systems work and power supply changes, other equipment added included a Rapp net sound winch, Pullmaster haulback winch and two gilson winches, and an aft-facing console added to the pilothouse with controls for the entire trawl system.

The Columbia's propeller was repitched, chafing guards added, and engine room and exteriors were painted. Harris Electric installed new electronics, including a Furuno FCT-1411 color radar coupled with the GD-2000 color plotter, Simrad ES-380 echo sounder, Simrad FA-100 catch indicator and ET-102 sounder with FR-500 Trawleye system.

In addition to having much of the same hull work performed, the American Beauty was fitted with two Rapp TWS-1220 trawl winches and the Autohaul system, Rapp new sound winch, two Gearmatic gilson winches and a Gearmatic inhaul winch.

Owner-furnished electronics installed in the American Beauty by Lunde Marine Electronics included a Simrad EQ echo sounder, FR-500 Trawleye system, and FA-100 catch indicator, as well as a Raytheon NWU-50 color video plotter and NOM-50 tape date recorder.

SAN FRANCISCO
Southwest Marine

During 1985 Southwest Marine, Inc. of San Diego repowered three 725-passenger ferries owned by the Golden Gate Bridge, Highway and Transportation District of San Francisco, replacing the original three gas turbines in each vessel with two fuel-efficient Detroit Diesel 16V-149TIB engines.

During the break-in period of the first vessel to be repowered, the San Francisco, the Ferry Division found "dramatically improved performance" from the diesel-powered boat, leading to savings in commuting time as well as impressive dollar savings. These savings are being achieved despite a reduction in propulsion power from 7,500 shp with

the original gas turbines to 3,100 bhp with the diesels. Reliability is said to have been 100 percent, and the noise level as low as it was with the gas turbines.

The San Francisco and her sister vessels, Marin and Sonoma, provide passenger-only commuter service between downtown San Francisco and the port of Larkspur serving the residential communities of Marin County.

Fuel savings have already met the goals set for the repowering, and overall performance has exceeded expectations. Hourly full-power fuel consumption has averaged 170 gallons with the two diesels and one genset; the original gas turbines burned 500 gallons per hour. Cruising speed has met the boat's design speed of 20.5 knots, surprising in view of the great reduction in horsepower.

A critical demand has been that ferry service be increased to meet anticipated gains in ridership, and that the Ferry Division's high level of on-time departures and landings be maintained. The markedly improved performance of the boat at slow and intermediate speeds, the result of conversion from waterjet to propeller drive, is paying off in terms of time saved during dockings and departures, and has added an important margin of safety to ferry operation.

In order to convert from the waterjets to propellers, a five-foot extension was added to the stern of each ferry to house rudders and steering mechanism. This slight increase in the waterline length of the 165-foot vessels also contributed to maintaining the original design speed.

B&R Offers Literature On Company Services, Products And Programs

Bull & Roberts (B&R) of Springfield, N.J., is offering free literature on the company's service, products and programs available to the marine industry. B&R is one of the largest suppliers of chemical products and services to all types of oceangoing vessels through one of the largest worldwide service networks.

Listed in the material are such products as BR-700 corrosion inhibitor; BIOBOR® fuel biocide; BROVAP PLM-NF evaporator treatment; H-400 scale remover; BR-801 fuel antifreeze; BROMAR air cooler cleaner, tank and bilge cleaner; B&R Electri-Cleaner; and BROMAR emulsifying degreaser. A description of each is included.

Among the services mentioned is B&R oil analysis consulting service, a diagnostic service of sampling and analyzing oil samples from engines, transmissions and other oil-based systems to determine contaminants, wear rates, filter changes and lubricant replacement.

The literature also highlights Aqualert® ultra-violet water purifiers for sterilization of potable water.

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Circle 10 on Reader Service Card

Joseph A. Watters Appointed President, Royal Viking Line

Royal Viking Line recently announced the appointment of **Joseph A. Watters** as its new president and chief operating officer.

Mr. **Watters** comes to the line from Princess Cruises, where he has served as president since April 1981. Prior to that time he was vice president and subsequently executive vice president of marketing for Princess, which he joined in 1977.

Announcement of Mr. **Watter's** appointment was made by **Erland M. Raastad,** president and chief executive officer of the Oslo-based parent company of Royal Viking Line. Mr. **Raastad** added that **Warren S. Titus,** chairman of Royal Viking Line, will assist in coordinating an orderly transition. He will continue to work with the line on a full-time basis on a variety of projects. Associated with Royal Viking Line since its inception in 1970, Mr. **Titus** was appointed president the same year. He became chairman in 1981.

Long-term service experience confirms that Wartsila Diesel engines are capable of burning the low fuel qualities of the future. For example, the recommended time between overhauls for the Vasa 32 engine on heavy fuel is today 12 000 hours.

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1986

DIESEL ENGINE GUIDE

MARITIME REPORTER AND ENGINEERING NEWS

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1986

DIESEL ENGINE GUIDE

As we enter 1986, marine engineers and shipowners have available the largest selection of diesel engines ever—low-speed, medium-speed and high-speed machines; two-stroke cycle and four-stroke cycle designs; crosshead-piston and trunk-piston designs; loop-scavenaged and uniflow-scavenaged designs; conventional- and opposed-piston designs. Not only is the available selection broad enough to satisfy the needs of nearly every ship design but the fuel economy available from the modern diesel engine makes it the undisputed choice of nearly every shipowner building or contemplating to build a ship. Even with the depressed state of the marine industry, the international and domestic diesel engine manufacturers continue their aggressive research and development programs. One of the greatest problems facing both marine engineers and owners contemplating new ship construction is keeping up with the new developments in diesel engines for both main propulsion and auxiliary duty.

ENGINE AVAILABILITY RANGE

Whereas a decade ago there were apparent power ranges for marine diesel engines, today we find very extensive overlapping of the power ranges for diesel engines as classified by specific speed; low-speed engine C_s=1-3, medium-speed engines C_s=3-9, high-speed engines C_s=9-27. (Note specific speed is defined as $C = 1n^2/600{,}000$ where 1=length of stroke in inches and n=engine speed in rpm.) Low-speed engines can be found in sizes from just a few thousand horsepower to over sixty thousand horsepower. Medium-speed engines range from approximately one thousand horsepower to well over twenty thousand. High-speed engines range up to a few thousand horsepower. With the advent of the super-long stroke and what some may call the ultra-long stroke engines, the engine speed of the diesel engine is as low as 50 rpm at rated power. The upshot of this colossal range of engines available for marine application is that the ship designer can select an engine that will allow him to optimize the vessel design. Power and fuel consumption are not the only variables considered in selecting an engine, for even the largest of ships, but other variables impacting on the economics of the vessel are appropriately considered such as engine dimensions, engine weight and impact on overall system integration and maintenance.

FUEL ECONOMY

A few years ago the designers of low-speed engines, responding to the demands caused by the rising fuel prices of the mid-1970s, achieved a significant breakthrough when they developed engines with thermal efficiencies of greater than 50 percent (specific fuel consumption of 125 g/bbp h). The designers of low-speed diesel engines achieved this breakthrough by developing the long-stroke engines with their greater capacity for expanding the cylinder gases and the use of uniflow scavenging. At present, the ultra-long stroke engines are approaching stroke/bore ratios of 4:1 and are achieving SFC of 115 g/bbp h. Some medium-speed engine designers have also taken advantage of greater stroke/bore ratios (approximately 1.4:1) to improve the fuel economy of the inherently more efficient, four-stroke cycle engines to a level where it rivals the best of the large bore low-speed engines. Both low-speed and medium-speed engine manufacturers have adopted more of a systems approach to the configuring of their engine package and have incorporated into their engine packages shaft-geared recovery power turbines yielding SFC of approximately 115 g/bbp h at economy ratings.

FUEL COMPATABILITY

Diesel engine manufacturers catering to the needs of the international market have long been aware of the need to have their engines capable of burning low-grade/high-viscosity fuels without compromising engine reliability or longevity. In general, they have been very successful on this front. Most manufacturers of marine diesel engines for the international market claim to be capable of burning fuels up to 380-cst viscosity. Some manufacturers claim the engines can burn fuels up to 700-cst viscosity. Several engine manufacturers are researching the potential of using coal/oil and petroleum coke/oil slurries as fuel. One research tack that some of the engine manufacturers are using to make their engines compatible with the poor-quality fuels is the use of ceramics for engine components susceptible to attack by the fuel impurities. The use of ceramic and/or ceramic-coated parts appears to have the potential to increase the tolerance of the engines to low-quality fuels, especially in high-speed and medium-speed engines.

MAINTENANCE

Engine manufacturers continue to improve the maintenance requirements of marine diesel engines by developing new component designs with increased longevity and increased ease of removal and repair. The manufacturers appear to be well aware of the economic pressures forcing ship operators to complement their vessels with ever smaller crews and are adopting their designs to simplify the maintenance procedures and to lessen the demand for manpower. The use of various types of bolt-stretching devices and specialized removal/assembly fixtures has been common for years and their adaptation to the shipboard maintenance process continues.

UPGRADING OF OLDER ENGINES

As the economic climate has forced ship operators to change their mode of operation, sometimes requiring the vessels to be operated at powers significantly below design levels, the engine manufacturers have responded by designing and making available retrofit packages allowing the operator to optimize the existing engine to the new operating conditions. The most encompassing of the retrofit packages available involves replacement of pistons and cylinders among other parts of existing standard stroke low-speed engines to convert them to super long-stroke machines rated at a lower power but with improved specific fuel consumption and a better match between crank/propeller speed and ship hydrodynamics. Other types of upgrading packages include turbochargers, turbocharger intercoolers and turbocharger bypass systems designed to upgrade the engines to optimize performance at new-load conditions.

ANCILLARY ENERGY RECUPERATION SYSTEMS

In attempts to improve on the already phenomenal specific fuel rates of the larger diesel engines and to improve on vessel overall fuel rates, various techniques and systems have been used to recuperate energy from exhaust gases and cooling water. The most common of these systems is the waste-heat boiler supplying steam to turbogenerator and/or to various heating loads aboard ship. With the availability of high-efficiency exhaust gas power turbines, it has become possible to extract significantly more energy from the exhaust gas than can be used by the turbocharge blower. Various engine manufacturers have adopted the exhaust gas power turbine to supply the excess power back to the engine shaft with improvements of 2.5 to 3 percent in specific fuel consumption. Some marine engineers have opted to use the excess exhaust gas energy to drive or assist in driving an electrical generator.

The following review will highlight the developments of the principal diesel engine manufacturers supplying the marine community with propulsion and auxiliary diesel engines.

AKASAKA DIESELS

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep ★ (bar)
MH22R	4	6L	220x390	430	440	14.12
MH23R	4	6L	230x390	440	515	14.23
AH24R	4	6L	240x410	410	660	17.75
A24R	4	6L	240x450	410	900	17.07
A245R	4	6L	245x450	410	1000	17.25
AH25R	4	6L	250x410	395	700	17.93
MH25SSR	4	6L	250x400	430	590	14.21
AH26R	4	6L	260x440	400	880	19.26
DM26R	4	6L	260x440	400	770	16.86
DM28AR	4	6L	280x460	390	955	17.65
AH28R	4	6L	280x440	385	990	19.41
AH28AR	4	6L	280x460	390	1065	19.69
AH28	4	6L	280x440	385	990	19.41
DM30R	4	6L	300x480	375	1105	17.68
AH30R	4	6L	300x480	375	1175	18.86
A28R	4	6L	280x550	320	1105	20.76
6U24	4	6L	240x280	900	625-770	13.70
6U26	4	6L	260x320	720	955	15.94
8U26	4	8L	260x320	720	1250	15.63
6U28	4	6L	280x340	680	1325	18.78
A31R	4	6L	310x600	290	1325	20.56
AH33R	4	6L	330x500	340	1325	18.57
DM33R	4	6L	330x500	350	1175	16.03
A34R	4	6L	340x660	270	1620	20.40
DM36R	4	6L	360x540	330	1325	14.88
DM36KR	4	6L	360x540	320	1470	17.06
DM36K	4	6L	360x540	320	1470	17.06
AH36	4	6L	360x540	330	1545	17.37
A37	4	6L	370x720	250	1910	20.15
DM38AK	4	6L	380x660	310	1690	16.35
AH38	4	6L	380x560	310	1690	17.52
AH38AR	4	6L	380x600	330	—	17.37
DM38AR	4	6L	380x600	310	1545	14.93
DM40	4	6L	400x600	310	1910	16.69
DM40K	4	6L	400x600	310	2060	17.97
AH40	4	6L	400x600	300	2205	19.90
AH40A	4	6L	400x640	320	2205	19.90
A41	4	6L	410x800	230	2427	20.38
DM41	4	6L	410x640	300	2205	17.75
AH41	4	6L	410x640	310	2205	20.04
DM46	4	6L	460x720	265	2345	15.14
DM47	4	6L	470x760	250	2795	15.47
DM47K	4	6L	470x760	260	2795	16.63
DM47M	4	6L	470x760	260	2940	17.50
6DM51SS	4	6L	510x840	230	2795	14.44
6U50	4	6L	500x620	380	4045	17.83
8U50	4	8L	500x620	380	5380	17.75
9U50	4	9L	500x620	380	6065	17.83

BAUDOUIN

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep ★ (bar)
P15	4	4,5L	150x150	1800	105-158	—
15.2	4	6L,V8,V12	150x150	1800	243-589	—
F11	4	V6,V12	115x105	2800	97-324	10.80
D106	4	3,4,6L	106.5x110	2500	48-129	7.30

BERGEN DIESEL

MODEL	CYL.	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
KRM-6	6	25,800	127x50	78	750	1330
KRMB-6	6	25,800	127x50	78	825	1480
KRM-8	8	34,618	157x54	78	750	1775
KRMB-8	8	34,618	157x54	78	825	1970
KRM-9	9	38,367	172x51	78	750	2000
KRMB-9	9	38,367	172x51	78	825	2200
KVM-12	12	47,628	153x91	85	750	2670
KVMB-12	12	47,628	153x91	85	825	2960
KVM-16	16	58,432	191x91	84	750	3550
KVMB-16	16	58,432	191x91	84	825	3940
KVM-18	18	63,945	210x91	84	750	4000
KVMB-18	18	63,945	210x91	84	825	4440
Marine Generator Sets (output in kW)						
KRG-3	3	27,560	172x52	108	720-750	425-440
KRG-5	5	35,280	211x58	111	720-750	705-735
KRG-6	6	42,780	233x63	113	720-750	955-995
KRGB-6	6	42,780	232x57	113	900	1060
KRG-8	8	54,020	266x63	118	720-750	1270-1325
KRGB-8	8	54,020	266x63	118	900	1415
KRG-9	9	59,090	283x63	118	720-750	1430-1490
KRGB-9	9	59,090	283-63	118	900	1590
KVG-12	12	75,850	278-80	124	720-750	1910-1990
KVGB-12	12	75,850	275-80	124	900	2885
KVG-16	16	98,560	336x93	123	720-750	2545-2650
KVGB-16	16	98,560	336x93	123	900	2825
KVG-18	18	110,690	361x93	123	720-750	2865-2980
KVGB-18	18	110,690	358x93	123	900	3180

KRM, KVM, KRG, and KVG engines can be equipped for operation on intermediate fuel up to 7,000 sec. Redwood No. 1 (700 CSt.)

BOLNES

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep ★ (bar)
DNL 190/600	2	3,5,6,7 8,9,10L	190x350	600	400-1400	14.00
VDNL 190/600	2	V10,V12 V14,V16 V18,V20	190x350	600	1400-2000	14.00

BOMBARDIER/ALCO POWER

MODEL	CYL.	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
251	6	25,800	154x71	100	720-1200	675-1400
	8	27,600	139x66	106	720-1000	1165-1620
	12	35,600	180x66	118	720-1200	1750-2800
	16	45,500	213x66	124	720-1200	2330-3730
	18	54,700	247x66	129	720-1100	2620-4000

CALLESEN

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep ★ (bar)
425-CO	4	3	250x300	500	135	7.3
425-DO	4	4	250x300	500	179	7.30
425-COT	4	3	250x300	500	194	10.60
427-CO	4	3	270x400	425	179	7.40
427-DO	4	4	270x400	425	239	7.40
427-EO	4	5	270x400	425	298	7.40
427-FO	4	6	270x400	425	358	7.40
427-COT	4	3	270x400	425	257	10.60
427-DOT	4	4	270x400	425	343	10.60
427-EOT	4	5	270x400	425	429	10.60
427-FOT	4	6	270x400	425	515	10.60
427-COTK	4	3	270x400	425	302	12.30
427-DOTK	4	4	270x400	425	403	12.30
427-EOTK	4	5	270x400	425	504	12.30
427-FOTK	4	6	270x400	425	604	12.30
427-HTKO	4	8	270x400	395	746	12.20
427-HTKO	4	8	270x400	425	806	12.20

CATERPILLAR TRACTOR

MODEL	CYL.	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
Propulsion Engines						
3304 NA	4	1,905	62x35	41	2000	85
3304 T	4	1,930	62x35	41	2000	125
3208 NA	8V	1,980	60x38	40	2400	150
3306 T	6	3,115	83x37	50	2000	190
3306 TA	6	3,115	83x37	50	2000	215
3208 T	8V	2,150	62x38	40	2400	215
3406 TA	6	4,425	90x43	55	1200	230
3306 [1]	6	3,115	83x37	50	2000	235
3208 TA	8V	2,230	62x38	40	2400	235
3406 T	6	4,120	90x43	55	1800	250
3408 TA	8V	5,805	94x49	65	1200	318
3406 TA	6	4,425	90x43	55	1800	322
3408 TA	8V	5,805	94x49	65	1300	375
3408 TA	8V	5,805	94x49	65	1800	402
3412 TA	12V	8,510	130x60	70	1200	425
3412 T	12V	7,430	130x61	69	1800	503
D379 [1]	8V	16,275	148x63	90	1225	565
3412 TA	12V	8,510	130x60	70	1800	624
3508 TA	8V	16,000	149x67	79	1200	705
3508 TA	8V	16,000	149x67	79	1600	775
3508 TA	8V	16,000	149x67	79	1800	775
D398 [1]	12V	20,130	161x63	90	1225	850
3508 TA	8V	16,000	149x67	79	1600	855
3505 TA	8V	16,000	149x67	79	1800	855
3512 TA	12V	19,900	153x67	81	1200	1060
D399 [1]	16V	25,240	210x63	90	1225	1125
3512 TA	12V	19,900	153x67	81	1600	1175
3512 TA	12V	19,900	153x67	81	1800	1175
3512 TA	12V	19,900	153x67	81	1600	1280
3512 TA	12V	19,000	153x67	81	1800	1280
3516 TA	16V	25,700	210x67	81	1200	1410
3516 TA	16V	25,700	210x67	81	1600	1550
3516 TA	16V	25,700	210x67	81	1600	1550
3506 TA[2]	6	34,500	143x67	103	700	1700
3516 TA	16V	25,700	210x67	81	1600	1710
3516 TA	16V	25,700	210x67	81	1800	1710
3606 TA[2]	6	34,500	143x67	103	800	1900
3606 TA[2]	6	34,500	143x67	103	900	2100
3608 TA[2]	8	41,800	175x67	103	700	2250
3606 TA[2]	6	34,500	143x67	103	1000	2250
3608 TA[2]	8	41,800	175x67	103	800	2535
3608 TA[2]	8	41,800	175x67	103	900	2800
3608 TA[2]	8	41,800	175x67	103	1000	3000
3612 TA[2]	12V	50,100	158x67	103	700	3400
3612 TA[2]	12V	50,100	158x67	103	800	3800

MODEL	CYL.	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
3612 TA²	**12V**	**50,100**	**158x67**	**103**	**900**	**4200**
3616 TA²	**16V**	**60,700**	**195x67**	**103**	**700**	**4500**
3612 TA²	**12V**	**50,100**	**158x67**	**103**	**1000**	**4500**
3616 TA²	**16V**	**60,700**	**195x67**	**103**	**800**	**5075**
3616 TA²	**16V**	**60,700**	**195x67**	**103**	**900**	**5600**
3616 TA²	**16V**	**60,700**	**195x67**	**103**	**1000**	**6000**
Marine Generator Sets (output in kW)						
3304 NA	4	2,895	80x39	42	1800	60
3304 T	4	2,940	85x39	42	1800	90
3306 T	6	3,485	99x36	44	1800	135
3306 TA	6	3,790	99x36	44	1800	155
3406 T	6	4,790	110x39	53	1800	185
3406 TA	6	5,465	110x39	63	1200	190
3408 TA	8V	6,385	111x49	55	1200	245
3406 TA	6	5,465	110x39	53	1800	250
3408 TA	8V	6,385	111x49	55	1800	300
3412 TA	12V	8,765	123x50	56	1200	310
3412 T	12V	7,560	123x50	56	1800	320
D379 TA	8V	15,580	140x62	90	1200	420
3412 TA	12V	8,765	123x50	56	1800	435
3508 TA	8V	16,450	145x67	74	1200	450
3508 TA	8V	16,450	145x67	74	1200	560
3508 TA	8V	16,450	145x67	74	1800	560
D398 TA	12V	20,390	168x62	90	1200	600
3512 TA	12V	22,030	171x67	81	1200	700
3508 TA	8V	16,450	145x67	74	1800	715
3512 TA	12V	22,030	171x67	81	1200	845
D399 TA	16V	26,010	186x62	90	1200	850
3512 TA	12V	22,030	171x67	81	1800	850
3516 TA	16V	25,420	195x67	84	1200	925
3512 TA	12V	22,030	171x67	81	1800	1070
3516 TA	16V	25,420	195x67	84	1200	1090
3516 TA	16V	25,420	195x67x84	1800	1135	
3606 TA³	6	34,500	278x80	124	720	1350
3516 TA	16V	25,420	195x67	84	1800	1440
3606 TA³	6	34,500	278x80	124	900	1650
3608 TA³	8	41,800	314x80	124	720	1800
3608 TA³	8	41,800	314x80	124	900	2200
3612 TA³	12V	50,100	324x96	137	720	2750
3612 TA³	12V	50,100	324x96	137	900	3300
3616 TA³	16V	60,700	360x96	137	720	3650
3616 TA³	16V	60,700	360x96	137	900	4400

NA-Naturally Aspirated; T-Turbocharged; TA-Turbocharged-Aftercooled; ¹ -SCAC Separate Circuit Aftercooled 85º F; ² -Dimensions and weights do not include transmission;³ -Weights do not include generator.
Note-All Dimensions are in inches and include representative transmission/generator unless otherwise noted. All weights are in pounds and include representative transmission/generator unless otherwise noted.

CUMMINS ENGINE

MODEL	CYL.	WT*	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
4B3.9M	4	906	42x26	32	2500	76
4BT3.9M	4	939	49x26	32	2500	100
6BT5.9M	6	1,275	63x26	34	2500	152
V-504-M	8	1,772	61x33	33	2800	170
V-555-M	8	2,042	58x35	33	2800	185
VT-555-M	8	2,250	62x36	35	2800	235
VT-555-M (BC)	8	2,250	63x36	35	2800	270
VT-903-M	8	3,200	66x41	40	2300	285
VTA-903-M	8	3,650	74x38	41	2300	320
N-855-M	6	3,435	84x37	61	1800	195
NT-855-M	6	4,410	87x37	63	1800	300
NTA-855-M	6	4,520	87x37	63	1800	350
KT19-M	6	5,360	93x43	72	1800	425-365
KTA19-M	6	6,800	107x45	79	1800	500
VTA19-M	12	8,800	120x52	79	1800	675
KT38-M	12	11,700	149x53	76	1800	800
KTA38-M	12	13,450	152x53	75	1800	940
KTA50-M	16	10,700	132x53	75	1800	1250

*Weight and dimensions include standard marine gear except KTA50-M.

AUXILIARY

	CYL.	SPEED (rpm)	60HZ Continuous KW (BHP)
4B3.9 -G/GC	4	1800	37 (6I)
4BT3.9 -G1/GC1	4	1800	50 (82)
6B5.9 -G/GC	6	1800	55 (97)
6BT5.9 -G1/GC1	6	1800	72 (134)
N-855 -G/GC	6	1800	125 (195)
NT-855 -G/GC2	6	1800	215 (320)
NT-855 G/GC3	6	1800	235 (355)
NTA-855 G/GC	6	1800	260 (385)
KT19 -G/GC	6	1800	285 (420)
KTA19 -G/GC1	6	1800	335 (505)
KTA19 -G/GC2	6	1800	360 (525)
VT28 -G/GC	12	1800	420 (620)

VTA28 -G/GC1	12	1800	465	(690)
VTA28 -G/GC2	12	1800	510	(750)
KT38 -G/GC	12	1800	625	(1030)
KTA38 -G/GC1	12	1800	700	(1030)
KTA38 -G/GC2	12	1800	750	(1085)
KTA50 -G/GC	16	1800	925	(1350)

DAIHATSU

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep ★ (bar)
M2	4	6L	120x150	2000	55-200	12.00
M3	4	6L	140x160	1800	110-265	12.20
M5	4	6L	145x160	1800	220-315	13.50
PK16	4	6L	160x210	1200	199-265	10.40
PK16A	4	6L	160x210	1200	353	13.90
PS26H	4	6L	260x320	750	500-770	12.10
DS18A	4	6L	180x230	1200	430-550	15.70
DS22	4	6L,12/16V	220x280	1000	660-2205	15.50
DS26A	4	6L,12/16V	260x300	750	955-2940	18.40
DS32	4	6L, 8L 12V, 16V	320x380	600	1655-4710	16.90
DL19	4	6L	190x230	1000	440-550	16.90
DL20	4	6L	200x260	1000	485-660	16.20
DL22	4	6L	220x300	900	660-880	17.20
DL24	4	6L	240x320	750	880-995	17.60
DL26	4	6L	260x340	750	990-1215	17.90
DL28	4	6, 8L	280x360	750	1175-1910	17.70
DL32	4	6, 8L	320x400	600	1400-2425	19.00
DL40	4	6L	400x480	500	3090-4120	20.50

DETROIT DIESEL ALLISON

MODEL	CYL.	WT (kg)	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
4-53	4	1,350	46x30	36	2400-2800	107-136
4-71	4	2,275	58x35	41	1800-2300	120-167
6V-53	6	1,830	51x40	40	2400-2800	158-210
8.2T	8	1,526	54x31	31	3200	250
6V-71	6	2,570	55x44	45	1800-2300	179-250
6-71	6	2,740	68x39	44	1800-2300	179-250
6-71M	6	2,740	68x36	44	2300	267
6V-92	6	2,860	57x44	47	1800-2300	239-291
6V-53(T)L	6	2,200	48x36	41	2300	320
8V-71L	8	3,100	62x46	46	1800-2300	239-333
6V-71TA(L)	6	2,725	57x37	46	2300	375
8V-92	8	3,230	65x46	47	1800-2300	313-338
6V-71TA(L)	6	2,780	61x37	46	2300	435
8V-71TI(L)	8	3,430	62x49	47	2300	462
6V-92TA(L)	6	3,566	62x44	47	2300	475
12-V71	12	4,925	81x48	50	1800-2300	359-500
6V-92TA(L)	6	3,140	61x44	47	2300	550
8V-92TI(L)	8	3,815	70x49	47	2300	650
8V-92TI(L)	8	4,440	71x49	51	2300	650
16V-71	16	7,400	115x49	58	1800-2300	478-666
8V-92TA	8	4,440	71x49	51	2300	735
12V-71TI	12	5,200	81x46	55	2300	750
16V-92	16	7,760	115x49	58	1800-2100	626-760
12V-149	12	12,300	129x58	74	1800-1900	700-800
12V-71T(L)	12	5,000	83x50	52	2300	870
8V-149TI	8	6,000	64x64	68	1800-1900	705-900
12V-149T	12	12,715	129x66	72	1800-1900	905-1050
16V-149	16	16,000	160x58	71	1800-1900	930-1060
12V-92TA	12	6,325	96x52	48	1800-2300	545-1085
12V-149TI	12	12,845	129x66	72	1800-1900	1055-1250
16V-149T	16	11,600	113x66	66	1800-1900	1215-1385
16V-149TI	16	11,750	112x66	66	1800-1900	1440-1800

DEUTZ—MWM

MODEL	CYL.	WT (kg)	LxW (mm)	H (mm)	SPEED (rpm)	OUTPUT (kW)
D234	V6	825	1030x865	1135	2100	137
TBD23	V6	940	1390x865	1135	2100	250
D234	V8	980	1220x910	1130	2100	183
TBD234	V8	1100	1565x910	1130	2100	333
D234	V12	1350	1590x910	1125	2100	274
TBD234	V12	1535	1835x910	1125	2100	500
TBD234	V16	2150	2330x1050	1245	2000	666
A6M816	6	1435	1665x862	1374	2000	165
BA6M816	6	1605	1796x1112	1459	1800	342
A8M816	8	1880	1883x852	1236	2000	220
BA8M816	8	2050	2156x978	1459	1800	456
BA8M816C	8	2085	2175x947	1473	1800	495
BA12M816	V12	2900	1977x1700	1407	1800	684
BA12M816C	V12	2980	2120x1510	1402	1800	740
BA16M816	V16	3620	2477x1700	1407	1800	912

		(kg)	(mm)	(mm)	(rpm)	(kW)
BA16M816C	V16	3730	2600x1565	1425	1800	990
TBD604L6	6	2200	1847x1143	1582	1650	470
TBD604V8	V8	2750	1687x1390	1667	1650	625
TBD604V12	V12	3890	2267x1390	1810	1650	940
TBD603V16	V16	4850	2704x1554	1715	1650	1250
TBD604BL6	6	2150	1856x1143	1582	1800	630
TBD604BV8	V8	2750	1687x1389	1667	1800	840
TBD604BV12	V12	3890	2267x1389	1810	1800	1260
TBD604BV16	V16	4850	2767x1554	1810	1800	1680
D440-6	6	7000	2575x1360	1990	1000	284
TBD440-6	6	7500	3065x1525	2275	1000	720
TBD440-6K	6	7500	3065x1525	2275	1000	900
D440-8	8	8500	3185x1360	1990	1000	378
TBD440-8	8	9000	3675x1525	2275	1000	960
TBD440-8K	8	9000	3675x1525	2275	1000	1200
D441V12	V12	10300	3000x2000	2240	1000	567
TBD441V12	V12	11500	3480x2210	2560	1000	1440
TBD441V12K	V12	11500	3480x2210	2560	1000	1800
D441V16	V16	13000	3735x2000	2400	1000	756
TBD441V16	V16	14000	4220x2210	2560	1000	1920
TBD441V16K	V16	14000	4220x2210	2560	1000	2400
TBD444L6	6	9500	3445x1470	2923	750	1110
TBD444L8	8	12000	4150x1470	2923	750	1480
BA6M528	6	6200	3234x1240	2342	1000	772
BA8M528	8	8600	3900x1220	2342	1000	1030
BV6M628	6	7700	3345x1370	2570	1000	1185
BV8M628	8	10500	4080x1505	2792	1000	1600
BV9M628	9	11100	4390x1505	2792	1000	1800
BV12M628	V12	14800	4265x2040	2660	1000	2435
BV16M628	V16	19000	5150x1905	2822	1000	3280
12PA6V280	V12	19300	4718x1990	3116	1030	3885
14PA6V280	V14	33700	5178x1990	3460	1030	4120
16PA6V280	V16	25300	5676x1990	3460	1030	5180
18PA6V280	V18	27450	6136x1990	3460	1030	5180
TBD501-6	6	29000	5130x1910	3140	514	1820
TBD501-8	8	35550	6350x1910	3140	514	2425
TBD501BL6	6	24000	5195x2110	3545	750	2430
TBD510BL8	8	31000	6175x2110	3545	750	3240
TBD510BV12	V12	44000	6020x3320	3645	750	4860
TBD510V16	V16	54500	7160x3920	3645	750	6480
BV6M640	6	29000	6348x2249	4075	650	2650
BV8M640	8	38000	7664x2249	4075	650	3530
BV12M640	V12	48000	6640x3524	3884	650	5295
BV16M640	V16	62000	7982x3524	4068	650	7250

ELECTRO-MOTIVE DIVISION, GENERAL MOTORS CORP.

MODEL	CYCLE	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
8E6	8	20,425	141x66	108	900	1050
12E6	12	26,260	175x66	111	900	1500
16E6	16	36,350	214x66	111	900	1950
8E7C	8	22,000	183x68	126	900	1525
12F7B	12	29,000	210x68	132	900	2550
16F7B	16	37,700	259x68	132	900	3400
20F7B	20	42,500	281x68	140	900	4000
8G7	8	26,000	186x68	127	900	1800
12G7	12	33,000	222x68	135	900	2800
16G7	16	40,000	263x68	135	900	3600
20G7	20	46,400	296x68	143	900	4300

FAIRBANKS MORSE ENGINE DIVISION/ COLT INDUSTRIES

COLT-PIELSTICK

MODEL	CYCLE	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
PC2.6	6L	76,450	288x83	127.75	520	4422
	7L	87,175	317x83	127.75	520	5159
	8L	97,900	346x83	127.75	520	5896
	9L	106,680	390x94	127.75	520	6633
PC2.3,	12V	145,200	277x132	164.75	520	6420/8844
PC2.5	14V	166,540	306x132	164.75	520	7490/10318
PC2.6	16V	182,600	335x132	164.75	520	8560/11792
	18V	196,000	387x146	164.75	520	9630/13266
10PC-4.2	10	418,000	374x203	255	400	16270
12PC-4.2	12	478,000	424x203	255	400	19524
14PC-4.2	14	584,000	451x203	281	400	22778
16PC-4.2	16	644,000	552x203	281	400	26032
18PC-4.2	18	710,000	597x203	281	400	29286
6PA4L185VG	6	7,496	123x36	67	1500	1000
8PA4L185VG	8	9,480	146x36	67	1500	1335
6PA4V185VG	6	6,922	65x57	73	1500	1000
8PA4V185VG	8	8,532	76x57	73	1500	1335
12PA4V185VG	12	12,390	100x57	73	1500	2000
16PA4V185VG	16	15,697	124x57	73	1500	2670
18PA4V185VG	18	17,571	135x67	76	1500	3000
8PA4V200VG	8	9,921	82x62	73	1500	1540
12PA4V200VG	12	13,699	100x57	71	1500	2310
16PA4V200VG	16	17,416	123x67	73	1500	3080
18PA4V200VG	18	19,400	135x67	73	1500	3465
8PA4V200DS	8	11,684	74x57	88	1500	1920

12PA4V200DS	12	15,873	117x57	90	1500	2880
16PA4V200DS	16	20,503	121x73	98	1500	3840
18PA4V200DS	18	22,487	133x73	88	1500	4320
20PA4V200DS	20	24,960	140x73	88	1500	4800
6PA5L	6	23,600	143x50	91	1000	1800
12PA5L	12	38,250	163x78	103	1000	3600
6PA6L280	6	30,660	152x56	104	1000	2400
6PA6L-CL	6	27,350	152x53	103	750	2400
8PA6L280	8	44,500	185x56	105	1000	3200
9PA6L280	9	50,000	202x56	105	1000	3600
12PA6V280	12	52,000	145x70	98	1000	4800
12PA6V-CL	12	45,800	206x74	116	750	4800
14PA6V280	14	61,600	163x70	98	1000	5600
16PA6V280	16	70,400	181x70	98	1000	6400
18PA6V280	18	79,200	199x70	98	1000	7200
20PA6V280	20	88,000	217x70	98	1000	8000

PA4 engines can burn up to 1,500 sec. Redwood fuel; PA5 and PA6 engines can burn up to 3,500 sec. Redwood.
All engines available with front-end PTO.

FAIRBANKS MORSE ENGINE DIVISION

38D 1/8 Blower Scavenged	4	20,300	151x60	117	750	708
38D8 1/8 Blower Scavenged	4	20,300	151x60	117	900	920
38D8 1/8 Blower Scavenged	5	21,900	163x60	117	750	885
38D8 1/8 Blower Scavenged	5	21,900	163x60	117	900	1150
38D8 1/8 Blower Scavenged	6	23,500	171x60	117	750	1062
38D8 1/8 Blower Scavenged	6	23,500	171x60	117	900	1380
38D8 1/8 Blower Scavenged	8	28,500	203x60	117	750	1416
38D8 1/8 Blower Scavenged	8	28,500	203x60	117	900	1840
38D8 1/8 Blower Scavenged	9	32,000	218x60	117	750	1593
38D8 1/8 Blower Scavenged	9	32,000	218x60	117	900	2070
38D8 1/8 Blower Scavenged	10	35,500	230x60	117	750	1770
38D8 1/8 Blower Scavenged	10	35,500	230x60	117	900	2300
38D8 1/8 Blower Scavenged	12	42,200	266x60	124	750	2124
38D8 1/8 Blower Scavenged	12	42,200	266x60	124	900	2760
38TD8 1/8 Turbo-charged	6	26,440	183x78	118	750	1750
38TD8 1/8 Turbo-charged	6	26,400	183x78	118	900	2100
38TD8 1/8 Turbo-charged	9	35,850	229x82	120	750	2625
38TD8 1/8 Turbo-charged	9	35,850	229x82	120	900	3150
38TD8 1/8 Turbo-charged	12	46,200	285x83	121	750	3,500
38TD8 1/8 Turbo-charged	12	46,200	285x83	121	900	4200

FUJI DIESEL

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
M/V23F	4	6L, 8L, 12V	230x260	1000	1007-2014	18·40
H/VH27·5	4	6L, 8L, 12V, 16V	275x300	1000	1790-4775	19·80
H/VH32	4	6L, 8L, 12V, 16V, 18V	320x470	600	2238-6714	19·50
L/V27·5X	4	6L, 8L, 12V, 16V	275x320	720-750	1194-3245	16·80
L/V27·5E	4	6L, 8L, 12V, 16V	275x320	720-750	1380-3581	18·60
M28	4	6L	280x350	750	1529	19·00
M30	4	6L	300x350	750	1790	19·00
L/V32X	4	6L, 8L, 12V, 16V, 18V	320x380	600	1716-5174	18·40
L/V32E	4	6L, 8L, 12V, 16V, 18V	320x380	600	1880-5640	20·20
S26N	4	6L	260x410	380	746	16·90
S27·5G	4	6L	275x410	380	895	18·10
S30B	4	6L	300x450	380	1194	18·50
S32F	4	6, 8L	320x500	380	1343-1790	18·80
S37C	4	6L	370x550	330	1716	17·30
S40B	4	6, 8L	400x580	380	2238-2984	15·90
S40C	4	6, 8L	400x620	320	2238-2984	16·80
S40F	4	6, 8L	400x620	360	2646-3528	18·90

GARDNER DIESELS

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
LXB	4	6L, 8L	120·65x152·40	1500	95-127	—
LXCT	4	6L, 8L	120·65x152·40	1700	112-149	—
L3B	4	8L	139·70x196·85	1150	149	—
LW	4	4L	108·00x152·40	1500	41·8-46·2	—
LXDT	4	6L	140·00x168·00	1630	179-194	—

GENERAL ELECTRIC

MODEL	CYCLE	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
7FDM8	8	30,185	127x68	109	1050	1800
7FDM8	8	30,185	127x68	109	900	1525
7FDM12	12	37,665	160x68	115	1050	3000
7FDM12	12	37,655	160x68	115	900	2550
7FDM16	16	45,965	193x68	120	1050	4000
7FDM16	16	45,965	193x68	120	900	3400

GMT FINCANTIERI

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
B550	4	6, 8, 9L, 10V, 12V, 14V, 16V, 18V, 20V	550x590	450	6480-21600	20·60
A420H	4	6, 8, 9L, 10V, 12V, 14V, 16V	420x480	600	3528-9408	17·70
A420	4	5, 6, 8, 9, 10L, 12V, 14V, 16V, 18V, 20V	420x500	500	2575-10300	17·80
B230	4	4, 6L, 8V, 10V, 12V, 16V, 18V, 20V	230x270	1200	840-4200	18·70
B230DV	4	16V, 18V, 20V	230x270	1200	4160-5200	23·20
BL230	4	4, 6L, 8V, 10V, 12V, 16V, 18V, 20V	230x310	1050	870-4350	19·30
BL230DV	4	16V, 18V, 20V	230x310	1050	4480-5600	24·80
A210	4	6V, 8V, 12V, 16V, 20V	210x230	1500	975-3250	16·20
BL230P	4	4, 6L, 8V, 10V, 12V, 16V, 18V, 20V	230x310	1000	692-3460	16·10
A320	4	6, 8, 9L, 12V, 14V, 16V, 18V, 20V	320x360	750	220-7360	20·30

HANSHIN DIESEL

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
LUD22	4	6L	220x410	400	588	19·25
LUD24	4	6L	240x410	400	660	18·20
LU26C	4	6L	260x440	400	772	16·86
LUD26	4	6L	260x440	400	956	20·87
LUN28A	4	6L	280x450	395	1029	17·99
LUN28	4	6L	280x480	395	1176	20·56
LH28	4	6L	280x460	395	1029	18·77
MUH28	4	6L	280x340	660	1471-1691	18·73-21·71
LU32	4	6L	320x510	370	1323	17·79
LU35	4	6L	350x550	320	1470	17·72
LU38	4	6L	380x580	315	1691	16·65
LUS40	4	6L	400x640	315	2574	20·72
6EL30	4	6L	300x600	300	1323	21·22
6EL32	4	6L	320x640	280	1470	20·82
6ELS32	4	6L	320x640	280	1618	22·90
6EL35	4	6L	350x700	260	1765	20·56
6ELS35	4	6L	350x700	260	1912	22·27
6EL38	4	6L	380x760	240	2060	20·30
6EL40	4	6L	400x800	240	2427	20·52
6EL44	4	6L	440x880	220	2942	20·38
6ELS44	4	6L	440x880	220	3310	22·93
6LF54	4	6L	540x850	230	3677	16·75
6LF58	4	6L	580x1050	180	4413	18·02

ISOTTA FRASCHINI

MODEL	CYCLE	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
ID32X6L	6	1,556	69.17x22.80	41.50	3000	210
ID32S6L	6	1,600	69.17x22.80	41.50	3000	270
ID32SS6L	6	1,655	69.17x22.80	41.50	3000	335
ID32SS6LM	6	1,655	69.17x22.80	41.50	3000	362
ID38N5V	6	1,766	42.90x38.18	37 40	2900	195
ID38SS8V	6	1,766	42.90x38.18	37.40	3000	450
ID36N6V	6	4,812	60.39x58.27	55.11	1800	330
ID35SS6V	6	4,812	60.39x58.27	55.11	1800	660
ID36N8V	8	5,739	70.35x55.90	57.40	1800	440
ID36SS8V	8	5,739	70.35x55.90	57.40	1800	880
ID36N10V	10	6,843	73.42x55.90	57.40	1800	550
ID36SS10V	10	6,843	73.42x55.90	57.40	1800	1100
ID36N12V	12	8,057	95.47x57.36	63.89	1800	700
ID36SS12V	12	8,057	95.47x57.36	63.89	1800	1320
ID36N15V	16	11,479	121.65x54.33	66.73	1800	880
ID36SS16V	16	11,479	121.65x54.33	66.73	1800	1760

ISUZU

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
UMO2ABI	4	2L	86x102	2600	15 00	5 80
UMO3ABI	4	3L	86x102	2600	22 00	5 80
UMC240	4	4L	86x102	2600	30 00	5 80
UM4BBI	4	4L	102x110	2750	52 00	6 40
UM4BCI	4	4L	102x100	2900	48 00	6 30
UM4BDI	4	4L	102x118	2600	59 00	7 20
UM4BDIT	4	4L	102x118	2600	70 00	8 60
UM6BDI	4	6L	102x118	2600	85 00	6 90
UM6BDIT	4	6L	102x118	2600	106 00	8 60
UM6SAI	4	6L	115x135	2200	107 00	6 80
UM6QAI	4	6L	125x150	2000	117 00	6 50
UME120	4	6L	135x140	2200	140 00	6 30
UM10PBI	4	10V	115x135	2200	168 00	6 60
UM12PBI	4	12V	115x135	2200	206 00	6 50
UME120TC	4	6L	135x140	2200	206 00	9 30
E120S-MF6R	4	6L	135x140	2200	177 00	7 90
UM8MAI	4	8V	145x125	2300	202 00	6 40

KRUPP MaK

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
9M601		9	580x600	425	9900	
8M601		8	580x600	425	8800	
6M601		6	580x600	425	6600	
12M552		12V	450x520	500	7400	
9M552		9	450x520	500	5500	
8M552		8	450x520	500	4900	
6M552		6	450x520	500	3700	
8M551		8	450x550	450	4600	
6M551		6	450x550	450	3450	
8M35		8	350x380	750	3920	
6M35		6	350x380	750	2940	
16M453B		16V	320x420	600	4800	
12M453B		12V	320x420	600	4000	
9M453B		9	320x420	600	3000	
8M453B		8	320x420	600	2650	
6M453B		6	320x420	600	2000	
6M452		6	320x450	500	1320	
8M332		8	240x330	900	1600	
			240x330	750	1300	
6M332		6	240x330	900	1200	
			240x330	750	1000	
12M282		12V	240x280	1000	2400	
8M282		8	240x280	1000	1600	
6M282		6	240x280	1000	1200	
			240x280	750	740	
6M281PE553)		6	240x280	750	600	

LISTER DIESEL

MODEL	CYCLE	WT	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
HRW6	6	1,490	27.10x52.6	48.2	2200	93.00
HRW6-MA	6	1,490	26.0x52.6	48.3	2200	93.00
HRW6-MGR	6	1,765	30.0x61.5	38.1	2200	93.00
HL6	6	1,095	26.1x46.0	33.8	2500	101.00
HL6-MGR	6	1,808	26.8x71.3	41 9	2500	101.00
HL6-MGR	6	1,808	26.70x56.60	41.80	2500	101.00
HRWS6	6	1,532	30.0x52.6	48.2	2000	102.00
HRWS6-MA	6	1,533	26.0x52.6	48.3	2000	102.00
HRWS6-MGR	6	1,785	29.5x61.5	41.9	2000	102.00
HLT6-MA	6	1,122	26.3x46.0	40.9	1800	115.00
HLT6	6	1,119	26.2x46.0	40.8	2300	126.00
JA6	6	2,100	30.2x55 5	43.1	2000	150.00
JA6-MA	6	2,094	30.1x59.4	39.3	2000	150.00
JW6	6	2,155	28.3x64.7	50.5	2000	150.00
JW6-MA	6	2,340	31.4x64.5	49.7	2000	150.00
JW6-MGR	6	2,560			2000	150.00
JWS6-MGR	6	2,582			2000	170.00
JAS6	6	2,150	31.0x63.5	43.2	1800	195.00
JAS6-MA	6	2,150	31.1x66.2	39.3	1800	195.00
JWS6	6	2,271	28.3x72.2	56.0	2000	220.00
JWS6-MA	6	2,470	31.4x72.4	49.7	2000	225.00
JWSC6M	6	3,160	33.3x75.5	43.0	2000	250.00
LT1MGR	1	230	18.9x27.3	20.6	3000	7.00
LT1	1	175	15.2x15.7	19.4	3600	7.50
LV1	1	178	14.5x13.8	19.7	3600	9.00
ST1-MA	1	295	21.5x21.9	25.5	2600	10.00
ST1-MGR	1	330	22.50x34.3	27.6	2600	10.00
LV2	2	286	17.2x19.3	21.2	3600	18.00
ST2-MGR	2	575	25.5x40.6	27.3	2600	20.00
STW2-MA	2	485	22.8x27.2	24.3	2600	20.00
STW2-MGR	2	575	24.8x41.4	24.3	2300	20.00
TS2-MGR	2	680	24.9x34.5	26.1	2600	20.70
TS2	2	407	21.0x22.4	25.0	3000	22.00
TL2	2	429	19.3x21.3	25.5	3000	26.90
ST3-MGR	3	660	24.5x47.2	27.1	2600	30.00
STW3-MA	3	573	22.8x32.2	24.3	2600	30.00
STW3-MGR	3	660	24.8x47.4	24.3	2300	30.00
HR2	2	700	25.7x20.2	33.2	2200	31.00
HR2-MA	2	620	26.0x24.5	35.3	2200	31.00
HRW2	2	699	26.0x23.2	43.6	2200	31.00
HRW2-MA	2	317	26.0x23.2	43.6	2200	31.00
HRW2-MGR	2	1,015	31.7x41.5	35.6	2200	31.00
TS3-MGR	3	770	24.9x39.5	26.1	2600	31.05
TS3	3	506	21.0x27.4	25.0	3000	33.00
HL3-MA	3	706	26.2x29.5	33.0	1800	39.60
TL3	3	528	19.3x26.3	25.5	3000	40.30
HR3	3	900	26.1x25.7	33.2	2200	46.50
HR3-MA	3	820	26.0x30.0	35.8	2200	46.50
HR3-MGR	3	1,110	29.0x53.6	30.9	2200	46.50
HRW3	3	948	26.0x28.7	43.6	2200	46.50
HRW3-MA	3	430	26.0x28.7	43.6	2200	46.50
HRW3-MGR	3	1,235	31.7x47.0	35.6	2200	46.50
HL3	3	704	26.1x29.4	33.0	2500	50.50
HL4-MA	4	842	26.2x35.0	33.9	1800	52.80
HRW4	4	1,171	26.20x41.7	48.2	2200	62.00
HRW4-MA	4	1,170	26.0x41.6	48.3	2200	62.00
HRW4-MGR	4	1,600	28.7x53.6	38.1	2200	62.00
HL4	4	840	26.1x35.0	33.8	2500	67.30
HL4-MGR	4	1,323	26.8x60.3	41.9	2500	67.30
HL6-MA	6	1,098	26.2x46.0	33.9	1800	79.30

M.A.N.-B&W

Diesel engines—

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
L20/27	4	5L, 6L, 7L, 8L, 9L	200/270	900-1000	450-900	14.15
L20/27	4	V12, V14, V16, V18	200/270	900-1000	1080-1800	14.15
T23LH	4	5T, 6T, 7T, 8T	225/300	720-750	530-880	14.8
L23/30	4	6L, 8L, 9L	225/300	720-750	780-1215	18.1-18.2
L25/30	4	6L, 8L, 9L	250/300	900-1000	1200-1980	17.9-18.1
V25/30	4	V12, V16, V18	250/300	900-1000	2400-3960	17.9-18.1
S28LH	4	5S, 6S, 7S, 8S	280/320	720-750	875-1480	14.9
U28LH	4	12U, 16U, 18U	280/320	720-750	2100-3330	14.9
L28/32	4	6L, 8L, 9L	280/320	720-750	1260-1980	17.8
V28/32	4	V12, V16, V18	280/320	720-750	2520-3960	17.8
L32/36	4	6L, 7L, 8L, 9L	320/360	720-750	2340-3645	22.4
V32/36	4	V12, V14, V16, V18	320/360	720-750	4680-7290	21.4
L40/45	4	6L, 7L, 8L, 9L	400/450	600	3630-5445	21.4
V40/45	4	V12, V14, V16, V18	400/450	600	7260-10,890	21.4
L52/55B	4	6L, 7L, 8L, 9L	520/550	428-450	4440-7965	20.2
V52/55B	4	V10, V12, V14, V15, V18	420/550	428-450	7400-13950	17.7
L58/64		6L, 7L, 8L, 9L	580/640	400-428	5790-10935	17.1-20.0
L40/54A[1]		6L, 7L, 8L, 9L	400/540	428-450	2625-4140	18.1
L40/54A[1]		V12, V14, V16, V18	400/540	428-450	5250-8280	18.1
L52/55A[2]		6L, 7L, 8L, 9L	520/550	428-450	4440-6795	17.7
V52/55A[2]		V12, V14, V16, V18	520/550	428-450	7400-13950	17.7
K90	2	4, 5, 6, 7, 8, 9, 10, 11, 12	900/2700	67-82	8000-45600	—
L90	2	4, 5, 6, 7, 8, 9, 10, 11, 12	900/2916	61-74	7800-44520	—
S80	2	4, 5, 6, 7, 8, 9, 10, 11, 12	800/3056	63-77	7040-40,200	—
K80	2	4, 5, 6, 7, 8, 9, 10, 11, 12	800/2400	79-63	6360-36360	—

L80	2	4, 5, 6, 7, 8, 9, 10, 11, 12	800/2592	68-83	6160-11680	—
S70	2	4, 5, 6, 7, 8	700/2674	72-88	5400-20560	—
L70	2	4, 5, 6, 7, 8	700/2268	78-95	4720-17920	—
S60	2	4, 5, 6, 7, 8	600/2292	84-102	3920-14960	—
L50	2	4, 5, 6, 7, 8	600/1944	91-111	3480-13200	—
S50	2	4, 5, 6, 7, 8	500/1910	101-123	2760-10480	—
L50	2	4, 5, 6, 7, 8	500/1620	109-133	2400-9100	—
L42	2	4, 5, 6, 7, 8	420/1360	130-159	1720-6480	—
L35	2	4, 5, 6, 7, 8	350/1050	164-200	1160-4480	—

[1] Built by E.N. Bazan Cartagena, Spain; KHI Kobe, Japan; MHI Yokohama, Japan; ICM Resita, Romania.

[2] Built by KHI Kcbe, Japan; MHI Kanazawa, Japan; ICM Resita, Romania.

Alpha Diesel propulsion systems						
L20/27VO	4	5L, 6L, 7L, 8L, 9L	200/270	1000	500-900	14.15
V20/27VO	4	V12, V14, V16, V18	200/270	1000	1200-1800	14.15
L23/30KV	4	5L, 6L, 8L	225/300	825	570-1080	16.5
V23L-VO	4	V10, V12, V14, V16, V18	225/300	825	910-2050	13.9
L28/32-VO	4	6L, 8L, 9L	280/320	775	1320-1980	17.3
V28/32-VO	4	V12, V16, V18	280/320	775	2640-3960	17.3
L32/36-VO	4	6L, 7L, 8L, 9L	320/360	750	2340-3645	22.4
D25	4	6, 10, 12	125/142	1800	210-382	—
D28	4	10, 12	128/142	1800	210-243	7.7

M.A.N.

Cogeneration Plant Modules (M.A.N.—New Technology)

Module consists of diesel engine, as well as generator and heat recovery system. (A-induction alternator; S-synchronous alternator)

Model	KW-Electrical
D0226ME-A	47
D0226ME-2	47
D2866E-A	110
D2866E-S	110
D2842ME-A	225
D2842ME-S	225
D2542ME-A	300
D2542ME-S	300

[3]Modules also manufactured with spark-fired gas engines. Contact manufacturer for details.

M.A.N. Main Propulsion Engines

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
D0226ME	6	1146	41x26	41	1800-3000	82-136
D0226MTE	6	1212	51x27	41	2600-2800	150-184
D0226MLE	6	1256	51x27	41	2600-2800	170-210
D2866E	6	2171	71x40	42	1500-2200	170-252
D2866TE	6	2204	57x35	43	1800-2200	264-340
D2866LE	6	2281	57x34	43	1800-2200	300-408
D2848LE	8	2645	52x47	38	2300	510
D2840LE	10	2976	70x49	41	1800-2300	470-625
D2842LE	12	3416	81x47	47	1800-2300	571-760

M.A.N.—Generating Sets

MODEL	CYL.	WT.	LxW (inches) Engine Only	H (inches)	SPEED (rpm)	kVa (bhp)
D0226ME	6	—	—	—	1500-3000	55-98
D0226MTE[4]	6	1102	50 28	50	1500-1800	100-117
D0226MLE[5]	6	1300	60 35	50	1500-1800	122-141
D2866E	6	1874	53 34	45	1500-1800	148-178
D2866LE[5]	6	2094	57 38	68	1500-1800	280-323
D2840LE	10	—	— —	—	1500-1800	386-445
D2842LE	12	2920	66 47	46	1500-1800	465-535

[4] Includes Pan and Donaldson Air Cleaner in Dimensions and Weight
[5] Includes Radiator in Dimensions and Weight

MTU of North America

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
6V396TC62	6	4,189	64 56	53	1650	590
8V396TC62	8	5,291	73 57	55	1650	790
12V396TC63	12	7,390	96 60	63	1650	1180
6V396TB63	6	4,545	68 57	55	1650	650
8V396TB63	8	5,670	77 57	57	1650	880
12V396TB63	12	7,874	101 59	60	1650	1315
16V396TB63	16	10,475	128 62	67	1650	1755
12V1163TB62	12	25,140	136 65	99	1100	2950
16V1163TB62	16	31,640	163 65	102	1100	3940
20V1163TB62	20	37,600	191 65	106	1100	4930

MIRLEES BLACKSTONE

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep • (bar)
Mirlees Blackstone Stockport Ltd.						
K Major Mk3	4	6, 8, 9L, 12V, 16V	400/457	600	3267-8713	18.90
K Major	4	6, 7, 8, 9L 12V, 14V, 16V	381/457	600	1476-7875	18.90
MB275	4	6, 8L, 12V, 16V	275/305	1000	1650-4600	19.10
MB430	4	6, 8, 9L, 12V, 16V, 18V	430/480	600	3964-11892	19.00
Mirlees Blackstone Stamford Ltd						
E Range	4	4, 6, 8L 12, 16TB	222/292	1000	250-1850	12.60
ESL Mk2	4	5, 6, 8, 9L 6, 8L	222/292	1000	550-1500	17.50
MB190	4	6, 8L 12V, 16V	190//210	1500	640-2140	17.90

MITSUBISHI HEAVY INDUSTRIES

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (kW)
S6B-MPTA	6	2426	57x37	53	2200	380
S6B-MPTK	6	2426	57x37	53	2200	430
S6A2-MPTA	6	3462	65x43	56	2100	520
S6A2-MPTK	6	3462	65x43	56	2100	575
S12A-MTPA	12	6439	88x53	63	2100	860
S12A-MTPK	12	6439	88x53	63	2100	970
S6N-MPTA	6	5292	88x44	63	1800	540
S6N-MPTK	6	5292	88x44	63	1800	600
S8N-MPTA	8	7055	110x44	63	1800	720
S8N-MPTK	8	7055	110x44	63	1800	800
S12N-MPTA	12	10364	101x55	74	1800	1080
S12N-MPTK	12	10364	101x55	74	1800	1440
S16N-MPTA	16	13230	125x55	74	1800	
S16N-MPTK	16	13230	125x75	74	1800	1600
S6U-MPTA	6	17640	121x50	81	1200	1500
S6U-MPTK	6	17640	121x50	81	1200	1650
S8U-MPTA	8	22050	151x50	84	1200	2000
S8U-MPTK	8	22050	151x50	84	1200	2200
S12U-MPTA	12	28660	130x70	93	1200	3000
S12U-MPTK	12	28660	130x70	93	1200	3300
S16U-MPTA	16	37480	176x67	97	1200	4000
S16U-MPTK	16	37480	176x67	97	1200	KH40

NOTE: Former Daiya Engines ceased manufacturing engines in early 1985.

NIIGATA DIESELS

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep • (bar)
M22GT	4	6L	220/380	420	441	14.54
M24GT	4	6L	240/410	410	625	16.45
M24GX	4	6L	240/410	410	736	19.34
M26AGT	4	6L	260/460	400	883	18.07
M28AGTE	4	6L	280/480	390	1030	17.87
M31AGTE	4	6L	310/530	360	1324	18.39
M34AGT	4	6L	340/620	310	1618	18.54
M34AT	4	6L	340/620	310	1618	18.54
M40CX	4	6L	400/600	350	2574	19.50
NSBA-M	4	6L	160/200	1450	405	13.87
MG18CX	4	6L	180/240	950	478	16.47
MG20CX	4	6L	200/260	900	588	16.00
MG22LX	4	6L	220/290	900	809	16.30
MG25BX	4	6L	250/320	720	883	15.60
MG25CXE	4	6L	250/320	750	1030	17.47
MG28BXE	4	6L, V12 V16	280/320	720	1324-3089	18.65
MG28BXF	4	6L	280/320	720	1471	18.95
MG31FZE	4	6, 8L	310/380	600	1618-2133	18.81
MG40CXE	4	6, 8L	400/520	450	2648-3530	18.00

ONAN CORPORATION

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
L317D-M	3	475	23x26	26	3600	41
L423D-M	4	549	27x26	26	3600	60

PAXMAN VALENTA

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
	6	9600	105x42	46	750-1500	1350
	8	100200	62x57	63	750-1500	1880
	12	13627	85x57	62	750-1500	2996
	16	18522	106x57	66	750-1500	3994
	18	20396	117x57	63	750-1500	4497

PERKINS

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
6.3554M	4	6L	98.4/127.0	2800	100	
T6.3544M	4	6L	98.4/127.0	2400	123	
T6.3544M	4	6L	98.4/127.0	2400	149	
T6.3544M	4	6L	98.4/127.0	2600	179	
V8.540M	4	8V	108.0/120.7	2400	141	
TV8.540M	4	8V	108.0/120.7	2600	262	
C8M410	4	8V	130.2/152 4	2000	305	
CV12M800	4	12V	135.0/157.0	2100	596	

RUSTON DIESELS

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
AP230C	4	4, 6L	230/273	750-1000	533-1074	18.90
RKC	4	6L, V8 V12, V16	254/305	750-1000	1180-3730	18.10-20.3
RK270	4	5, 8L, 12V	270/305	750-1000	1285-3430	19.60
AT350	4	6, 8, 9L	350/368.3	600	2240-3360	21.00

SACM/UNI DIESEL

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
UD18L6M5	6	2420	57x32	46	2300-2500	270-425
UD18V8M5	8	3080	52x43	47	2300-2500	360-565
UD18V12M1	12	4070	72x43	45	2300-2500	540-850
UD6SPZrM	6	4950	78x47	72	1500-1650	330-345
UD25L6M4	6	6160	76x48	70	1500-1650	430-480
UD25L6M5	6	6160	76x48	70	1650-1650	480-550
UD12150SrM	12	9460	104x59	73	1500	630-660
UD12150SrHM	12	9790	104x59	73	1500	720-780
UD20V12M5	12	5390	98x47	43	2300-2500	815-1100
UD25V12M4	12	10450	109x62	78	1500	860-960
UD25V12M5	12	10450	109x62	78	1650	960-1100
UD30V12M5	12	10428	110x62	91	1150	1100
UD30V12M6	12	10428	110x62	91	1380-1500	1350-1430
UD30V12M7	12	10428	110x62	91	1650	1800
UD30V16M5	16	16830	118x68	79	1150	1450
UD30V16M6	16	16830	118x68	79	1380-1500	1650-1830
UD30V16M7	16	14520	122x62	91	1650	2110
UD33V12M6	12	14300	130x67	87	1500	2200
UD33V12M7	12	14300	130x67	87	1800	3300
UD33V16M6	16	19360	141x67	87	1500	3000
UD33V16M7	16	19360	141x67	87	1800	4400
UD33V16M9	16	21560	150x67	98	1700	5280
UD33V20M7	20	22880	172x67	87	1800	5500
UD33V20M9	20	26400	180x67	98	1700	6600
UD45L6M6	6	22000	140x63	109	1150-1250	1430-1630
UD45L8M6	8	28600	169x75	106	1150-1250	1900-2180
UD45V12M6	12	26620	148x87	106	2850-3260	1150-1250
UD45V12M7	12	30800	148x87	102	5060	1480
UD45V12M9	12	35200	161x91	110	5936	1395
UD45V16M6	16	48400	197x87	104	3700-4350	1150-1250
UD45V16M7	16	41800	173x87	104	6770	1480
UD45V16M9	16	46200	173x87	116	7920	1395
UD45V20M6	20	52800	220x91	114	4760-5440	1150-1250
UD45V20M7	20	52800	220x91	114	8400	1480
UD45V20M9	20	57200	232x91	116	9900	1395

SAAB-SCANIA

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
DN8	4	6L	115/125	2000	96	7.40
DS8	4	6L	115/125	2000	131	10.10
DN11	4	6L	127/145	2000	134	7.30
DS11	4	6L	127/145	1800	188	11.40
DS111	4	6L	127/145	1800	214	12.90
DS14	4	8V	127/140	1800	252	11.80
DS114	4	8V	127/140	1800	279	13.10

STORK WERKSPOOR DIESEL

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (hp)
DRO216K	6	16900	126x51	69	900	690
DRO218K	8	21300	157x51	72	900	920
6FHD240/ 6SW240	6	25500	139x59	72	1000	1350
8FHD240/ 8SW240	8	32200	173x59	72	1000	1750
9FHD240/ 9SW240	9	35000	173x59	72	1000	2000
6SW280	6	35300	159x71	102	1000	2400
8SW280	8	45200	203x71	106	1000	3200
9SW280	9	50500	221x71	106	1000	3600
12SW280	12V	59000	184x95	109	1000	4800
16SW280	16V	80700	236x95	133	1000	6400
18SW280	18V	88850	254x95	133	1000	7200
6TM410	6	134500	230x101	127	600	5050
8TM410	8	172000	285x101	127	600	6750
9TM410	9	194000	313x101	127	600	7600
12TM410	12V	216000	223x156	132	600	10100
16TM410	16V	286500	278x156	132	600	13500
18TM410	18V	308700	306x156	132	600	15200
6TM620	6	386000	403x132	174	425	11500
8TM620	8	496000	444x132	174	425	15400
9TM620	9	551000	444x132	192	425	17300

SULZER BROTHERS

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
RLB56	2	4, 5, 6, 7, 8L	560/1150	150-170	3760-8800	13.70
ZA40	4	6, 8, 9L, 12V 14V, 16V, 18V	400/480	580	3300-11520	21.95
Z40	4	6, 8L, 12V, 14V, 16V	400/480	560	3000-8800	19.50
AT25	4	5, 6, 8, 10L 12V, 16V, 18V	250/300	720-1000	620-3960	17.90
AS25	4	5, 6, 8, 10L 12V, 16V, 18V	250/300	720-1000	620-3600	16.30
A20	4	6, 8L	200/240	720-1000	420-820	16.30
RTA84M	2	4-10, 12L	840-2900	55-67	7440-40560	16.10
RTA84	2	4, 5, 6, 7, 8, 9, 10, 12L	840/2400	65-90	7280-39720	16.60
RTA76	2	4, 5, 6, 7, 8, 9, 10, 12L	760/2200	71-98	5960-32520	16.60
RTA68	2	4, 5, 6, 7, 8L	680/2000	78-108	4760-17360	16.60
RTA62	2	4-8L	620/2150	73-102	4040-14640	16.60
RTA58	2	4, 5, 6, 7, 8, 9L	580/1700	92-127	3480-14310	16.70
RTA52	2	4-8L	520/1800	88-122	2840-10320	16.60
RTA48	2	4, 5, 6, 7, 8, 9L	480/1400	111-154	2400-9810	16.80
RTA38	2	4, 5, 6, 7, 8, 9L	380/1100	141-196	1480-6120	16.70
RLB90	2	4, 5, 6, 7, 8, 9, 10, 12L	900/1900	90-101	10000-35280	14.30
RLB76	2	4, 5, 6, 7, 8, 9L	760/1600	106-120	7200-19080	14.60
RLB66	2	4, 5, 6, 7, 8L	660/1400	124-140	5440-12800	14.30

TRANSAMERICA DELAVAL

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
R4	4	6, 8L, 12V, 16V, 20V	431·8/533·4	450	2700-9000	15·30
R5	4	6, 8L, 12V, 16V	431·8/533·4	514	3750-10000	19·00
HA	4	6L	355·6/381·0	630	1500	13·00
HVA	4	8V, 12V, 16V	355·6/381·0	630	2050-4100	13·00

VALMET LINNAVUORI WORKS

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
311C	4	3L	108/120	2600	40-44	6·70
411C	4	4L	108/120	2600	54-60	7·40
411CS	4	4L	108/120	2600	74-82	10·00
611C	4	6L	108/120	2600	80-88	7·40
611CS	4	6L	108/120	2600	103-113	10·00
611DS	4	6L	108/120	2500	120-132	11·40

VOLVO PENTA OF AMERICA

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
2001	1	247	24x18	23	2800-3200	9
2002	2	306	28x18	23	2800-3200	18
2003	3	351	32x18	23	2800-3200	28
2003T	3	407	32x18	23	2800-3200	43
MD30A	4	732	31x24	29	3400-3800	65
TMD30A	4	814	45x24	29	3400-3800	90
TAMD30A	4	827	45x24	29	3400-3800	110
TMD40C	6	1,014	58x27	30	3200-3600	136
TAMD40B	6	1,047	58x27	30	3200-3600	165
AQAD40B/290B	6	1,157	51x27	30	3200-3600	165
TAMD60C	6	1,655	60x29	34	2600-2800	250
TAMD70E	6	2,005	64x31	36	2300-2500	300
TMD100C	6	3,181	73x32	41	1800-2000	272
TMD121C	6	2,910	66x34	42	1800-2000	340
TAMD121C	6	2,990	66x34	46	1800-2000	408

WARTSILA POWER

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
Vasa 4R22HF	4	15,900	109x57	89	900/1000	840
6R22HF	6	20,500	135x57	91	900/1000	1326
8R22HF	8	24,900	164x57	101	900/1000	1768
8V22HF	8	19,600	118x68	102	900/1000	1768
12V22HF	12	33,900	158x78	101	900/1000	2652
16V22HF	16	39,700	191x78	108	900/1000	3536
Vasa 4R32D	4	40,800	158x73	134	720/750	2040
6R32D	6	57,300	196x73	137	720/750	3060
8R32D	8	78,300	239x73	148	720/750	4080
9R32D	9	83,800	256x73	145	720/750	4590
12V32D	12	92,600	224x101	144	720/750	6120
16V32D	16	110,200	268x103	150	720/750	8160
18V32D	18	127,900	292x107	156	720/750	9180

All models can burn fuel up to 700cSt/50°C (7000 sec RI/100°F)

WAUKESHA ENGINE DIV.

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
F476DM	6	1,685	54x36	48	2000	131
F476DSM	6	1,825	54x36	48	2000	178
F674DM	6	2,050	69x31	45	2000	182
F674DSM	6	2,103	69x31	45	1800	256
F674DSIM	6	2,326	69x31	45	1800	291
H867DSM	8	2,555	57x45	51	1800	337
H867DSIM	8	2,599	57x45	51	1800	379
F2896DM	6	14,200	123x66	88	1215	404
F3335DM	6	14,200	123x66	88	1215	456
F2896DSM	6	14,600	137x65	88	1215	568
F2896DSIM	6	14,900	137x65	88	1215	710
F3335DSIM	6	14,900	137x65	88	1215	818
L5792DM	12	19,900	143x74	102	1215	807
L6670DM	12	19,900	143x74	102	1215	912
L5792DSM	12	20,400	143x74	102	1215	1136
L5792DSIM	12	20,900	143x74	102	1215	1420
L6670DSIM	12	20,000	143x74	102	1215	1636
6L-AT25D	6	26,125	138x53	102	1000	1800
8L-AT25D	8	31,747	171x53	108	1000	2400
12V-AT25D	12	44,000	170x82	124	1000	3600
16V-AT25D	16	53,000	209x82	118	1000	4800

WICHMANN DIESEL, INC.

MODEL	CYL.	WT.	LxW (inches)	H (inches)	SPEED (rpm)	OUTPUT (bhp)
5AXAG	5	46,300	166x74	113	475	2244
6AXAG	6	54,000	189x78	119	475	2693
7AXAG	7	60,600	211x78	118	475	3142
9AXAG	9	73,800	247x78	122	475	4039
10AXAG	10	81,600	265x78	124	475	4488
WX28L4	4	29,800	141x74	105	600	1632
WX28L5	5	34,400	160x74	105	600	2040
WX28L6	6	43,000	180x74	116	600	2448
WX28V8	8	45,200	132x81	116	600	3264
WX28V10	10	55,100	152x81	119	600	4080
WX28V12	12	66,100	167x75	128	600	4896
WX28V16	16	88,200	175x75	146	600	6528

YANMAR DIESEL

MODEL	CYCLE	CYL.	BORE/STROKE (mm)	SPEED (rpm)	OUTPUT (kW)	Bmep * (bar)
6MA-HTS	4	6L	200x240	900	358	
6M-DT	4	6L	200x240	750	350	
6MA-DT	4	6L	200x240	900	410	
M200-DT	4	6L	200x260	900	448	
M200-ST	4	6L	200x260	900	597	
T220-UT	4	6L	220x280	800	597	
T220-ST	4	6L	220x280	800	671	
T220-ET	4	6L	220x280	800	746	
T240-UT	4	6L	240x310	750	756	
T240-ET	4	6L	240x310	750	821	
T240-ST	4	6L	240x310	750	895	
T260-ST	4	6L	260x330	700	1044	
T260-ET	4	6L	260x330	700	1119	
Z280-ST	4	6L	280x360	650	1193	
Z280-ET	4	6L	280x360	650	1343	
8Z280-ST	4	8L	280x360	650	1567	
8Z280-ET	4	8L	280x360	650	1790	
12T26-ST	4	12L	260x330	700	2089	
12T26-ET	4	12L	260x330	700	2238	
S165-ST	4	6L	165x210	1300	405	
S165-ET	4	6L	185x230	900	447	

NOTE: * 1 PSI=6.895 (10^2) bars
Contact manufacturer for fuel rates.

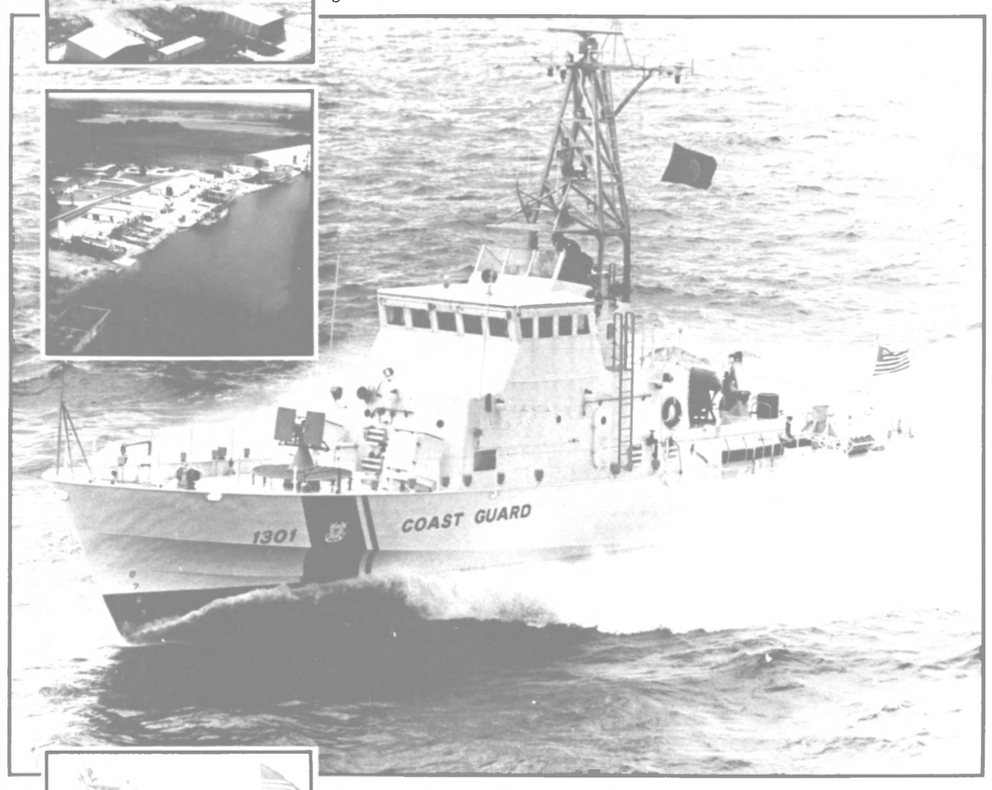
IF THE SUPPLEMENT HAS BEEN REMOVED FROM THE JANUARY 1, 1986 ISSUE AND THERE IS NO READER SERVICE CARD, PLEASE CONTACT MARITIME REPORTER FOR DISTRIBUTOR INFORMATION.

We're Making it Happen!

In case you haven't looked at us lately, things are happening at Bollinger. We're having dedications, winning awards and continually celebrating the Bollinger tradition of total commitment to quality and professionalism in our work and from our people. It's the commitment that will be behind sixteen 110 foot Coast Guard patrol boats presently under construction and every other vessel that leaves the yard.

Along with two existing 1,500 ton floating dry docks, our newly constructed 3,500 ton capacity dry dock at our Larose division truly makes our repair sevices complete by all standards.

From push boats to patrol boats, we've built them all and can repair them all. It's all in a day's work...work that we've taken pride in doing for our customers for three generations.



It's happening here and now at Bollinger...and you're invited. Celebrate the happening!

Bollinger
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Circle 217 on Reader Service Card

Texaco Marine Services Receives Ship Management Contracts —Free Literature Available

Texaco Marine Services Inc. (TMSI), Port Arthur, Texas, has signed operating agreements with Archon Shipping Inc., and Acturus Shipping Inc., to manage the tanker Brooklyn and the tanker Williamsburg, according to **William R. Cumming,** president of TMSI.

TMSI, a wholly owned subsidiary of Texaco Inc., is a full-service ship mangement company located in new facilities at Port Arthur. The tanker Brooklyn and the tanker Williamsburg are both 225,000 dwt, very large crude carriers (VLCCs), constructed in 1974 and remain under time charter to American Petrofina Incorporated.

In addition to the new operating agreements, TMSI also operates Texaco and subsidiary U.S. and foreign-flag fleets of oceangoing tankers and coastwise units, as well as vessels for Saudi International Petroleum Carriers Ltd. and Nigerian National Petroleum Corporation.

Mr. **Cumming** said that "TMSI is staffed with a professional multinational force of marine and engineering experts and is actively seeking additional operating agreements to fully manage more vessels, both foreign and domestic." He also noted that TMSI offers shipowners many special services ranging from inventory control and planned maintenance programs to computerized energy conservation programs.

For additional information on Texaco Marine Services Inc., call (409) 989-6624 or write TMSI, P.O. Drawer 1028, Port Arthur, Texas 77641 or, for complete literature and information,

Circle 52 on Reader Service Card

Wilson Walton Sells Testing Services For Ships/Offshore Structures

Wilson Walton International Ltd. of Stockton-on-Tees, U.K., signed an agreement with BV Materiaal Metingen of Holland to sell the company's range of testing services in the U.K. for ships and offshore structures.

Under the terms of the agreement, Wilson Walton will be able to offer the shipowner and offshore operator within the U.K. a wide range of non-destructive testing services including ultrasonic and radiographic inspection, ultrasonic thickness measurement, magnetic particle inspection, crack depth analysis and liquid penetration inspection. These facilities are available from the BVMM offices in Holland and from their office in Curacao.

The agreement in conjunction with Wilson Walton's existing corrosion monitoring protection business enables the company to offer comprehensive corrosion monitoring services to all shipowners and offshore operators.

The BVMM engineers are able to carry out this work while the vessel is alongside or alternatively on the voyage so enabling a full survey to be carried out prior to vessel/rig drydocking.

For further information on Wilson Walton testing services,

Circle 71 on Reader Service Card

Naval Approval Goes To Imperial Welding —Literature Available

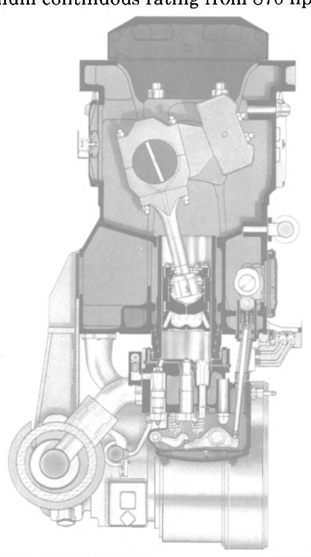
Imperial Weld Ring Corporation, Elizabeth, N.J., has been approved for level I sub safe nuclear work by the United States Navy's Ship Parts Control Division. "We are proud of this new designation," stated **Calvin Sierra,** company vice president. "We feel that this is added recognition of the quality of our products."

For almost 30 years, Imperial has been producing backing rings, weld test coupons and consumable inserts (SPEC. Mil-I-23413). The company distinguished itself by its excellent service and competitive pricing. Imperial products are used in all welding markets including marine construction, nuclear, steam pressure vessels and other pipe fabrication. **Circle 11**

PROPULSION UPDATE

Sulzer Introduces A Longer-Stroke Medium-Speed Engine

Sulzer Brothers Limited of Winterthur, Switzerland, has introduced a longer-stroke version of their 400-mm bore medium-speed, four-stroke cycle engine. The new engine, called the ZA40S, is a long-stroke version of their proven ZA40 engine. By increasing the engine stroke from 480 mm to 560 mm (stroke/bore ratio increase from 1.2 to 1.4), a significant improvement in fuel economy was achieved (4 g/bhp h), while increasing the maximum continuous rating from 870 hp to 900 hp, and lowering the engine speed from 580 rpm to 510 rpm.



The longer stroke and consequential slower rotation speed of the ZA40S have the advantages of:

—Better combustion as the time available for combustion is increased;

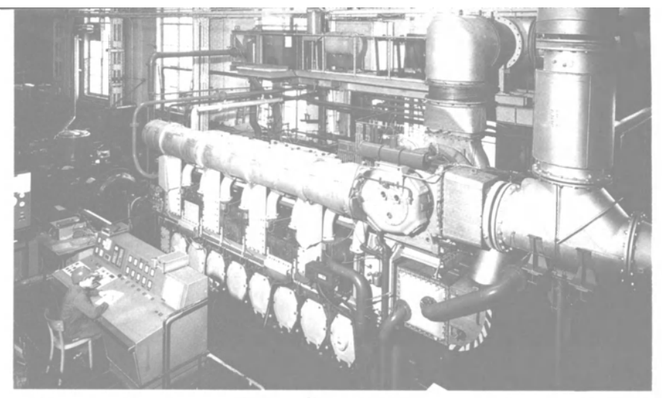
—Better mechanical efficiency due to lower friction losses in the engine bearings;

—And improved combustion chamber geometry.

All of which contribute to the improvement in specific fuel consumption without increasing the maximum firing pressure above 155 bar as in the ZA40.

Sulzer achieved the characteristics of the ZA40S engine with a minimum number of design changes to the ZA40 engine components. The longer stroke is accomplished within the same frame dimensions as the shorter-stroke ZA40 by compensating for the increased crank throw with a shorter connecting rod. Three notable design features contained in the ZA40S which have demonstrated their importance for reliability and long component life on poor-quality heavy fuel oils operation are:

—Rotating piston—at maximum cylinder pressures above 150 bar, rotating pistons are an asset in guarding against scuffing and maintaining low wear rates while ensuring low lubricating oil consumption, generally less than 1.0 g/bhp h.



—Bore cooling—applied to all combustion space components (cylinder head, cylinder liner and piston crown) results in low stress levels, high rigidity and optimum metal temperatures, all prerequisites for satisfactory heavy-fuel performance.

—Exhaust valve technology—exhaust valve design incorporating water-cooled seat inserts, Nimonic valves and valve rotators, contributes to extended time between overhauls.

The ZA40S engine is available in an in-line configuration with six, eight or nine cylinders, and in a "V" configuration with 12, 14, 16 or 18 cylinders and ranging in power from 5,400 to 16,200 bhp at 510 rpm. At an economy rating of 750 bhp at 510 rpm, the "V" engines achieve a specific fuel consumption of 129 g/bhp h. By using an exhaust gas power turbine as an "efficiency booster," the specific fuel rate can be improved by 3 percent to 125 g/bhp h.

For further information and complete literature on the ZA40S engine from Sulzer Brothers,

Circle 12 on Reader Service Card

Eastern Marine Developing One Of Three Facilities As Offshore Supply Base

Eastern Marine, Inc., the Panama City, Fla., shipbuilding firm, has announced plans to develop one of its three facilities as an offshore supply base. This move was stimulated on account of the increasing offshore exploration activities in the Gulf of Mexico off Florida's Northwest Panhandle Region. Eastern Marine's proposed facility consists of a 10.5-acre prime, centrally located tract, which is a peninsula bordered by water averaging 14 feet in depth. This strategic location is just minutes away from the Intracoastal Waterway, and six miles from the Gulf of Mexico Jetties. Major highways and rail facilities are also located nearby. Plans are currently in motion to develop an extensive bulkhead system and dock loading area which would extend for more than 1,000 feet in length, and could support numerous offshore support vessels, crewboats and barges.

In addition, facilities are now existent with a multilevel office building, warehouse, loading dock, and small vessel repair operation. Brian D'Isernia, president of Eastern Marine, Inc., has conducted a study with several oil companies, and service-support groups, and indicates that there is a great deal of interest for a "one-stop" supply base, providing fuel, water, drilling fluids and equipment, tubulars and personnel lodging and transfer facilities. Eastern Marine's proposed supply base would provide all the necessary requirements, and in addition the area could also be utilized as a helicopter base.

For additional information,

Circle 45 on Reader Service Card

SAAB Tank Control Relocates To New, Larger Facilities

James Rolfe, president of Saab Tank Control (formerly salwico) recently announced the company's relocation to new and larger quarters. Saab is now located at One Harmon Plaza, Secaucus, N.J. 07094. The new telephone number is (201) 348-3000.

"The move was necessary," Mr. **Rolfe** stated, "in order to supplement our expanding business and accommodate our personnel growth. All sales, marketing and technical information will be at the new location."

Circle 14 on Reader Service Card

Chesapeake Marine Engineering Symposium Set For January 24, 1986

The Chesapeake Section of The Society of Naval Architects and Marine Engineers has announced that the 1986 Chesapeake Marine Engineering Symposium is to be held on January 24, 1986, at the Sheraton National Hotel in Arlington, Va. The featured speaker for the reception and luncheon will be Rear Adm. **James Webber,** USN, Chief Engineer of the Naval Sea Systems Command.

Preceding the symposium, on the evening of January 23, 1986, will be the annual joint dinner meeting of the Chesapeake Section and the Flagship Section of the American Society of Naval Engineers. This year's joint dinner meeting speaker is Representative **Roy Dyson** of Maryland, member of the House Armed Services Committee and member of the Merchant Marine Subcommittee.

The theme of the symposium is "Marine Engineering in the Year 2000."

Morning Sessions—9 a.m.

Session I—Moderator, **Jack Abbott;** Assistant, **Richard Murphy.**

"Noise Source Levels of Shipboard Machinery," by **P.K. Kasper** and **S. Feldman,** NKF Engineering, Inc.

"Hydraulic Analysis of Multibranch Piping Systems," by **R.C. Sanders, T.G. Lestina,** and **D.B. Weaver,** MPR Associates, Inc.

"Shipboard Vibration Can Be Controlled," by **E.F. Noonan,** NKF Engineering, Inc.

Session II—Moderator, Comdr. **John Maxham,** USCG; Assistant, **Bruce Jackson.**

"Application of Power System Modeling Techniques to 400 Hz Shipboard Electronic Power Systems," by **J. Sofia,** David Taylor Naval Ship Research and Development Center.

"Evaluation of Automated Vital Systems," by Lt. **P.L. Randall,** USCG.

"The Electric Power Interface Compatibility (EPIC) Program," by **J. Langsner,** Designers & Planners, and **H.P. Wong,** Naval Sea Systems Command.

Afternoon Sessions—2 p.m.

Session III—Moderator, Capt. **James Grabb,** USCG (ret.); Assistant, **Vernon Klemm.**

"Selection of the Propulsion Plant for an Icebreaking Tanker," by **R.A. Levine,** ARCO Marine, Inc.

"Introducing a Foreign Diesel into U.S. Navy Service," by **E.K. Moe,** Naval Sea Systems Command, and **R.S. Carleton** and **V. Kamal,** Designers & Planners.

"Saving Fuel Aboard U.S. Naval Vessels," by **R. Dangel** and **G. Healy,** Naval Sea Systems Command.

Session IV—Moderator, **Ron Cauley;** Assistant, **Ralph Johnson.**

"The Role of Human Engineering in Achieving Technical Excellence," by **J. Castle,** Naval Sea Systems Command, and **G. Miller,** G.E. Miller & Associates.

"The Concept of Advanced Concepts," by **J.F. Sladky Jr.,** University of Washington, **R.W. Gallington,** SAI Corp., and **M. Terry,** Boeing Marine Systems.

"Marine Corrosion," by **H. Bliele,** Naval Sea Systems Command.

For registration information, contact **Gregg Hagedorn,** 1124 Allison Street, Alexandria, Va. 22302, phone (202) 692-0323.

NAVSEA Awards $21-Million Contract To Sperry Corporation

Sperry Corporation, Defense Products Group, St. Paul, Minn., was awarded a $21,000,000 firm-fixed-price modification by the Naval Sea Systems Command (NAVSEA), Washington, D.C., definitizing a previously awarded letter contract for 190 USQ-69 data terminal sets, 53 OL-267 data terminal groups, and an option for 250 USQ-69 data terminal sets, and 24 data terminal groups.

The work, which will be performed in St. Paul, is expected to be completed in December 1987. The contract funds for the project would not have expired at the end of the current fiscal year.

The contract number for the project is N00024-85-D-7031.

Marathon LeTourneau Reorganizes Marine And Offshore Operations

Marathon LeTourneau Company, Houston, Texas, a Marathon Manufacturing company, has reorganized its marine and offshore energy-related operations, it was announced by **Charles P. Siess Jr.,** president and chief executive officer.

Mr. **Siess** said that the principal changes involve the following management changes in the company's marine operations.

John B. Allison, who served most recently as president of Marathon LeTourneau's Gulf Marine Division shipyard in Brownsville, Texas, will return to the company's Houston offices where he will serve as president-Marathon LeTourneau Marine Company, a newly formed division of Marathon LeTourneau Company to oversee Marathon's consolidated marine businesses.

Mr. **Allison** joined the Marathon organization in 1971 as project manager at the Singapore facility. After serving in an administrative role in Houston in 1973, he was appointed managing director of Marathon's shipyard in Clydebank, Scotland, in 1974. In 1976, he was named president of the Brownsville facility.

David C. Crawford, executive vice president of Marathon LeTourneau Company and Marathon Manufacturing Company, will take early retirement, a decision he announced internally several months ago. However, Mr. **Crawford** will maintain an affiliation with Marathon through 1986.

Mr. **Crawford** joined Marathon in 1971 as managing director of the firm's shipyard in the Republic of Singapore. In 1973, he was elected senior vice president and assigned to Marathon's corporate headquarters in Houston where he was elected executive vice president and a director in 1974.

William K. Trimble, who served as president and managing director of the Singapore facility from June 1983 until mid-September 1985 when Marathon completed its earlier announced disengagement from Singapore, will transfer to the Gulf Marine Division, Brownsville, Texas, where he will serve as president.

Mr. **Trimble** began his career with Marathon in 1972 at the company's Houston office where he was a Project Engineer. In 1973, he was assigned to Brownsville as a Project Manager and in 1976 he transferred to Singapore as assistant production manager.

Marathon is a Penn Central company. Penn Central manufactures products and supplies services in the areas of electronics, telecommunications, defense and energy.

For further information on Marathon LeTourneau,

Circle 73 on Reader Service Card

Garlock Offers 44 Page Catalog On Sealing Devices

Garlock Mechanical Packing Division, Colt Industries, is offering a free 44-page full-color catalog on their line of sealing devices for the marine industry.

Garlock, a worldwide supplier of sealing devices, has been developing effective sealing methods and products since 1887. The company has manufacturing and distribution centers around the globe including such locations as: Palmyra, N.Y.; Dusseldorf, West Germany; Brisbane, Australia; Montreal, Canada; London, England; Barcelona, Spain; and many others.

The 44-page publication uses color photographs, specification, reference and data charts to describe and explain the applications of Garlock sealing devices. The catalog covers such devices as: high-temperature valve stem packing; stern tube packings; soft packings for pumps and valve service; versatile VFE packings; tough metallic and highly lubricated packing; abrasive service packing; and several more.

A special feature of the Garlock catalog is a handy "Garlock Quick Reference Marine Sealing Devices" chart. The chart, which is broken into two sealing device categories—compression packings and jointing material—gives the style, material, application and service of each product found in the catalog.

For a free copy of this informative and thorough catalog from Garlock,

Circle 18 on Reader Service Card

Rowbotham Fleet Acquired By Marine Transport Lines

In a big expansion move, Marine Transport Lines Inc. (MTL) of Secaucus, N.J., recently acquired the 25-vessel fleet of the British-based Rowbotham Tankships from Ingram Corporation of New Orleans. MTL chairman and chief executive officer **James H. Rand** said the move "will serve to broaden and diversify MTL's business while expanding dramatically MTL's presence in the European market."

Ingram had acquired the British company in 1970 and continued the policy of expansion and replacement of tonnage with new and efficient ships. MTL intends to retain the present U.K. management and operate the ships, which range from 1,174 to 30,000 dwt, under the British flag.

McDermott Gets $48-Million Contract To Build Drilling And Production Platform

McDermott International Inc. of New Orleans has been awarded a $48-million contract by the Chinese Petroleum Company of Taiwan for engineering, procurement, and construction of an offshore drilling and production platform, two wellhead platforms, 40 miles of pipelines, and other equipment for the CBK Field 15 miles north of Hsin Chu. Fabrication is expected to begin in January and offshore work in May 1986.

Todd Awarded $33-Million Conversion By Matson Navigation

The Los Angeles Division of Todd Shipyards Corporation has been awarded a $33-million fixed-price contract by Matson Navigation Company, San Francisco, Calif., to convert and expand the RO/RO trailership Matsonia into a combination lift-on/lift-off container and RO/RO trailer carrier.

According to Todd chairman **J.T. Gilbride,** it is the first major ship conversion job contracted by Matson on the West Coast since 1961.

Engineering work has already commenced at the yard in anticipation of the Matsonia's arrival in Los Angeles in March. The conversion will get underway in June, and the vessel will be delivered in March 1987.

The 700-foot-long, 92-foot-wide Matsonia will be cut in two and a 291-foot midsection will be removed and replaced by a 351-foot-long, 105-foot-wide mid-body section. The conversion will triple the vessel's present cargo capacity, enabling it to carry 1,256 containers (TEU), plus 55 forty-foot trailers and 422 automobiles. Her tanks will carry 3,900 long tons of molasses.

The mid-body section will be constructed on one of the Los Angeles Division's two shipways, while the vessel will be cut on the Shiplift and Land Level Transfer (Syncrolift) facility. Upon completion of these operations, the vessel will be reassembled on the Syncrolift and launched. Approximately 350 employees will be added to the workforce to perform the conversion.

Todd Shipyards Corporation, one of the nation's largest independent shipbuilders and ship repairers, operates other yards in Seattle, Wash.; San Francisco, Calif.; Galveston, Texas; and New Orleans, La.

McAllister Bros. Acquires Norfolk, Baltimore And Carolina Lines Assets

McAllister Brothers, Inc., the New York-based towing and transportation company, has acquired the marine and other transportation-related assets of Norfolk, Baltimore and Carolina Lines, Inc. (NBC). The announcement was made by company president **Brian A. McAllister**. Termed a charter/sale transaction, the move involves NBC's five tugs and seven barges, as well as water and motor carrier rights.

According to Mr. **McAllister**, the former NBC operation will be known as McAllister Feeder Line, and will provide uninterrupted continuance of NBC's barge service between Norfolk, Baltimore, and Philadelphia on a charter basis, along with other operations including trucking between the three ports and to inland destinations. The new routes complement McAllister's container barge sailings between New York and New England two or three times a week.

As vice president of McAllister Feeder Line, **E. Patrick Mullaly** will be responsible for the former NBC operations, and will continue to direct the container barge services.

Wartsila Gets $44-Million Contract From Board Of Navigation For Icebreaker

Wartsila's Helsinki shipyard has received an order from the Finnish Board of Navigation (FBN) to construct an icebreaker of the advanced Karhu II Class, a type developed by the shipyard in close cooperation with the FBN. A sister ship is nearing completion at the Helsinki yard. The new design replaces the obsolete Karhu Class.

To be powered by four Wartsila Vasa 16V32 7,425-bhp diesel engines, the new vessel will have an overall length of 324.8 feet, beam of 79.4 feet, and draft of about 26 feet. The diesel-electric propulsion will feature a Kymi/Stromberg cycloconverter ac plant providing a service speed of 18.5 knots.

Mark Controls Butterfly Valve Approved By Navy —Literature Available

Mark Controls Corporation of Evanston, Ill., has recently had its FlowSeal high-performance butterfly valve placed on the qualified products list for use in firesafe applications by the U.S. Navy. This qualification has been awarded after rigorous evaluation and fire testing of the valve by the Navy. It signifies that the FlowSeal Fire-Flow seat design is suitable for use in critical applications involving flammable liquids such as jet fuel.

The Navy qualification of FlowSeal valves is in accordance with Military Specification MIL-V-24624 (SH) and Amendment I, and includes styles A and B of Type I firesafe stainless steel valves, and Type III firesafe aluminum/bronze valves.

For further information and free literature on Mark Controls high-performance valves,

Circle 17 on Reader Service Card

Tech Development Issues Series 52RL Air Starter Motor Specification Sheet

Tech Development Inc., manufacturer of the Turbostart™ air starter, recently announced the availability of a revised product specification sheet entitled "Series 52RL Open-Pit Mining Haul Truck Air Starter Motor." This revised spec sheet features the "TDI Turbostart™ Selection Guide for Various Sized Engines and Operating Pressures." The 52RL, Part Number 52447-12, can be applied to diesel engines in the 500 to 2,000-hp range, and will provide good starts on air pressures from 200 psig down to 60 psig. It is directly interchangeable with other types of starters now used on U.S.-built engines such as the Cummins KTA 2300, Detroit Diesel 16V-149 and the EMD 16-645.

For further information and a free copy of data sheet 52RL from Tech Development,

Circle 47 on Reader Service Card

Fine Metering Valves From Nupro Offer Improved Stability & Flow Control

Nupro Company of Willoughby, Ohio, has available fine metering valves, redesigned for better flow control and longer cycle life. The valves also have a more compact design with fewer components.

Long-term reliability is an important benefit. Stem threads, for example, are removed from system fluids by an O-Ring seal that also eliminates the need for packings and adjustments. The orifice and tapered needle are protected from damage by a guide O-Ring that allows the stem to "float" within the body. A body seal prevents leakage to atmosphere.

Valves are available in brass, Monel® and 316 stainless steel. O-Ring materials include Viton®, Buna, neoprene, silicone and ethylene propylene. Kalrez® O-Rings and TFE body seals for use with corrosive system fluids are optional. Also optional are vernier handles for repeatable flow adjustment.

Maximum pressure rating is 2,000 psi. Temperatures range from −10°F to 300°F for brass valves and −10°F to 400°F for stainless steel and Monel valves.

Swagelok tube fitting and pipe end connections from $\frac{1}{16}$-inch to $\frac{1}{4}$-inch.

For further information,

Circle 41 on Reader Service Card

$57.9-Million Modification Awarded General Dynamics For Trident Sub Work

A $57,902,400 negotiated cost-plus-fixed-fee modification was awarded to the General Dynamics Corporation, Electric Boat Division, Groton, Conn., by the Naval Sea Systems Command, Washington, D.C., to definitize a previously awarded letter contract for engineering and technical services for Trident submarines.

The work, which is expected to be completed in September 1988, will be carried out at the company's Groton location.

By the end of the 1985 fiscal year, approximately $14,335,200 of the contract funds would have expired. The contract number is N00024-84-C-2167.

Sparrows Point Yard Wins Repair Contract For 'Energy Independence'

The Sparrows Point Shipyard of Bethlehem Steel Corporation has been awarded a major contract for the repair of the S.S. Energy Independence, according to **David Watson,** general manager.

The 666-foot-long coal carrier, owned by the New England Collier Company in Philadelphia, Pa., entered the yard recently for an approximate 40-day duration while the engine's main drive gear is removed and replaced with a new gear, Mr. **Watson** said. The cost of the job was not disclosed.

Mr. **Watson** said the work will be complicated and represents one of the first quick turnaround repair projects lined up by the yard, which has historically been involved in long-term new buildings and reconstruction.

The general manager said employee levels have been declining recently while the yard prepares for the construction start of two U.S. Navy T-AGS oceanographic survey ships, expected to begin in January. Work on this ship will help maintain the present workforce level of 1,200.

The S.S. Energy Independence, one of the only American-flag ships afloat capable of using coal or oil for fuel, carries coal throughout the northeast and calls frequently on the Port of Baltimore. The ship is 95 feet wide, 56 feet deep and powered by General Electric steam turbines and gears.

In addition to this job, the yard began the fabrication this month of a 310-foot-long container barge for the Hale Container Line, Inc. of Baltimore.

For further information and complete literature on the Sparrows Point Shipyard of Bethlehem Steel Corporation,

Circle 72 on Reader Service Card

Circle 180 on Reader Service Card →

The Federal Policy Vacuum: We Are Little Known And Less Understood

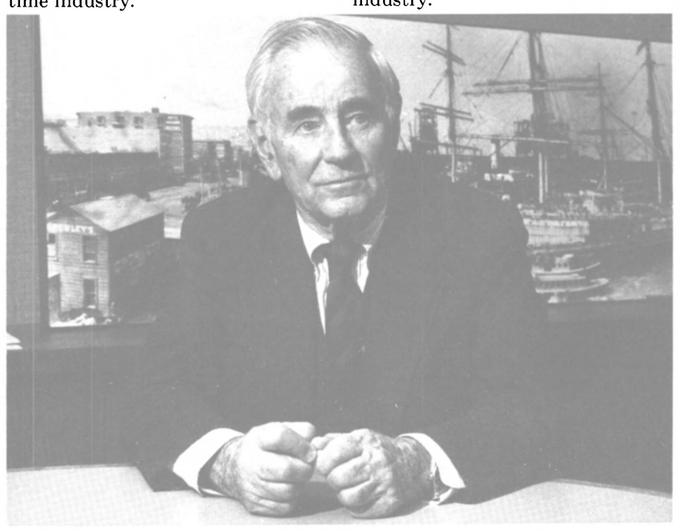
By Thomas B. Crowley, President
Crowley Maritime Corporation

The following article is excerpted from a November 13, 1985 statement by **Thomas B. Crowley**, *president, Crowley Maritime Corporation, before the Congressional Maritime Caucus, on behalf of the Inland and Coastal Tug and Barge Industry. Mr.* **Crowley** *is a member of the Congressional Maritime Caucus Advisory Board.*

Federal policies do not yet recognize the distinct and unique character of the tug and barge industry. For the most part, federal policymakers do not know of the scope and importance of the tug and barge industry, or understand its contribution to longstanding policy goals and objectives. This in part results from the traditional federal focus on America's deep-draft merchant fleet. However, it also stems from the fact that we in the tug and barge industry have failed ourselves, so far, in bringing our message to the Congress and the Administration. The recognition by the Congressional Maritime Caucus that the barge and towing industry should be represented on the Industry Advisory Board is appropriate. We hope that it signals a change in the understanding and attention afforded this important segment of the U.S. maritime industry.

The concern within the barge and towing industry that we are neither known nor understood by most federal policymakers is much more than simply a matter of perception. This vacuum has led directly to the enactment of federal laws and the adoption of policies which have had a punishing impact on the industry. There is, of course, no malice toward our industry in these actions, but the results have been no less severe. Indeed, it is not an overstatement to say that the depression in which the barge and towing industry finds itself today is due in large part to a litany of federal actions which were undertaken without sufficient attention to or an understanding of their direct and serious impact on the barge industry. Consequently, what our industry now needs most are thoughtful and rational laws which recognize our severely depressed condition and our vital place in the nation's transportation system, and which will restore much needed stability to our businesses.

A number of important topics must be examined in order to assist the Congressional Maritime Caucus in the development of rational and effective policies which will sustain and promote both the national interest and the barge and towing industry.



Thomas Crowley

The Integrity Of The Jones Act

The barge and towing industry believes that the Jones Act is the cornerstone of U.S. maritime policy. Indeed, since 1920, the act has been the lifeblood of U.S.-flag carriers engaged in the domestic trades. The provisions of the Jones Act have fostered a stable domestic transportation market which allows for rational investment decisions regarding capital equipment, maintains healthy competition, and provides shippers with safe and reliable service. More important, it is a necessary adjunct to U.S. security.

The U.S. ownership requirement contained in the Jones Act is likewise critical to the nation's security and economy. During national emergencies, the domestic fleet of merchant vessels is called upon to transport troops and materials to support military operations. American ownership also keeps shipping revenues and taxes at home.

Another requirement for Jones Act vessels is that they be built in American shipyards. It is imperative for the U.S. to maintain a strong shipbuilding base in the event that a national emergency would require a sudden need to build additional vessels and repair damaged ones. Economically, building vessels in the United States provides billions of dollars of income to the domestic labor force, shipyards, and hundreds of allied industries. Moreover, maintenance of the U.S. construction provision is necessary to protect the billions of dollars invested in the existing domestic fleet. Any intrusion by foreign-acquired vessels into the domestic trades would depreciate overnight billions of dollars invested by American citizens in U.S.-built capital equipment.

The barge and towing industry believes that the Congress must be vigilant if both the letter and the spirit of the Jones Act is to be maintained. Various foreign and domestic interests continually call for and seek to weaken the provisions of this 1920 law. Additionally, attacks on the Jones Act also come in the form of proposals which would not directly change the statutory provisions of the law, but would undermine the economic foundation of the domestic trade. We encourage the Congressional Maritime Caucus to protect the act and the American investors owning Jones Act vessels by assisting the maritime industry in defending the statute against recurring and unwarranted attacks. To facilitate the strengthening of the act, we encourage the Congress to close the Alaska Third Proviso, allow only Jones Act tugs to provide assist services for *all* vessels calling at U.S. ports, extend the jurisdiction of the act beyond its current three-mile offshore limit, and end the Virgin Islands exemption.

Lastly, the barge and towing industry supports and applauds the efforts now underway to legislatively clarify the intent of Congress that all marine towing and support activities on the U.S. outer continental shelf are subject to the provisions of the Jones Act and are therefore reserved for American-flag vessels. we believe that this clarification of our cabotage laws is both timely and imperative, and will appropriately ensure that the significant and growing employment opportunities on the OCS are available to U.S. operators.

Relieving The Excess Capacity-Depressed Cargo Vise On The Industry

Largely through unwitting actions by the federal government, the barge industry is being crushed by too many barges chasing too few cargoes. The result: rates which are often below the cost of operating the equipment.

In the late 70s, federal government predictions of over-expanding U.S. exports of coal and grain produced feverish activity in building new barges and towboats. Then, amendments to the Internal Revenue Code at about the same time provided incentive to bring hordes of investors into barge-building partnerships to own barges for purposes of sheltering personal income. Meanwhile, on yet another front, the federal government promoted barge building through the Title XI program administered by the Maritime Administration. In essence, this program availed companies which wished to build barges with credit on terms more favorable than those available in private lending institutions.

Overtonnage is in the range of 20 percent; one in five barges is idle. And, about three quarters of the excess stems from misguided federal initiatives. It is arguably true that, unless the government redresses its errors which have so adversely impacted our industry, the predicted (slow) growth of tonnage along the coasts and the inland rivers will not soak up this excess capacity by the end of the century.

On the depressed cargo side of the equation, one should first look at U.S. exports of grain and coal. Barges typically haul about half the grain bound for international export markets and about 15 percent of coal to U.S. ports where the cargoes are loaded for transshipment to foreign markets. These export cargoes constitute a very substantial part of

(continued)

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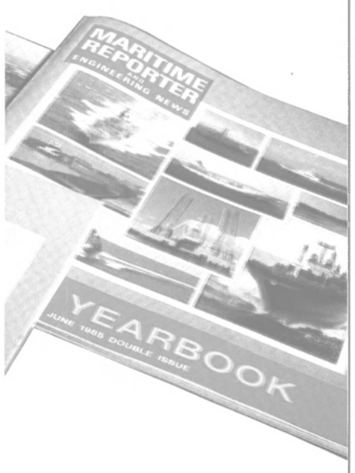

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Total Requested Circulation	24.305	22,745	6,873	9,985
Unrequested free copies	0	2,390	0	3,046

WORKBOAT does not report titles of all readers, Presidents, Vice Presidents, Treasurers, Purchasing Agents, etc. Impossible to identify number of buyers reached.

Circulation audit bureaus do not identify buyers.
Identification of BUYERS is based on a 1984 survey, commissioned by MARITIME REPORTER, of over 1,000 marine sales managers who identified true buyers as shoreside management, design and purchasing people in vessel operations, shipbuilding and design (naval architects). Signed and dated replies on file at MARITIME REPORTER.

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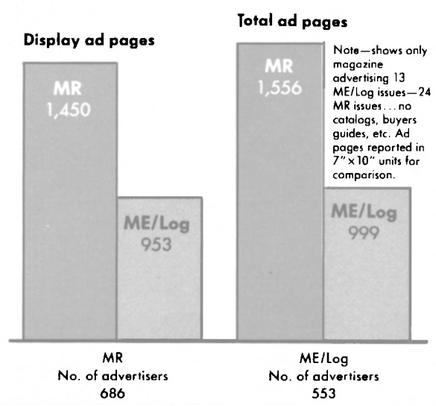

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(continued)

the barging business. When they are depressed for any reason, our industry is hit hard.

At the time President **Carter** imposed the embargo on grain to the USSR, the United States shipped 20 million tons of grain to that country. The window was slammed shut on that market, and the Argentines, Canadians and Australians moved in. Even though a new trade agreement was signed with the Soviet Union in September of 1983, we will probably never recover the market share we held in 1980.

The PIK program is another example of a well-intentioned initiative by the federal government which added to the woes of the industry. Farm acreage lay fallow, encouraged by "payment in kind."

But, PIK was only a one-time blip compared to the ongoing federal subsidies to U.S. farmers which contribute much to price U.S. grains out of the export market. That, of course, rolls back on the barge industry.

Coal exports are a similar story. U.S. coals are relatively uncompetitive for a variety of reasons. One reason can be traced to domestic (U.S.) transportation costs. The 1980 Staggers Rail Act freed the "revenue inadequate" railroads to hike prices charged to captive mines for the shipment of coal to East and Gulf Coast ports. The U.S. simply is not price competitive with Australian, Canadian, Polish and South African steam coals.

And, of course, overhanging the entire trade issue is the vastly overvalued U.S. dollar which has resulted in record-breaking balance of payment deficits.

An array of federal actions are urgently needed to promote U.S. exports across the board. And, some innovative private sector-federal partnerships need to be sought to remove the excess capacity in the industry which was created by past federal policies.

Preventing New Taxes On The Industry

The barge industry is in a depression, not a recession, and we are not recovering. Our industry is currently faced with economic conditions that threaten the survival of many companies. In 1981, the industry experienced a significant downturn in business. In 1982, the industry slipped further and in 1983 we continued to slide down the ever steeper slope.

Although it is apparent that this industry cannot withstand further taxation, whether it be termed as a user tax, charge, fee, or toll, it is also clear that additional fees on the inland system and new taxes in our ports are likely to be enacted. If the Congress elects to approve these additional taxes for inland waterway operators, a generous moratorium period should be authorized before escalation of the present inland waterway user tax. Coastal tug and barge operators deserve appropriate protection from unfair and discriminatory taxation by local interests for port projects from which the operators receive no benefit.

The barge and towing industry, and the merchant marine as a whole, is united and resolute in its opposition to the enactment of user taxes to recover the costs of Coast Guard-provided services. The establishment of Coast Guard user fees would require the U.S.-flag maritime industry to reimburse the Coast Guard for functions performed as a result of statutorily-mandated requirements enacted by the Congress. There is no doubt that these requirements were promulgated for the public good and do not constitute benefits conferred upon the industry. The record developed by the Congress over the past four years on this issue is clear—Coast Guard user taxes are simply a mechanism for a tax increase, and represent a gross injustice to an ailing industry of vital importance to our national defense and economy.

Furthermore, the barge and towing industry supports the retention of existing federal tax policies and programs which have had a positive impact on vessel owners and operators, and which have encouraged investment in modern and more efficient equipment. The industry considers accelerated cost recovery, the investment tax credit, and the Capital Construction Fund program as important incentives to the continued modernization of the tug and barge fleet which should be maintained.

Military Competition With The Barge And Towing Industry

The inland and coastal tug and barge industry has proved to be an important partner to American military forces stationed overseas in times of national emergency. additionally, when self-propelled ships generally engaged in domestic trades have been requisitioned or chartered by the government for overseas deployment, tugs and barges have quickly moved to effectively and efficiently fill the gap left in domestic service. Unfortunately, the important role played by tugs and barges in times of national emergency has not been widely recognized by national policymakers, despite many historical and contemporary examples.

Despite a solid record of achievement and reliability, the tug and barge industry continues to find an inexplicable reluctance by the military services to increase the use of commercial vessels for logistics support activities. For example, the Navy now operates over 80 large harbor tugs and has plans for constructing or acquiring 20 more. The Army maintains a fleet of 58 tugboats, and plans to replace this fleet with up to 40 modern vessels. The U.S. Air Force has a fleet of more than 70 self-propelled vessels, and is considering additional construction. The U.S. Coast Guard is seeking funding to recondition its buoy tender fleet as an interim measure to the construction of a new fleet of buoy tenders beginning in the 1990s. The costs of each of these construction and acquisition programs promises to be immense. With each of these military services, the commercial tug and towboat industry has expressed continued interest in performing the support functions now accomplished with military vessels and military personnel, and has pledged to do so at lesser cost.

Utilization of commercial assets would preclude the need for a substantial outlay of federal funds for the construction now contemplated. It would also save the military services in operating expenses over the life of the vessel. Moreover, the use of commercial tug services would release military personnel from assignment to essentially civilian or commercial type billets, and enhance the ability of the industry to respond to national emergencies. Lastly, the funds not expended on vessels performing civilian functions can be used instead for fighting ships and combatant vessels for which there is no commercial counterpart.

The barge and towing industry urges the Congressional Maritime Caucus to carefully consider the role which our industry can play in fulfilling the role of the U.S. merchant marine as the "fourth arm of national defense." We believe large tug construction programs by the military services are counterproductive to military/commercial coordination, and diminish our contribution to the defense effort. To that extent, we also perceive them to be at odds with federal maritime policy, at considerable expense.

Newport News Awarded $204.9-Million Navy Contract Modification

Newport News Shipbuilding and Dry Dock Company, Newport News, Va., was awarded a $204,953,148 modification to a previously awarded contract for the overhaul planning efforts for the USS Dwight D. Eisenhower (CVN-69). The value of the total contract is $276,620,000.

The work will be performed in Newport News, and is expected to be completed in April 1987.

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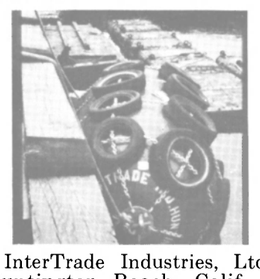
InterTrade Awarded Navy Contract For Fenders—Literature Offered



InterTrade Industries, Ltd. of Huntington Beach, Calif., and Washington, D.C. area, one of the world's largest suppliers of marine fenders, has been selected by the U.S. Navy to protect their ships and piers at the U.S. Naval Base in Norfolk, Va. The award, under contract No. N00189-85-C-0556, is for 100 six-foot-diameter by 12-foot-long Hi-Tec foam-filled marine fenders.

The InterTrade Industries' Hi-Tec foam-filled fender has an internal core of resilient closed-cell foam that is manufactured using the latest technology available, to provide the highest energy absorption upon impact of the berthing ship. Because of this feature, the manufacturer claims that the Hi-Tec marine fender is unsinkable even if severely damaged.

The outer skin of the fender is made from a specially formulated elastomer (Alphathane™) that is 15 times more abrasion resistant than steel. According to the manufacturer, Alphathane offers a combination of toughness and durability beyond the range of most rubbers and plastics today. The outer skin can be provided with or without nylon filament tire cord to assist the tough Alphathane in achieving even higher tensile strength and minimizing stresses.

The Hi-Tec marine fender uses an external chain and tire net that carries the attachments of the fender to the pier. This outer net reduces the stresses on the fender skin because it can take all of the tensile loads, thereby reducing loads on the fender.

For further literature containing full information,

Circle 16 on Reader Service Card

Honeywell Names Haugen Director Of Engineering

Honeywell has named **Dean P. Haugen** director of engineering for the company's Marine Systems Division. He will report to **J. Charles Preble,** vice president of operations for the Division.

Mr. **Haugen** will be responsible for the development and application of acoustic and underwater systems for Navy and commercial uses. Key technologies include digital signal processing, acoustic sensing, vessel dynamics and control, and advanced microelectronics.

Fisher Named Operations Vice President At Nicor

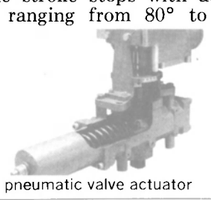
Nicor Inc. of Naperville, Ill., has announced the resignation of **Lawrence L. Forsell** as executive vice president.

Thomas L. Fisher, formerly group vice president-transportation and extractive, has become vice president-operations of Nicor. He will now have responsibility for all nonutility operations including oil and gas exploration and development and contract drilling, activities for which Mr. **Forsell** had previously been responsible.

Limitorque Introduces HR Series Line Of Pneumatic Valve Actuators —Literature Offered

A comprehensive line of pneumatic valve actuators to meet virtually any service condition required has been introduced by Limitorque Corporation. Complete details are contained in a new free brochure from the company.

Ranging in torque outputs from 70 to 250,000 inch-pounds, on supply pressures varying from 40 to 120 psi, the line features a new, slim profile design for easy installation, maintenance and all-cast-iron construction to meet harsh environmental service requirements. Standard features include built-in adjustable stroke stops with adjustments ranging from 80° to 100° travel, and double scotch yoke mechanisms for improved balance.



pneumatic valve actuator

A full range of optional controls such as manual override, limit switches, solenoid and pneumatic control valves, speed control valves, filters, lubricators and positioners—both 3-15 psi and 4-20 MA—are available to meet specialized operating conditions.

The new HR pneumatic actuator series standard units are inventoried by Limitorque and its stocking distributor network for shipment as of the first of this month.

Headquartered in Lynchburg, Va., Limitorque Corporation is an international manufacturer of valve actuators for industry-wide applications with manufacturing facilities, stocking distributors and sales/service centers nationwide and abroad.

For additional information and free technical literature,

Circle 15 on Reader Service Card

David W. Taylor Medal was presented by SNAME president **Perry W. Nelson** (left) to Dr. **J. Randolph Paulling Jr.**, professor of naval architecture at the University of California in Berkeley.

Thomas B. Crowley, chairman and president of Crowley Maritime Corporation in San Francisco, was presented the Vice Adm. "Jerry" Land Medal by Maryland congresswoman **Helen D. Bentley.**

The Blakely Smith Medal went to **John A. Mercier,** senior staff naval architect at Continental Oil Company in Houston. Presentation was made by **Kenneth E. Wilson Jr.** (left), chairman of the Awards Committee.

The 93rd SNAME Annual Meeting— A Special Report

At the recent 93rd Annual Meeting of The Society of Naval Architects and Marine Engineers, honors in the form of medals, prizes, and certificates were presented to a number of members and others during ceremonies at the New York Hilton Hotel. The four top awards, the Taylor, Land, and Blakely Medals and the Elmer A. Sperry Award were presented at the Annual Banquet, at which the principal speaker was **Walter F. Williams,** president and chief operating officer of Bethlehem Steel Corporation.

The Society's David W. Taylor Medal "for notable achievement in naval architecture and marine engineering" is given annually. The 1985 recipient, **J. Randolph Paulling Jr.,** professor of naval architecture at the University of California, holds degrees from the Massachusetts Institute of Technology and the University of California, and has been prominent on the faculty of the University of California, Berkeley, for 30 years. A Fellow of the Society, Dr. **Paulling** is a proficient researcher in marine structure analysis and a prolific author on that and related subjects.

Thomas B. Crowley, who received the annual Vice Adm. "Jerry" Land Medal "for outstanding accomplishment in the marine field," took the helm of Crowley Launch and Tugboat Company more than 35 years ago, and built the company from a local tug operation into the diverse and worldwide Crowley Maritime of today. He is an ardent supporter of the U.S. merchant marine, and has been active in a number of organizations in support of that goal.

The Blakely Smith Medal is awarded biennially "for outstanding accomplishment in ocean engineering." It was given to **John A. Mercier,** a key figure in the development and placement in the North Sea of Conoco's Tension Leg Platform (TLP), a gigantic engineering achievement that makes oil and gas production practical from waters deeper than ever before.

The Elmer A. Sperry Award for 1985 was given to **George H. Plude, Carleton E. Tripp,** and **Richard K. Quinn** for design concepts and construction methods of the Stewart J. Cort, the first 1,000-foot, self-unloading Great Lakes bulk carrier.

At the President's Luncheon held the day before the Banquet, the following awards were presented:

The Capt. Joseph H. Linnard Prize for 1985 was awarded to **Robert X. Caldwell, Maurice Gordon,** and **Dwight K. Koops** for their paper, "Two State-of-the-Art Specialty Products Ships: Design, Construction, and operation." This prize goes to the author or authors of the best paper contributed to the Transactions of the Society at its Annual Meeting of the preceding year.

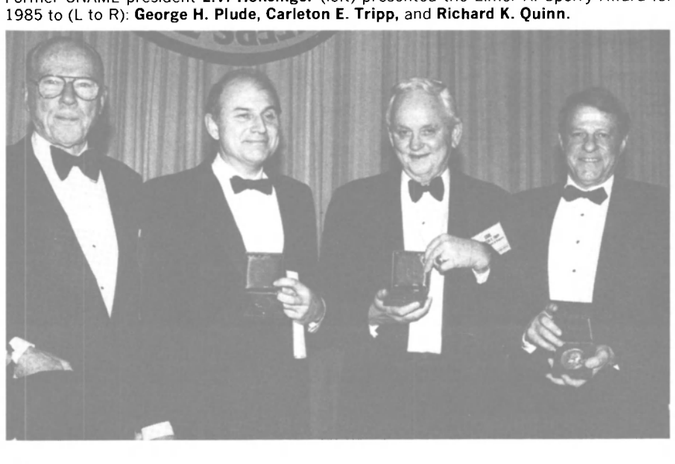
The best paper delivered before one of the SNAME Sections gets the Vice Adm. E.L. Cochrane Award. The 1985 prize went to **Richard W. Harkins** and **Michael G. Parsons** for their paper, "Investigation of Fuel Injection System Cavitation Problems," delivered at the Great Lakes/Great Rivers Section in October 1984.

The Graduate Paper Honor Prize for 1985 was presented to **Vassilios E. Theodoracatos** for his paper, "An Experimental Study of Elastohydrodynamics of Towed Flexible Cylinders Aided by Video Image Processing."

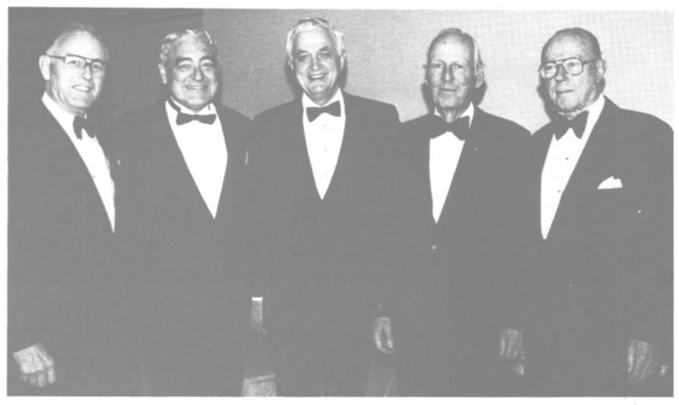
The Graduate Paper Award for 1985 was given to **Charles H. Goddard** and **Udo H. Rowley** for their paper, "Implementation of a Computer-Supported Naval Ship Design System at MIT," delivered at the New England Section in January 1985.

George A. Kriezis received the Undergraduate Paper Award for his 1985 paper, "A Computer Code for

Former SNAME president **L.V. Honsinger** (left) presented the Elmer A. Sperry Award for 1985 to (L to R): **George H. Plude, Carleton E. Tripp,** and **Richard K. Quinn.**



Current SNAME president **Perry W. Nelson** (center) is flanked by some former presidents (from left) **Robert T. Young, C. Larry French,** Rear Adm. **Albert G. Mumma,** USN (Ret), and Rear Adm. **L.V. Honsinger,** USN (Ret).



SNAME president **Perry W. Nelson,** president of M. Rosenblatt & Son, presented his annual address at the President's Luncheon. At left is **Jack A. Obermeyer** of Texaco, chairman of the Papers Committee.

the Prediction of Response Characteristics of a Marine Riser at Right Angles to a Uniform Stream," delivered at the MIT Student Section in November 1984.

Certificates of Appreciation were awarded to **Karl L. Kirkman, Richard C. McCurdy, Olin J. Stephens II,** and **Daniel D. Strohmeier** "for their outstanding contribution to the profession and to yachting safety as directors of the project on Safety from Capsizing." At the same ceremony, the Society's immediate past president, **C. Larry French,** received a Presidential Certificate of Appreciation.

Finally, eight Golden Award 50-Year Membership Certificate recipients were named, and those present received their certificates in person. The awardees, present and in absentia, were **William J. Dorman, R.P. DuMont, Murdock M. Earle, Marvin H. Gluntz, George H. Hodges, James W. Kirkman, Peter J. Riley,** and **William H. Watkins.**

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American United Marine Corp., 5 Broadway, Rte. 1, Saugus, MA 01906
ASEA, Inc., 4 New King St., White Plains, NY 10604
Bailey Controls, 29801 Euclid Avenue, Wickliffe, OH 44092
Barringer Research, 304 Carlingview Dr., Rexdale, Ontario, Canada M9W 5G2
Biospherics Inc., 4928 Wyaconda Rd., Rockville, MD 20852
Cooper Energy Services, Mount Vernon, OH 43050
Ergon, Inc., P.O. Drawer 1639, Jackson, MS 39205
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
Pandel Instruments Inc., 2100 N. Hwy. 360, Grand Praire, TX 75050
Propulsion Systems, Inc., 21213 76 Ave., Kent, WA 98032
Teleflex Inc., 771 First Ave., King of Prussia, PA 19406
Thomas Products Ltd., Flow Switch Div., 987 West St., Southington, CT 06489 1023
Transamerica Delaval, Inc., Gems Sensors Division, Cowles Road, Plainville, CT 06062
Valmet Automation A.S., P.O. Box 130, N-3430, Spikkestad, Norway

CRANES—HOISTS—DERRICKS—WHIRLEYS
Allied Marine Crane, P.O. Box 23026, Portland, OR 97233
Appleton Marine, P.O. Box 2339, Appleton, WI 54913
ASEA Hagglunds Inc., P.O. Box 7949, The Woodlands TX 77380
Davit Sales, Inc., P.O. Box 232, Jefferson Valley, NY 10535
HIAB Cranes & Loaders Inc., 258 Quigley Boulevard, New Castle, DE 19720
Marine Travelift, Inc., 49 E. Yew St., Sturgeon Bay, WI 54235
J.D. Neuhaus, Hebezeuge, D5810, Witten Heven, West Germany
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Cunningham Marine Hydraulics Co. Inc., 2030 E. Adams St. Jacksonville, FL 32202

DECK MACHINERY—Cargo Handling Equipment
Markey Machinery Co., Inc., 79 S. Horton St., Seattle, WA 98134
McElroy Machine & Mfg. Co., Inc., Lorraine Rd., Industrial Seaway, Gulfport, MS 39501
Schoellhorn Albrecht, Div. of St. Louis Ship, 3460 So. Broadway, St. Louis, MO 63118

DECKING—GRATING
Alligned Fiber Composites, Highway 52, South Chatfield, MN 55923
International Grating, 7625 Parkhurst, Houston, TX 77028
Selby, Battersby & Company, 5220 Whiby Ave., Philadelphia, PA 19143

DIESEL ACCESSORIES—CYLINDER LINERS
Colt Industries Inc. Fairbanks Morse Engine Div. 701 Lawton Ave., Beloit, WI 53511
General Thermodynamics Corporation, 210 South Meadow Road, P.O. Box 1105, Plymouth, MA 02360
Haynes Corporation, P.O. Box 179, Jackson, MI 49204
Illman Jones, 1111 Green Island Rd., American Canyon, CA 94589
Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637
Transamerica Delaval Engine & Comp. Div., 550 85th, Oakland, CA

DIESEL ENGINE—Spare Parts & Repair
Alban Engine Power, Inc., 6455 Washington Blvd., Baltimore, MD 21227
Alco Power Inc., 100 Orchard St., Auburn, N.Y. 13021
Caterpiller Tractor Co. 100 N.E. Adams Street, Peoria, IL 61629-2325
Colt Industries Inc. Fairbanks Morse Engine Div. 701 Lawton Ave., Beloit, WI 53511
Cummins Engine Co., Inc., Mail Code 40642, Box 3005 Columbus, IN 47202 3005
Goltens, 160 Van Brunt Street, Brooklyn, NY 11231
Granges Repair Service GMBH, Gutenbergring, 64 D-2000 Hamburg-Norderstedt TX:0215553
Schoonmaker Service Parts Co., Inc., P.O. Box 757, Foot of Spring St., Sausalito, CA 94966
Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637
Sulzer Brothers Inc., 200 Park Ave., New York, N.Y. 10166
Transamerica Delaval Engine & Comp. Div., 550 85th, Oakland, CA
Volvo Penta of America, P.O. Box 927, Rockleigh, NJ 07647

ELECTRICAL EQUIPMENT
Midland-Ross Corp., Russellstoll Division, 530 W. Mt. Pleasant Ave., Livingston, NJ 07039
Newmar, P.O. Box 1306, Newport Beach, CA 92663
Sigmaform Corporation, P.O. Box 515, Richboro, PA 18954
Stewart & Stevenson Services, Inc.—MWM, P.O. Box 1637, Houston, TX 77251-1637
Ward Leonard Electric Co., 31 South St., Mt. Vernon, NY 10550
Zidell Explorations, Inc., 3121 S.W. Moody St., Portland, OR 97201

ELECTRONIC SYSTEMS
Marine Electric RPD, Inc., 666 Pacific St., Brooklyn, NY 11217 TX: 125327

EMULSIFICATION SYSTEMS
Cleanodan A/S, N. American Agents, American United Marine Corp., 5 Broadway, Route 1, Saugus, MA 01906
Sunbelt Energy Systems, Inc., Park Square, 2105 Park Ave., Suite 14, Orange Park, FL 32073
S/S Research & Development Inc., 1050 State St., Perth Amboy, NJ 08862
Todd Marine Systems, 61 Taylor Reed Place, Stamford, CT 06906

ENGINE TEST EQUIPMENT
General Thermodynamics Corp., P.O. Box 1105, 210 S. Meadow Road, Plymouth, MA 02360

EQUIPMENT—Marine
American General/Levin Corp., 445 Littlefield Ave., So. San Francisco, CA 94083
ASEA Hagglunds Inc., P.O. Box 7949, The Woodlands TX 77380
Band-It Division, Houdaille Industries, Inc., P.O. Box 16307, Denver, CO 80216
Beaver Tool Co., 1525 SE 29th St., Box 94717, Oklahoma City, OK 73143
Boston Metals Co., 313 E. Baltimore St., Baltimore, MD 21202
Thomas Coudon Associates, 6655 Amberton Dr., Baltimore, MD 21227
Genstar Stone Products Co., Executive Plaza IV, Hunt Valley, MD 21031
Kearfott Marine Products, 550 South Fulton Ave., Mount Vernon, NY 10550
Maritime Power Corp., 200 Henderson Street, Jersey City, NJ 07302
Nicolai Joffe, P.O. Box 5362, 9171 Wilshire Blvd., Beverly Hills, CA 90210
Raytheon Service Co., 100 Roesler Rd., Suite 103, Glen Burnie, MD
Republic-Lagun Machine Tool Co., 1000 E. Carson St., Carson, CA 90749
Waterman Supply Co., Inc., 2815 E. Anaheim Street, P.O. Box 596, Wilmington, CA 90748

EVAPORATORS
Alfa-Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024
Aqua-Chem Inc., P.O. Box 421, Milwaukee, WI 53201
Atlas-Danmark Marine & Offshore, Baltorpvej 154, KD-2750 Bllerup, Copenhagen DENMARK
Meco (Mechanical Equipment Co., Inc.), 861 Carondelet Street, New Orleans, LA 70130
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130

FANS—VENTILATORS—BLOWERS
American United Marine Corp., 5 Broadway, Rte. 1, Saugus, MA 01906
Joy Manufacturing Company, 338 So. Broadway, New Philadelphia, OH 44663
Jon M. Liss Associates, Inc., 411 Borel Ave., P. O. Box 5554, San Mateo, CA 94402

FASTENERS
Hardware Specialty Co., Ships Division, 48-75 36th St., Long Island City, NY 11101
Sales Systems Limited,7006, 700 Florida Ave., Portsmouth, VA 23707

FENDERING SYSTEMS—Dock & Vessel
InterTrade Industries, 15301 Transistor Lane, Huntington Beach, CA 92649
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062
Seaward International, Inc., 6269 Leesburg Ave., Falls Church, VA 22044

FILTERS
Dahl Manufacturing, Inc., 2521 Railroad Ave., Ceres, CA 95307
Parker Filter Division, 16810 Fulton County Road, #2, Metamora, OH 43530

FINANCING—Leasing
Gulf Western Leasing Corp., 1500 City West Blvd., Suite 300, Houston, TX 77047
JMJ Marine Investors, P.O. Box 51509, New Orleans, LA 70151

FIRE PROTECTION, DETECTION & ALARM SYSTEMS
Walter Kidde, Walter Kidde Dr., Wake Forest, NC 27586

FUEL OIL/ADDITIVES—Analysis & Combustion Testing
Ferrous Corporation, 910-108th N.E., P.O. Box 1764, Bellevue, WA 98009
McTigue Industries Inc., 1615 9th Ave., Bohemia, NY 11716

FURNITURE
Bailey, Carpenter & Insulation Co., 2323 Randolph Avenue, Avenel, NJ 07001
Comfort-Mate, Inc., 7988 NW 56th Street, Miami, FL 33166

GALLEY EQUIPMENT
Insinger Machine Co., 6245 State Rd., Philadelphia, PA 19135

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

HATCH & DECK COVERS—Chain Pipe
MacGregor-Navire Internatinal, Box 8991, S-402 74 Goteborg, Sweden
MacGregor Navire U.S.A. Inc., 135 Dermody St., Cranford, NJ 07016
Mock Manufacturing Inc., 777 Rutland Rd., Brooklyn, NY 11203

GAUGES
Oil Recovery Systems, Inc., 1420 Providence Hwy., Norwood, MA 02062

HEAT EXCHANGERS
Alfa-Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024
Industrial Engineering & Equipment Co., 425 Hanley Industrial Ct., St. Louis, MO 63144
Meco (Mechanical Equipment Co., Inc.), 861 Carondelet Street, New Orleans, LA 70130
Riley-Beaird, P.O. Box 31115, Shreveport, LA 71130

HOLD LINERS
Himont U.S.A., Inc., 1313 N. Market St., Wilmington, DE 19894

HULL CLEANING
Aurand 1270 Ellis Street, 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
Petroferm Marine, Route 2, Box 280, Amelia Island, FL 32034
Phosmarine Equipment, 21 Bd. de Paris, 13002, Marseille, France
Seaward Marine Service, Inc., 201 N. Union Street, Alexandria, VA 22314
Seaward Marine Service, Inc. 5409 Beamon Rd., Norfolk, VA 23513 TX: 710-881-1182
Seaward Marine Service, Inc. 424 West 8th Street, National City, CA 92050
Taylor Diving & Salvage Co. Inc., 701 Engineers Rd., Belle Chasse, LA 70037

HYDRAULICS
Aeroquip Corp., 1130 Maynard Road, Jackson, MI 49202
Bardex Hydranautics, 6338 Lindmar Dr., P.O. Box 1068, Goleta, CA. 93116
Cunningham Marine Hydraulics Co., Inc., 201 Harrison St., Hoboken, NJ 07030; 2030 E. Adams St., Jacksonville, FL 32204, TX: 710-730-5224
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Del Gavio Marine Hydraulics Inc., 207 W. Central Ave., Maywood, NJ 07607
Hydra-Dynamics, Inc., 2141 Greenwood Ave., Wilmette, IL 60091
Parker Hannifin Corporation, 17325 Euclid Avenue, Cleveland, OH 44112
Titeflex Corporation, P.O. Box 54, Springfield, MA 01109
Washington Chain & Supply, Inc., P.O. Box 3646, Seattle, WA 98124

INERT GAS—Generators—Systems
Maritime Protection A/S, N. American Agents, American United Marine Corp., 5 Broadway, Rte. 1, Saugus, MA 01906

INSULATION—Cloth, Fiberglass
Bailey, Carpenter & Insulation Co., 2323 Randolph Avenue, Avenel, NJ 07001
Duracote Corp., 350 North Diamond St., Ravenna, Ohio 44266
Superior Energies, Inc. P.O. Drawer 386, Groves, TX 72619

INSURANCE
Adams & Porter, 510 Bering Dr., Houston, TX 77057-1408
Adams & Porter, 1 World Trade Center, Suite 8433, New York, NY 10048
Wm. Keith Hargrove, Inc., 1300 Post Oak Blvd., Suite 2050, Houston, TX 77056
United States P&I Agency, Inc., 80 Maiden Lane, New York, NY 10038

JOINER—Watertight Doors—Paneling
Advanced Structures Corp., 235 W. Industry Ct., Deer Park, NY 11729
Astech, 3030 S. Red Hill Ave., Santa Ana, CA 92711
Bailey Distributors, Inc., 2323 Randolph Avenue, Avenel, NJ 07001
Masonite Commercial Division, Dover, OH 44622
Walz & Krenzer, Inc., 400 Trabold Road, Rochester, NY 14624

KEEL COOLERS
R.W. Fernstrum & Co., 1716 Eleventh Ave., Menominee, MI 49858
Johnson Rubber Co., Duramax Marine Div., 16025 Johnson St., Middlefield, OH 44062

LIGHTING EQUIPMENT—Lamps, Fixtures, Searchlights
Carlisle & Finch, 4562 W. Mitchell Avenue, Cincinnati, OH 45232
Midland-Ross Corp., Russellstoll Division, 530 W. Mt. Pleasant Ave., Livingston, NJ 07039
Perko Inc., P.O. Box 6400D, Miami, FL 33164
Phoenix Products Company, Inc., 4769 North 27th Street, Milwaukee, WI 53209

LINE BLINDS
American Piping Products Inc., Box 1056, New Hyde Park, NY 11040
Stacey/Fetterolf Corp., P.O. Box 103, Skippack, PA 19474

MACHINERY MAINTENANCE, REPAIR, OVERHAUL, AND TESTING
A-C Brake Co., 308 E. College St., Louisville, KY
CMH Heleshaw, Inc., 201 Harrison St. Hoboken N.J. 07030
Cunningham Marine Hydraulics Co. Inc., 2030 E. Adams St. Jacksonville, FL 32202

Del Gavio, 207 W. Central Ave., Maywood, NJ 07607. Telex: 132610 DEL-MARINE
Jered Brown Brothers Inc., 1300 Coolidge, P.O. Box 2006, Troy, MI 48007
American General/Levin Corp., 445 Littlefield Ave., So. San Francisco, CA 94080
Goltens, 160 Van Brunt St., Brooklyn, NY 11231
Rosan, Inc., 2901 West Coast Hwy., Newport Beach, CA 92663

MINING
Rocky Mountain Energy, 10 Longspeake Dr., Box 2000, Broomfield, CO 80020

NAME PLATES—BRONZE—ALUMINUM
Duramax Metals, Inc., 2401 Wesley Street, Portsmouth, VA 23707

NAVAL ARCHITECTS, MARINE ENGINEERS, SURVEYORS
Aero Nav Laboratories, Inc., 14-29 112 St., College Point, NY 11356
American Hydromath Inc., Box 2450, Danby-Pawlet Road, Pawlet, VT 05761
American Systems Engineering Corp., P.O. Box 4265, Virginia Beach, VA 23454
Ameritech Corporation, 7 Belver Avenue, Suite 215, N. Kingston, RI 02852
Amirikian Engineering Co., Chevy Chase Center Bldg., Suite 505, 35 Wisconsin Circle, Chevy Chase, MD 20015
Art Anderson Associates, 148 First St., Bremerton, WA 98310
B.C. Research, 3650 Wesbrook Mall, Vancouver, B.C. Canada V6S 2L2
Del Breit Inc., 326 Picayune Place (Suite 201), New Orleans, LA 70130
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
Century Engineering, inc., 32 West Rd., Towson, MD 21204
Childs Engineering Corp., Box 333, Medfield, MA 02052
Crandall Dry Dock Engrs., Inc., 21 Pottery Lane, Dedham, MA 02026
Crane Consultants Inc., 15301 1st Ave., So. Seattle, WA 98148
C.R. Cushing, 18 Vesey St., New York, NY 10007
Design Associates Inc., 14360 Chef Menteur 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
Encon Management & Engineering Consultant Services, P.O. Box 7760, Beaumont, TX 77706
Capt. R.J. Fearson & Associates, P.O. Box 983, Tampa, FL 33601
Christopher J. Foster, Inc., 16 Sintsink Drive East, Port Washington, NY 11050
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 Guralnick 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., 40 Exchange Place, New York, NY 10005
Hi-Test Laboratories, Inc., P.O. Box 226, Buckingham C.H., VA 23921
HydroComp, Inc., 10 Cutts Road, P.O. Box 865, Durham, NH 03824
Intramarine, Inc., P.O. Box 53043, Jacksonville, FL 32201
R.D. Jacobs & Associates, 11405 Main St., Roscoe, IL 61073
Jantzen Engineering Co., 6655-H Amberton Drive, Baltimore, MD 21227
James S. Krogen & Co., Inc., 3333 Rice St., Miami, FL 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, NY 10048
McLear & Harris, Inc., 28 West 44 Street, New York, NY 10036
Fendall Marbury, 1933 Lincoln Drive, Annapolis, MD 21401
Marine Consultants & Designers, Inc., 308 Investment Insurance Bldg., Corner E. 6th St. & Rockwell Ave., Cleveland, OH 44114
Marine Design Inc., 401 Broad Hollow Road, Rte. 110, Melville, NY 11746
Marine Power Associates, 1010 Turquois St., Ste 217, San Diego, CA 92109
Marine Technical Associates, Inc., 95 River Rd., Hoboken, NJ 07030
Maritime Design, Inc., 2955 Hartley Rd., Jacksonville, FL 32217
George E. Meese, 194 Acton Rd., Annapolis, MD 21403
R. Carter Morrell, 715 S. Cherokee, Bartlesville, OK 74003
NKF Engineering Assoc., Inc., 8150 Leesburg Pile, Vienna, VA 22202
Nelson & Associates, Inc., 610 Northwest 183rd St., Miami, FL 33169
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, FL 33156
S.L. Petchul, Inc., 1380 S.W. 57th Avenue, Fort Lauderdale, FL 33317
Q.E.D. Systems Inc., 4646 Witchduck Rd., Virginia Beach, VA 23455
M. Rosenblatt & Son, Inc., 350 Broadway, New York, NY 10013 and 667 Mission St., San Francisco, CA 94105
Sargent & Herkes Inc., 611 Gravier St., New Orleans, LA 70130
Schmahl and Schmahl, Inc., 1209 S.E. Third Ave., Fort Lauderdale, FL 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 Systems, Inc., 28 Main St., Essex Ct. 06426; 17 Battery Place, N.Y. N.Y. 10004, P.O. Box 205, Solomons, MD 20688
Seaworthy Electrical Systems, 17 Battery Pl. N.Y. N.Y. 10004
George G. Sharp, Inc., 100 Church St., New York, NY 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
Thomas Coudon Associates, 6655 Amberton Drive, Baltimore, MD 21227
Timsco, 622 Azalea Road, Mobile, AL 36609
Tracor Hydronautics, Inc., 7210 Pindell School Rd., Laurel, MD 20707
Thomas B. Wilson, Associates, 1258 North Avalon Blvd., Wilmington, CA 90744

NAVIGATION & COMMUNICATIONS EQUIPMENT
Atkinson Dynamics, Section 6, 10 West Orange Ave., South San Francisco, CA 94080
British Telecom International, The Holborn Centre, 120 Holborn, London EC1N 2TE
CMC Communications Inc., 5479 Jetport Industrial Blvd., Tampa, FL 33614
COMSAT World Systems, 950 L'Enfant Plaza, S.W., Suite 6151 Washington, DC 20024
A/S Elektrisk Bureau, P.O. Box 98, N-1360 Nesbru, Norway
Furuno U.S.A., 271 Harbor Way, S. San Francisco, CA 94080
General Electric Company, Mobile Communications Division, Lynchburg, VA 24502
Harris Communications (RF Communications), 1680 University Avenue, Rochester, NY 14610
Henschel, 9 Hoyt Drive, Newburyport, MA 01950
Hose McCann Telephone Company, Inc., 9 Smith Street, Englewood, NJ 07631
ITT Mackay, 441 U.S. Highway #1, Elizabeth, NJ 07202
Kongsberg North America Inc., 400 Oser Ave., Hauppauge, NY 11738
Kongsberg Vopenfabrikk, Norcontrol Division, P.O. Box 145, Horten 3191, Norway
Krupp Atlas-Elektronik, 1453 Pinewood St., Rahway, NJ 07065
Micrologic, 20801 Dearborn, Chatsworth, CA 91311
Nav-Com, Inc., 9 Brandywine Drive, Deer Park, NY 11729
Navigation Sciences Inc., 6900 Wisconsin Ave., Bethesda, MD 20815 TX: 705999
Perko Inc. (Lights), P.O. Box 6400D, Miami, FL 33164
Racal Marine Inc., 1 Commerce Blvd., Palm Coast, FL 32037-0029
Radio-Holland USA, Inc., 6033 South Loop East, Houston, TX 77033
Raytheon Marine Co., 676 Island Pond Road, Manchester, NH 03103
Raytheon Ocean Systems Company, Westminster Park, Risho Avenue, East Providence, RI 02914
Raytheon Service Co., 103 Roesler Rd., Glen Burnie, MD 21061
Robertson Autopilot, 400 Oser Ave., Happauge, NY 11738
S.P. Radio A/S, DK 9200 Aalorg, Denmark
Sait, Inc., 33 Rector St., New York, NY 10006
Sperry Corporation, Rte 29 North, Charlottesville, VA 22906
Standard Communications, P.O. Box 92151, Los Angeles, CA 90009
Telesystems, 2700 Prosperity Ave., Fairfax, VA 22031 USA
Texas Instruments, Inc., P.O. Box 405, 3438, Lewisville, TX 75067
Tracor Instruments Austin Inc., 6500 Tracor Lane, Austin, TX 78725

OILS—Marine—Additives
B.P North America Petroleum, 555 US Route 1, So. Iselin, NJ 08830
Exxon Company, U.S.A., Room 2323 AH, P.O. Box 2180, Houston, TX 77701
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
Texaco, Inc. (International Marine), 135 East 42nd St., New York, NY 10017

OILY WATER ALARMS/MONITORS
Biospherics, Inc., 4928 Wyaconda Road, Rockville, MD 20852

OIL/WATER SEPARATORS
Alfa Laval, Inc., Dept. MR-2, 2115 Linwood Ave., Fort Lee, NJ 07024
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
Hyde Products, Inc., 810 Sharon Dr., Westlake, OH 44148
NALCO Chemical, Co., 2901 Butterfield Road, Oak Brook, IL 60521
Oil Recovery Systems, Inc., 1420 Providence Hwy., Norwood, MA 02062
Peck Purifier Sales Co., 3724 Cook Blvd., Chesapeake, VA 23323
Sigma Treatment System, Merry Meadows RD 1 Box 70, Chester Springs, Pa 19425

PAINTS—COATINGS—CORROSION CONTROL
Ameron, 4700 Ramona Blvd., Monterey Park, CA 91754
Dampney Company, Inc., 85 Paris St., Everett, MA 02149
Devoe 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
DuPont Co. MPS , Room X40750, Wilmington, DE 19898
Esgard, Box 2698, Lafayette, LA 70502
Farboil Company, 8200 Fischer Rd., Baltimore, MD 21222
Hempel Marine Paints, Inc., Foot of Currie Ave., Wallington, NJ 07057; 6868 NorthLoop East, Suite 304, Houston, TX 77028; P.O. Box 10265, New Orleans, LA 70181
International Paint Company, Inc., 2270 Morris Avenue, Union, NJ 07083
Jaegle Paint Company, Inc., 1012 Darby Road, Havertown, PA 19083
Jotun Marine Coatings Inc., 175 Penrod Court N&O, Glen Burnie, MD 21061
Magnus Maritec International Inc., 150 Roosevelt Pl., P.O. Box 150, Palisades Park, NJ 07650
Products Research & Chemical Corp., 5454 San Fernando Rd., Glendale, CA 91203
Selby Battersby & Co., 5220 Whitby Ave., Philadelphia, PA 19143

PIPE-HOSE—Cargo Transfer Clamps, Couplings, Coatings
Amermarine International, P.O. Box 9205, Dundalk, MD 21222
Deutsch Metal Components, 14800 S. Figueroa St., Gardena, CA 90248
Hydro-Craft Inc., 1821 Rochester Industrial Dr., Rochester, MI 48063
Knights Piping Inc., 5309 Industrial Road, Pascagoula, MS 39567
Tioga Pipe Supply Co. Inc., 2450 Wheotsheaf La., P.O. Box 5997, Philadelphia, PA 19137

PLASTICS—Marine Applications
Action Threaded Products, Bridgeview, IL 60455
Hubeva Marine Plastic, Inc., 390 Hamilton Ave., Brooklyn, NY 11231
Norton Chemplast, 309-150 Dey Rd. Wayne NJ 07470

PROPELLER POLISHING
Pacific Marine Services, P.O. Box 3400, Terminal Island, CA 90731

PROPULSION EQUIPMENT—Bowthrusters, Diesel Engines, Gears, Propellers, Shafts, Turbines
Allison Gas Turbine Division, General Motors Corp., P.O. Box 420 Speed code U6, Indianapolis, IN 46206
Amarillo Gear Co., P.O. Box 1789, Amarillo, Texas 79105
Armco Steel/Advanced Materials Div., 703 Curtis St., Middletown, OH 45043
Avondale Shipyards, Inc., P.O. Box 52080, New Orleans, LA 70150
Bergen Diesel Inc., 2110-10 Service Rd., Kenner, LA 70062
Boston Metals Co., 313 E. Baltimore St., Baltimore, MD 21202
Burmeister & Wain Alpha Diesel AS, DK-1400 Copenhagen K, Denmark
Caterpillar Engine Division, 100 N.E. Adams, Peoria, IL 61629
Colt 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, CT 06095
Coolidge-Stone Vickers, Inc., 56 Squirrel Rd., Auburn Hills, MI 48057
Deutz Corp., 7585 Ponce de Leon Circle, Atlanta, GA 30340
Elliott Company, 1809 Sheridan Ave., Springfield, OH 45505
George Engine Company, Inc., Lafayette, LA
General Motors, Electro-Motive Division, LaGrange, IL 60525
Golten Marine Co., Inc., 160 Van Brunt St., Brooklyn, NY 11231
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
Lips Propellers, 3617 Koppens Way, Chesapeake, VA 23323
M.A.N.-B&W Diesel, 2 Ostervej, DK-4960 Holeby, 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
Michigan Wheel, 1501 Buchanan Ave., S.W., Grand Rapids, MI 49507
Mitsubishi Kakoki Kaisha LTD, Mita Kokusai Bldg. 4-28 Mita 1-chome, Minato-ku Tokyo 108 Japan
National Marine Service Louisiana, Inc., 222 Bayou Rd., Belle Chasse, LA 70037
North American Marine Jet P.O Box 1232 Benton, AR 72015
Omnithruster Inc., 9515 Sorensen Ave., Santa Fe Springs, CA 90670
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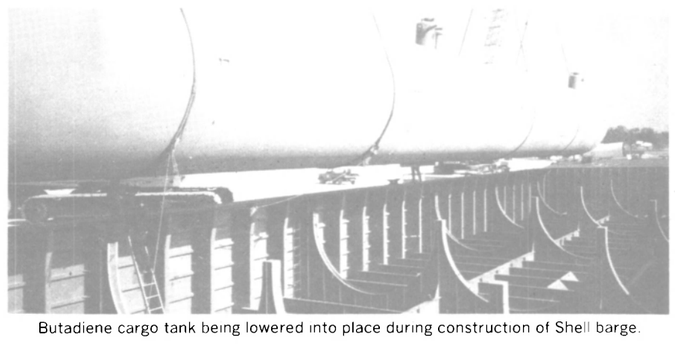


Butadiene cargo tank being lowered into place during construction of Shell barge.

Port Allen Marine Delivers Butadiene Tank Barge To Shell

Port Allen Marine Services (PAMS), a subsidiary of Midland Affiliated Company, recently delivered the first of two butadiene tank barges to Shell Oil Company. The second barge is scheduled for delivery one month after the first. These barges have an overall length of 205 feet, beam of 52.5 feet, and depth of 12.5 feet, and will be consistent with the current rules and regulations of the U.S. Coast Guard.

The unmanned, independent pressure tank barges are completely equipped with the tanks, piping, and auxiliaries required to carry inhibited butadiene (specific gravity of 0.638 at 40 F). Each barge is fitted with three independent pressure vessels supported by six saddles in one compartment within a single skin. The cargo tank compartment, covered by a structural steel trunk deck, features a closed-type cargo-handling system with pressure-type discharging and vapor recovery.

With modern, efficient facilities on the Gulf Intracoastal Waterway and in the Port of Baton Rouge, PAMS is one of the most diverse shipyards on the Lower Mississippi. A convenient location at milepost 5.7 on the Port Allen-Morgan City Cutoff allows PAMS to take on many projects at any one time. The shipyard provides barge construction, repair, sandblasting, painting, tank coating, cleaning, and drydocking. Boats, barges, offshore drilling structures, and quarters houses can all be constructed at the modern fabrication facility. Modern equipment includes a hydraulic press brake, robot-operated stiffiner, fitting and welding machines, a one-side butt welder, and an automatic structural cutting saw. The yard has many years of experience building barges for the largest fleet on the inland waterways.

PAMS' cleaning plant can handle as many as 100 barges a month. Liquid and dry bulk shippers rely on the company's cleaning services because of its competence, speed, and compliance with all environmental regulations. PAMS has specialized in the gas-freeing and cleaning of barges for more than 20 years.

Five drydocks, ranging from 500 to 2,500 tons, accommodate all major and minor repairs of barges, towboats, tugs, supply boats, and drilling rigs. A large inventory of structurals, plates, piping, valves, fittings, and other replacement parts, combined with the PAMS skilled work force, eliminate costly delays and get a vessel back in the water quickly.

Shown at launching of first Shell tank barge are (L to R): **Walter W. Rody,** president of Port Allen Marine; **Mrs. Lou Sternat,** sponsor; and **Lou Sternat,** Shell Engineer Products.

The same high standards of quality that characterize other PAMS operations apply to the machine shop. This fully equipped facility can produce the close-tolerance machined parts required by the marine and petrochemcial industries, as well as others.

The river repair facility, located at milepost 225 on the Lower Mississippi, offers immediate 24-hour midstream and topside repairs to ships in Baton Rouge Harbor. The river plant also provides service alongside its 600-foot dock and 1,500-ton drydock.

Circle 29 on Reader Service Card

Bailey Controls Offers 5-Day Maintenance/ Repair Seminar

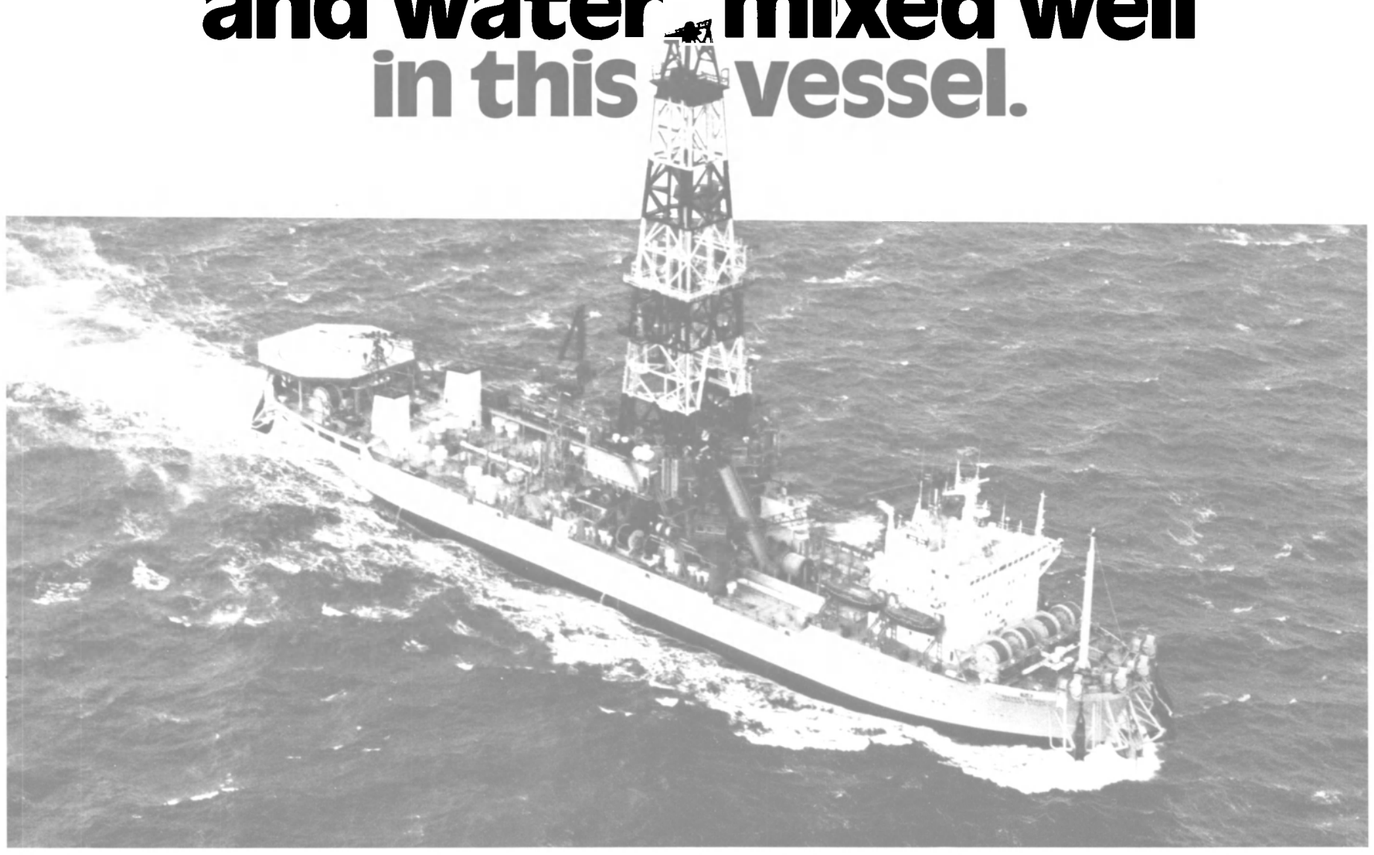
Pneumatic instrument maintenance and repair methods is the topic of a five-day seminar to be conducted by Bailey Controls from January 20 through January 24, 1986, at the Embassy Suites, 1440 East Imperial Avenue, El Segundo, Calif. A tuition fee of $900, payable in advance to Bailey Controls, will cover the cost of the seminar and necessary materials.

The course covers basic maintenance, installation, calibration and repair of pneumatic transmitters, controllers, control valves, positioners, control stations and indicators. Loop and tuning procedures will be reviewed, as well as fault isolation procedures. Significant lab time provides hands on experience to reinforce classroom activities.

The seminar should be of special interest to instrument mechanics and technicians, maintenance supervisors and control operators.

For a registration form or more information, write E.G. Bailey Training Center, 2882 Cricket Lane, Willoughby Hills, Ohio 44092, or call (216) 943-5533, outside Ohio toll free 1-800-447-0111.

Our experience with oil and water mixed well in this vessel.



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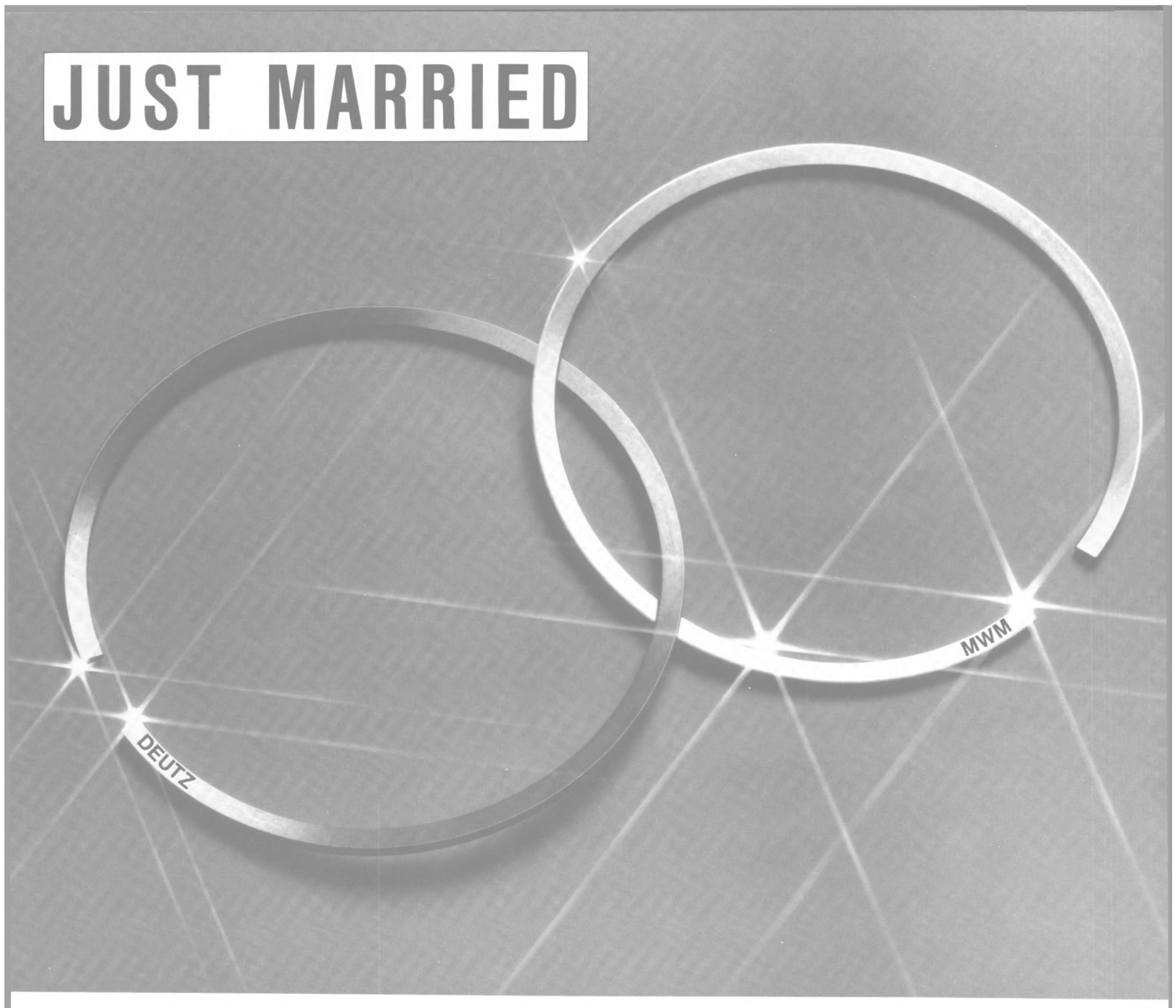

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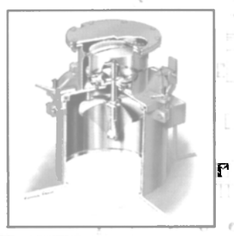
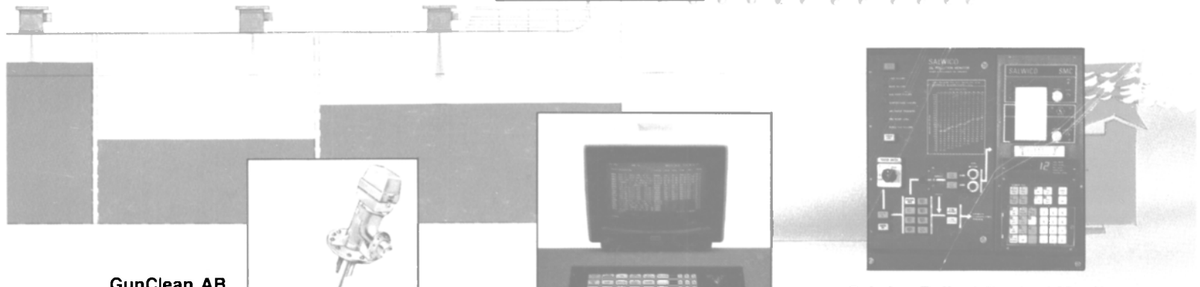
Microwave technology makes SAAB TankRadar level gauging the ultimate gauge for every cargo control system (restricted and closed). Since the unit never physically touches the cargo, maintenance and downtime is kept to minimum. Intrinsically safe and accurate to within ± 3mm, SAAB TankRadar offers precision that is hard to surpass.





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