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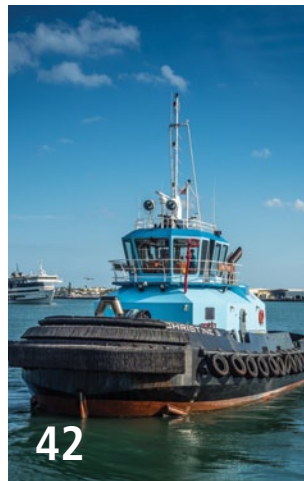
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# AMERICAN TUGBOAT REVIEW

Annual 2017  
Issue #214



Cover: Seabulk Towing is building three Rotortug vessels based on plans from Robert Allan Ltd. *Trident*, the lead tug in the class, shows off in the Port Everglades turning basin. Photo by Brian Gauvin.

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# AMERICAN TUGBOAT REVIEW

2017

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## Customer Service

1-866-918-6972

professionalmariner@pcspublink.com

## Editorial

editors@professionalmariner.com

Editor Casey Conley

Art Director Kim Goulet Norton

Copy Editor Kate Murray

Gulf Coast Photographer/

Correspondent Brian Gauvin

West Coast Photographer/

Correspondent Alan Haig-Brown

Founding Editor Gregory Walsh

## Advertising

advertising@professionalmariner.com

West Coast/Canadian/

International Susan W. Hadlock

East Coast Charlie Humphries

Midwest/Gulf Arthur Auger

Publisher Alex Agnew

## Business

Finance Ken Koehler

Business Office Lee Auchincloss

Events & Marketing Jody Gould

## Main Office

207-772-2466

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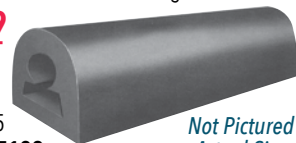
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Crews at Foss Maritime's shipyard in Rainier, Ore., preparing to launch the 7,268-hp *Nicole Foss*.



Foss Maritime

## Construction down following Tier 3 building boom, oil woes

by Casey Conley

The rush to lay keels before EPA Tier 4 emissions rules took effect contributed to a surge of new construction in recent years. Those better days in some ways contributed to the current slowdown in building that's been compounded by economic headwinds.

Many in the marine industry saw the change coming.

Around this time last year, shipyard managers with a yearlong backlog expressed concern about the lack of new work in the pipeline. Suppliers also noticed an impending dropoff.

"I made the comment last year that we had a backlog until the middle of this year and then it looked like it was slowing down. My predictions

were true," said Brandon Durar, president of JonRie InterTech, maker of winches and deck gear. "We are still building rapidly, but there is not much backlog left."

There are no firm numbers for vessel deliveries in a given year, but the website Shipbuildinghistory.com is one comprehensive source. The site, compiled by Tim

Colton, shows 122 tug and towboat deliveries in 2015 and 110 in 2016. For the six years between 2010 and 2016, the average was about 108 new tug and towboats a year.

The start of 2017 has been noticeably slower. Through May 1, 27 tug and towboats have been delivered. Plenty more vessels will be completed later this year, but the total number could fall below 100.

Well-documented trends led to the recent surge in new construction, and in many ways foreshadowed the current challenges. In particular, tug and towboat operators pushed ahead with ambitious Tier 3 projects ahead of the Tier 4 cutoff, which has since come and gone. Shipyards on all three coasts are still working through backlogs caused by this surge in orders, but most will be finished by 2018.

Despite some early adopters, orders for boats that meet Tier 4 emissions standards have been slow to materialize.



A welder working on *Rosemary McAllister*, the second of three Tier 4 tugs under construction at Horizon Shipbuilding.

Brian Gavinn



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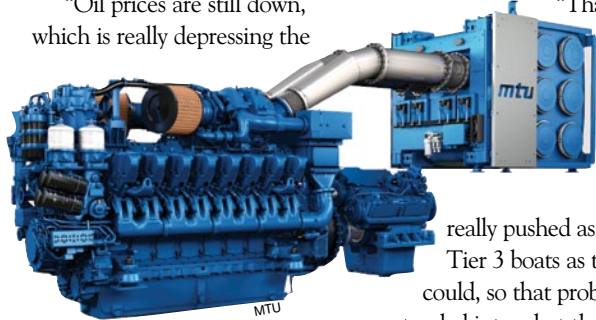
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Meanwhile, the steep drop in offshore support vessel (OSV) construction and other oil field vessels also has more shipyards bidding for tug projects.

“Oil prices are still down, which is really depressing the



oil patch down south, which is increasing the competition for the tugs,” said Bruce Washburn, naval architect and executive vice president with Washburn & Doughty shipyard in East Boothbay, Maine. “Companies that normally wouldn’t bother with a little thing like that now figure

it’s better than nothing.”

“We are facing a lot stiffer competition and hungrier competition for what work is out there,” he continued.

“That, plus there are a lot of companies that

really pushed as many Tier 3 boats as they could, so that probably extended into what their normal build rate was going to be.”

Tug operators that might normally build two or three

**Above, MTU’s first Tier 4 engines will be delivered later this year. Right, Master Marine yard manager Jody Krause aboard the Marquette Transportation towboat St. Matthias.**



vessels as part of a fleet replacement plan, for instance, might have ordered twice that many boats ahead of Tier 4. Washburn suggested these same operators are now slowing down to “catch their breath.”

Travis Short, president of Horizon Shipbuilding of Bayou La Batre, Ala., acknowledged similar trends during a March interview. Although his yard has typically operated with a backlog of 24 months of more, it is less these days. What new work is out there requires aggressive bidding.

“When a market gets into a slump, it turns from a builders’ market to a buyers’ market and all of a sudden you’re doing work at margins that are less than satisfactory,” he said, adding that the current period is definitely a buyers’ market.

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The Port of Virginia

**The 13,000-TEU COSCO Development arriving at The Port of Virginia in May. Bigger ships moving through the Panama Canal could spur demand for more powerful tugs.**

Demand for bluewater tugs has remained relatively steady and likely will remain so in the coming year. But brownwater construction, Short said, is in “a little bit of a slump.” He doesn’t expect a turnaround for at least another year.

The slowdown in the oil patch has reverberated across the maritime industry. Huge numbers of OSVs

are stacked up in the Gulf, meaning demand for new oil field vessels and tugs likely won’t rebound for some time. Meanwhile, companies that move oil or support the petroleum industry also are feeling the pinch, potentially crimping demand for new vessels.

“It’s a little slower due to the slowdown of the oil production in Alaska,” said Capt.

Russell Shrewsbury, vice president of Seattle-based Western Towboat, which hauls cargo barges and rail cars to Alaska. “A lot of western Alaska freight volumes dropped off dramatically.”

Western Towboat is still building new boats, but the company is hoping for a quick rebound in the Alaska trade.

The Damen-designed tugboats that Edison Chouest Offshore is building for tanker escort and response work around Prince William Sound, Alaska, are one big exception to the oil slowdown. Chouest is building the vessels at its own shipyards.

Despite the slowdown, there are reasons for tempered optimism. The new Panama Canal locks are facilitating bigger ship calls at East Coast ports, although perhaps initially not in the numbers some expected. If this picks up, more operators could be in the market for new tugs, according to Robert Allan, chairman of Robert Allan Ltd. in Vancouver, British Columbia.

Durar, of JonRie, predicts regulatory changes, particularly the Coast Guard’s Subchapter M, could force towing companies to replace aging boats. “I don’t believe some of the older tugs will meet the requirement for Subchapter M,” he said. “That should be the next trend for replacements.”

That is already happening in at least one notable case. Great Lakes Towing Co. is

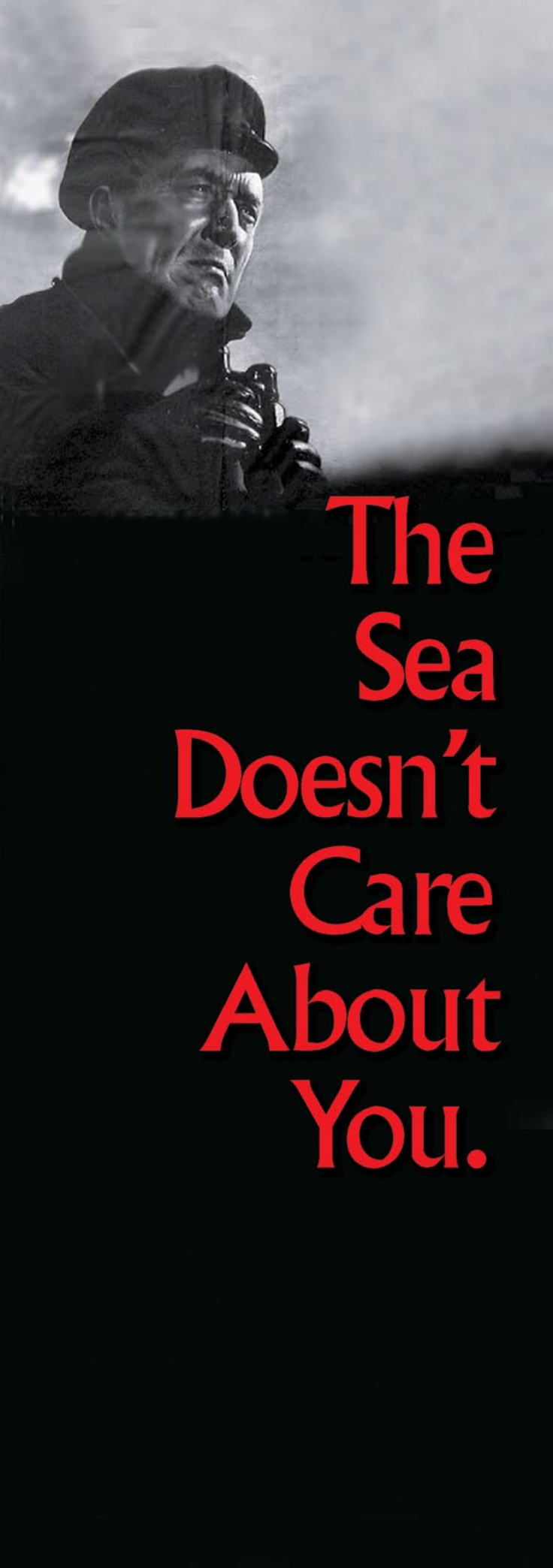
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# The Sea Doesn't Care About You.



Alan Haig-Brown

building 10 new vessels at its Cleveland shipyard. These tugs will replace aging tugs in its Great Lakes fleet, reducing the need for future repairs and upgrades. The lead boat, *Cleveland*, is profiled on page 35.

Completion of high-profile Tier 4 boats, in particular *Earl W. Redd*, *Capt. Brian A. McAllister* and *Caden Foss*, (profiled on pages 18, 23 and 28, respectively), also could demystify Tier 4 engine technology and aftertreatment systems. Caterpillar, for instance, has installed a telematic system that will gather real-world data from engines installed on *Earl W. Redd*.

This information will allow Cat to compare its modeling and lab testing with actual results. Cat predicts fuel savings of 5 to 10 percent with its Tier 4 engines compared with identical Tier 3 mains, and GE is predicting similar gains. These improvements largely come from changes to engine timing, which resemble Tier 2 calibrations.

Jason Spear, Cat's marine product definition engineer, expects the company's predictions will hold up. "I would not anticipate a whole lot of difference from what we calculated compared to (what happens) in the real world," he said.

There are also signs that inland operators are looking

**Nichols Brothers Boat Builders of Freeland, Wash., outfitting the 120-foot *Mount Baker* this spring for Kirby Offshore Marine.**

to build. Ed Shearer, principal naval architect with The Shearer Group in Houston, said the firm is developing Tier 4 towboat designs for potential customers. Other operators are exploring triple-screw tugboats with roughly 800-hp engines, which are small enough to fall under Tier 4 rules.

"We are also looking at diesel-electric systems utilizing several smaller engines which, when combined, give substantial horsepower through two propulsion systems," Shearer said.

Legislation under consideration in Washington also could jump-start some lagging sectors of the marine industry. The Trump administration's proposed tax and regulatory overhauls could reduce business costs, while a rise in infrastructure spending could spur demand for construction materials that move over water. Revised trade pacts could affect farm exports.

"So far, we haven't noticed any substantial benefits from the Trump administration for our industry, but there is a lot of optimism and positive thinking," said Randy Orr, president of Master Marine in Bayou La Batre, Ala.



Whether the new administration achieves these goals is anyone's guess. And even then, there will likely be a lag between rising demand and the need for new vessels.

"It really varies as to the segments and the various niche markets," said Bob Beegle, president of Coupeville, Wash., tug and towboat broker Marcon, "but in general there is too much equipment out there chasing too little work."

### A plateau on tug hp?

Horsepower and bollard pull have steadily crept up on docking and escort tugs, especially in the past 20 years. Some now believe performance will begin to plateau around 80 metric tons of bollard pull.

"I can't see it getting much higher, in part because the tugs are pushing on the sides of ships and we are reaching the thresholds of contact pressure limits in many instances," said Allan, of RAL.

There also are practical reasons for the pushback, so to speak. For one, most new ship-docking tugboats have z-drives, allowing captains to position the tug quicker and more accurately. This allows more consistent application of force, rather than fewer shorter bursts of power.

"Your average ship-docking dock today is somewhere around a \$10 million investment, and certainly more if you are building in North America," Allan said. "They are not insignificant investments, so the owners are being quite judicious."

Indeed, there are also

VT Halter Marine built Bouchard Transportation Co.'s 6,000-hp ATB tugboat *Frederick E. Bouchard*, which entered service last summer.

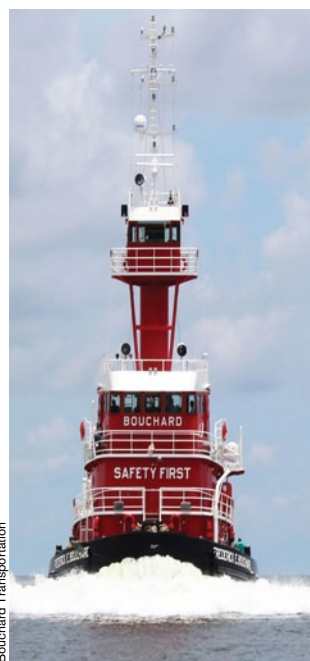
financial concerns: Larger engines cost more and require larger, more expensive components. Practically speaking, tugboats also use maximum power only a small percentage of the time, meaning there is little incentive to "overpower" a vessel.

### Newbuilds offer maximum versatility

The first three Tier 4 tractor tugs to hit the market, *Earl W. Redd*, *Capt. Brian A. McAllister* and *Caden Foss*, are brawny, powerful vessels ready to handle very large ships. But all three also are outfitted with towing winches for maximum versatility.

This is not groundbreaking — Western Towing's Titan-class tugs have long been used for ocean towing, ship docking and barge handling. But the trend does seem to be catching on, according to Johan Sperling, vice president of Jensen Maritime Consultants.

"The stereotypical harbor assist/escort tug looks different today than it did five years ago because (operators) are needing to make it more diverse in



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the things it can do,” he said in a recent interview. “If you look at some of the newer designs today, they are becoming multipurpose vessels.”

Design-wise, that often translates into raised forecastles and more powerful engines to handle rougher seas outside the harbor. Oversized fuel tanks also allow these vessels to take rescue towing jobs far offshore, or pursue long-haul ocean towing work.

### More z-drives on inland waterways

It’s been nine years since Southern Towing began the modern z-drive towboat era with its vessels *David Stegbauer* and *Frank T. Stegbauer*. Most towboats built today still have conventional propulsion, but z-drives are becoming more common on inland waterways.

Over the past two years, Paducah, Ky.-based Marquette Transportation has taken delivery of 11 2,000-hp z-drive towboats from Master Marine. The last of the series, *St. Matthias*, was completed in late 2016. American Commercial Barge Line of Jeffersonville, Ind., has added new z-drive towboats, including the 2,000-hp *American Strong* built by JeffBoat and *American Valor* built by Steiner Shipyard.

Shearer, of The Shearer Group, said efficiency gains have led to wider acceptance. In one example, z-drive towboats running from New Orleans to Cincinnati burned 10 percent less fuel and took a day less to make the round trip than towboats with conventional propulsion.

“We looked back at what we predicted versus what hap-

pened, and (z-drive boats) beat our estimates for fuel efficiency and trip times,” he said. “A lot of it is due to propeller efficiency.”

SCF Marine of St. Louis is taking z-drive propulsion a step further with *SCF Vision* (more detail on page 63). The 6,600-hp vessel delivered earlier this year is the largest and most powerful ASD towboat in the U.S., and two sister vessels are planned.

### Autonomous tugs on the horizon?

The same technology that propels driverless vehicles could one day appear in tugboats — in fact, it seems like more a question of when than if.

Allan said autonomous tugs are not yet at a similar development stage as driverless cars, but they are not that far

behind, either. His Vancouver, B.C., firm is working on concept plans for remotely operated tugboats. It does not yet have a buyer, but Allan said operators around the world are showing interest.

“We feel we have all the technical aspects of autonomous tugs dealt with, but the biggest challenge will be dealing with it from a regulatory and probably a union operations perspective,” he said.

Right now, these tugs would still require humans at the controls, although the operators would probably not be on board. In a two-tugboat escort or docking maneuver, for instance, Allan suggested one tugboat would be fully manned, and a second master on the manned tug would be in control of the autonomous vessel. ●







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**TRIDENT** | Seabulk Towing, Fort Lauderdale, Fla.

# First Rotortug arrives on American shores

Story and photos by Brian Gauvin

**H**arbor tugboats with three z-drives were first introduced almost two decades ago. The first of these so-called Rotortugs has finally reached North American shores.

Seabulk Towing took delivery of *Trident*, the first of three

planned Advanced Rotortugs (ART), in January. Master Boat Builders of Bayou La Batre, Ala., built the vessel using a design from Robert Allan Ltd. of Vancouver, B.C.

Seabulk assigned *Trident* — named for the weapon favored by



**Top, Seabulk Marine's 98.5-foot Trident is one of about 50 Rotortugs working around the world.**

**Inset, Seabulk outfitting Trident with a JonRie InterTech Series 500 double-drum stern winch. Left, Trident Capt. Steve Rotert steering Trident, which features an Alphatron bridge console with JRC navigation electronics.**

the sea god Poseidon — to Port Everglades in Fort Lauderdale, Fla. The second tug, *Triton*, named after Poseidon's messenger, is scheduled for delivery in late spring. A third tug, aptly named *Trinity*, is due in December.

"This was a proven design internationally, and we believed this concept could best service the growing LNG industry as well as accommodate the larger vessel sizes calling at our ports of operation," said Rick Groen, COO of Seabulk Towing, a subsidiary of Seacor Holdings Inc.

Naval architect Robert Allan, chairman of his namesake firm, considers the arrival of ART vessels in North America a potential game changer. "And I think it will make people stand up and take notice of what isn't even a new development in the industry, but it will be a new development



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Robert Allan Ltd., under an exclusive agreement with Rotortug B.V. of the Netherlands, designed a series of ART triple z-drive vessels, which are typically defined by their bollard pull, length and, in the U.S., with the “US” suffix to distinguish them from the metric designations used everywhere else in the world. Hence, *Trident* is designated ART 80-98US due to its 80 tons of bollard pull and a 98.5-foot length.

**Below left, *Trident* has a JonRie InterTech Series 350 hawser winch installed forward of the house and a remote-controlled FFS monitor capable of 5,240 gpm. Below right, one of three Caterpillar 3512C engines installed on the 5,733-hp *Trident*.**



The triangular arrangement of two z-drives forward and one drive aft provides increased omnidirectional maneuverability and control, as well as a great deal of propulsion redundancy.

“We liked the vessel redundancy the design provided, the dual towing system bow and stern, the additional drive unit so if one breaks down you’re not incapacitated, and the ability to run the boat as an ASD, true tractor (tug) or SDM,” said Groen. “We could lose a drive unit and still continue with the two units still functioning and have a bollard pull of 51 tons.”

The Rotortug, Groen added, can fit into spots and utilize the triangular drive configuration at angles not possible on an ASD tug. “When it comes to escort capability, the Rotortug design allows the operator to brake and steer simultaneously, whereas the ASD can only do one or the other when tethered.”

By March, *Trident* had proven her worth during some 40 docking and escorting assignments. During a demonstration run in Port Everglades, Capt. Steve Rotert explained that on a typical ASD or tractor tug, a skeg provides the hydrodynamic force used to steer a ship.

“In a Rotortug, the third thruster positioned aft provides

for the same forces,” said Rotert. “Not having a skeg makes the vessel more maneuverable, allowing the vessel to sidestep easily. We do this at 8 knots. The configuration also makes for safer escorting, since the same force required to apply steering force to the escorted ship is applied by use of a thruster, not a hull appendage. If you lose any propulsion, the tug will simply fall in behind the ship and avoid tripping.”

It is also much easier to maintain control of the tug in the wake or bow wash of a ship. “The quick water is not catching the skeg and tossing (the tug) around,” Rotert said.

Utilizing the third drive in place of the skeg increases the

#### **TRIDENT – ADVANCED ROTORTUG (ART 80-98US)** SPECIFICATIONS

**OWNER/OPERATOR:** Seabulk Towing  
**BUILDER:** Master Boat Builders  
**DESIGNER:** Robert Allan Ltd.  
**DIMENSIONS:** 98.5' x 43.5' x 18.5'  
**CREW SIZE:** 4 to 6  
**DELIVERY DATE:** 2017

#### **PROPULSION**

- ◆ Engines: (3) Caterpillar 3512C Tier 3 diesels producing 1,911 hp each at 1,600 rpm
- ◆ Bollard pull: 80 tons
- ◆ Vessel speed: 12.5 knots
- ◆ Propellers: (3) Schottel SRP 1012 z-drives
- ◆ Auxiliary generators: (2) Cat. C7.1 gensets producing 150 kW each

#### **DECK EQUIPMENT**

- ◆ Bow winch: JonRie Series 230 hawser winch with 450 feet of 8" Samson Saturn-12 HMPE rope
- ◆ Stern winch: JonRie Series 500 double-drum (towing and hawser) winch with 2,100' of 2.25" galvanized EIPS IWRC wire and 450' of Samson Saturn-12 8" rope
- ◆ Fendering: Schwyler Cos. extruded cylindrical and W-block

#### **NAVIGATION GEAR**

- ◆ Alphanon Marine integrated bridge
- ◆ Radar: (1) JRC Sea Radar; (1) JRC River Radar
- ◆ Sat compass: JRC JLR-31

- ◆ GPS: Rose Point ECS
- ◆ Autopilot: Alphanon
- ◆ Depth sounder: JRC JLR-31

#### **COMMUNICATIONS**

- ◆ Radio: (4) Icom M506 VHF

#### **CAPACITIES**

- ◆ Fuel: 52,027 gallons
- ◆ Water: 4,736 gallons
- ◆ Gear oil: 867 gallons
- ◆ Engine oil: 867 gallons

#### **FIREFIGHTING**

- ◆ Monitors: (1) fwd-mounted, remote-controlled FFS monitor, 5,240 gpm
- ◆ Pumps: FFS SFP 250, PTO to the port main engine.
- ◆ Onboard fire suppression systems: Ansol FM-200

#### **OTHER DETAILS**

- ◆ (2) Viking 10-person life rafts; SikaFloor Marine Flooring; Intershield systems coatings; Duramax box coolers; ABS-classed



Allan estimates there are about 50 Rotortugs operating around the world.

“When the Rotortug concept was introduced, it was definitely a quantum shift in tug technology,” Allan said. “We claim no credit for that. It was developed and patented by Kotug, but we worked with them on the design of several project applications and introduced a number of design refinements. After working with them for a few years, they invited us to be the worldwide exclusive designer. That is our current role.”



tug's overall maneuverability and sidestepping capabilities, explained James McCarthy, senior naval architect at Robert Allan Ltd. "The tug can go forward at 12.5 knots, backward at 12.5 knots, sideways at 8.5 knots and can turn on a dime," he said. Under load, increased mobility provided by the third drive allows the tug to shift position easily when handling ships in tight spaces.

Another significant advantage, when called upon to fit longer ships into existing moorages, is "rotoring" — a maneuver where the tug operates within the beam limits of the ship. When rotoring, the tug's wash is directed away from the ship, allowing for more efficient control while maneuvering the vessel. And the third drive on ART tugs allows them to perform effective sideways maneuvers in tight spaces where ASD tugs are constrained. Pushing athwart-

**Right, Trident will typically operate with four to six crew. Pictured from left are mate Jason Frongello, Capt. Steve Rotert, chief engineer Robert Santos and AB Gregory Schreiber. Below, Trident shows her moves in the Port Everglades, Fla., turning basin.**

ship, with the tug's beam positioned onto the ship's side, is one such situation.

While underway, Capt. Rotert steers the tug with the stern drive. "With the two forward units straight ahead, the aft unit is used as you would a tiller or single-screw boat. While working, the third unit is used to keep the stern of the tug at any angle you want. It allows

you to sidestep at 8-plus knots, which will keep you from getting under the flare of a ship. When



in indirect mode, it allows you to push with full power and still have full control of the tug."

The introduction of a slip clutch allows the operator to maneuver the tug below 25 rpm. "It makes coming alongside a dock or docked ship very easy without a hard landing and generating a lot

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of prop wash,” said Rotert.

Propulsion for the three Rotortugs is provided by three Caterpillar 3512C Tier 3 diesel engines producing 1,911 hp each at 1,600 rpm. The mains drive Schottel SRP 1012 z-drives. Twin Caterpillar 150-kW gensets provide electrical power.

Trident’s wheelhouse, designed for maximum all-around visibility, offers a clear view of the tug’s fore and aft working areas. Rotert is no stranger to innovation. He was a captain on *New River*,

the first Ship Docking Module (SDM) tug, delivered to Hvide Marine, now Seabulk Towing, in late 1997. He’s in his element explaining an array of sophisticated hardware and electronics populating the molded Alphantron integrated bridge system.

“The Alphantron system has four collapsible monitors that can be configured to each user’s preference.” For example, the radar can be put on any or all of the monitors, and the electronic charts can

be displayed on either the forward or aft monitor, or both. The monitors feature touch-screen control of the tug’s lights, whistle, horn, monitor displays, window washers and wipers. The NUC, RAM, underway and towing astern lights have separate switches.

On deck is what JonRie InterTech President Brandon Durar considers a Tri-Winch set. The term describes a JonRie Series 230 hawser winch on the bow and a JonRie Series 500 double-drum winch on the stern. The bow winch and aft hawser drum are wound with 450 feet of Samson Saturn-12 8-inch HMPE rope. The stern winch towing drum is wound with 2,100 feet of 2.25-inch wire rope.

“The JonRie Tri-Winch set was designed for escort operation over the bow or from the stern and long-line towing over the stern, and makes the winch ideal for escorting, terminal support, towing and ship assist of the new containerhips that come through the new Panama Canal expansion,” said Durar.

The JonRie foot pedal control is proving to be a popular feature. It allows hands-free operation of each winch. Operators press down to pay out and heal back to haul in.

“We are using the foot pedals exclusively as it frees up our hands to steer,” Rotert said. “The winches are working very well.”

Trident is outfitted to a high standard with six crew berths. The master’s and chief engineer’s cabins are located in the deckhouse with two double-crew cabins located on the lower accommodation deck. A fully appointed mess/lounge and a nicely equipped galley are located in the deckhouse.

The conservative nature of the U.S. marine industry portends a cautious acceptance of the ART design. However, larger and larger ships calling at ports shrinking in size due to waterfront development may speed their adoption.

A couple of decades ago, tractor tugs and ASDs faced the scrutiny of industry conservatism. Once accepted, however, ASD tugs became standard across the industry. It could only be a matter of time before ARTs achieve similar acceptance.

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Harley Marine Services

**EARL W. REDD** | Harley Marine Services, Seattle

# Harley Marine pulls industry into Tier 4 era

Story by Casey Conley

Some tugboats are built for long-distance ocean towing, while others are nimble and powerful enough to dock big ships. Harley Marine Services' *Earl W. Redd* is the rare vessel that performs both jobs equally well.

Diversified Marine built the 5,350-hp z-drive vessel at its Portland, Ore., shipyard using a design from Jensen Maritime Consultants. Upon delivery in January, *Earl W. Redd* became the first U.S. tractor tug with EPA Tier 4 engines. It's also the first using a selective catalytic reduction (SCR) system to meet tougher federal emissions rules.

*Earl W. Redd* has been assigned to Harley subsidiary Olympic Tug and Barge, and it is expected to work on the West Coast. Harley Marine's Chief Operating Officer Matt Godden likened the versatile new tug to a Swiss army knife. "For

us, it's an exciting tool because it can go anywhere and pretty much do anything," he said during an interview at the company's Seattle headquarters.

"With the fuel capacity at almost 130,000 gallons, there aren't a whole lot of places she can't go and the combined bollard pull and horsepower is exceptional for this kind of activity," Godden continued, noting the estimated 75-ton bollard pull rating.

*Earl W. Redd* is based on plans Jensen developed almost two decades ago. Over the years, the Seattle naval architecture firm has modified the design to accommodate higher and higher horsepower. This time around, the design evolved to accommodate heavier and slightly larger engines, SCR aftertreatment units and stainless steel urea holding tanks.

Jensen placed the roughly

**Above, Harley Marine Services celebrated *Earl W. Redd's* arrival at its Seattle headquarters with a tugboat parade and christening in February. Below, *Earl W. Redd's* bridge is outfitted with a Furuno electronics and navigation suite.**

100-cubic-foot side-mounted SCR units above each engine to save space. The units can be accessed from the fidley. Twin 4,000-gallon urea tanks are located in the center of the tug, aft of the mains. Ballast water tanks that formerly occupied those spaces are now located under the engine room.

"It's a challenge, to be honest with you," Jensen Vice President Johan Sperling said, describing the



Kurt Readd/Diversified Marine

★ First Tier 4-rated tractor tug to enter service ★ First Tier 4 tug outfitted with urea aftertreatment system ★ Designed for harbor, towing work



shift from Tier 3 to Tier 4. “The technology, though widely available, hasn’t been completely and fully rolled out and tested ... to know all the kinks have been worked out.”

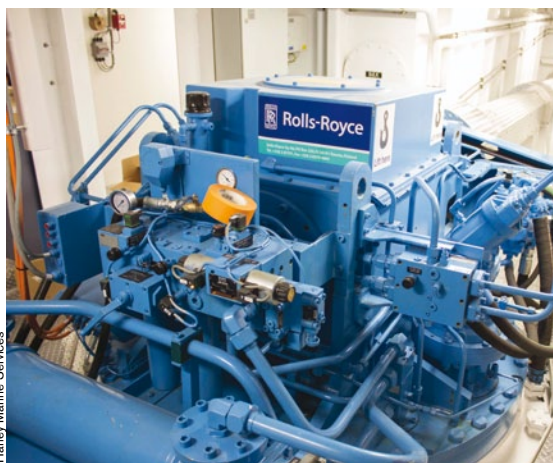
There are also changes from a shipyard perspective. As the lead Tier 4 tractor tug and the first with an SCR system, there is no established playbook for installing new components, said Kurt Redd, president of Diversified Marine.

“You have to build the stainless-steel tanks and all this equipment that has to go into the engine room that is already packed full of stuff,” he said, adding, “there is definitely some effort to figure out where you put the tanks and those kind of things.”

*Earl W. Redd* is named for Kurt Redd’s late father, who was an affable presence around the yard for many years. He considers the vessel an honor to his father’s legacy.

Propulsion aboard the ves-

Below, the 120-foot *Earl W. Redd* is outfitted with twin Rolls-Royce US 255-P30 FP z-drives.



Harley Marine Services

sel consists of next-generation Caterpillar 3516E Tier 4 Final engines each producing 2,675 hp at 1,600 rpm. The mains are paired with twin Rolls-Royce azimuthing stern drives turning 102-inch stainless-steel props. Ship service power comes from two John Deere gensets each producing 150 kW.

Cat’s Tier 4 engines use an SCR exhaust aftertreatment to meet

tougher nitrogen oxide emissions regulations. Urea is injected into the exhaust system to convert NOx to nitrogen and water. Caterpillar separated the engine from the SCR, thereby avoiding big changes to its proven line of engines. Jason Spear, the company’s marine product definition engineer, said differences compared to 3516 Tier 3 mains are mostly limited to engine timing.

Godden acknowledged the Caterpillar Tier 4 system has its challenges. Urea is a harsh ammonia-like chemical that requires additional crew training. It’s another consumable not yet available in every port. But, he said Caterpillar has offered extensive support and training to ensure the process goes smoothly. Harley also has a decades-long relationship with Caterpillar.

Engine makers are generally projecting operators will use between 5 and 10 percent less fuel with Tier

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4 mains, depending on the application. It's too soon to know how these predictions will align with actual results.

Harley isn't expecting windfall fuel savings. In fact, any reduction in fuel usage will likely be offset by urea costs, Godden said. Caterpillar projects *Earl W. Redd* will burn about 135 gallons of urea a day, requiring a new supply every seven weeks or so. Those estimates are based on 5,000 operating hours a year at a 60 percent load factor.

Outside the engine room, *Earl W. Redd* closely resembles its sister vessel *Bob Franco*. Diversified Marine built the ice-class tug in 2013, and it currently performs ship docking in Nikiski, Alaska. The two vessels are not identical, however. *Earl's* hull is not ice-strengthened and it lacks the Rapp Marine crane installed aft of *Bob's* pilothouse. *Bob* has Schottel z-drives instead of Rolls-Royce. Both tugs are 120



Harley Marine Services

feet by 35 feet with a 19.3-foot draft fully loaded.

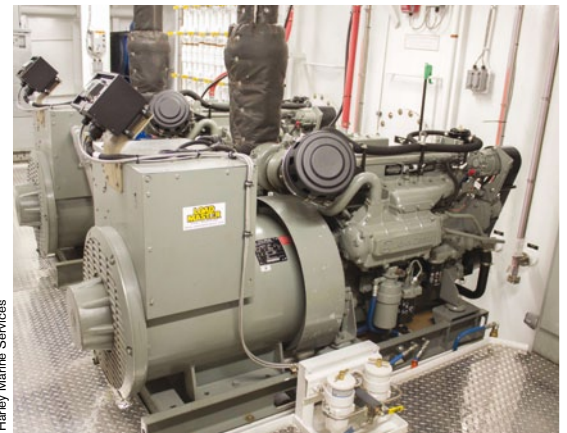
Like its predecessor, *Earl W. Redd* has electric-driven Markey winches at the bow and stern that share a 100-hp drive panel below deck. The space-saving system maintains separate controls and can dedicate maximum power to the stern winch or 50 hp to the hawser.

The TESD-34 100-hp double-drum tow winch on the stern can

**Left, propulsion aboard *Earl W. Redd* comes from twin Caterpillar 3516E Tier 4 engines with the aftertreatment system installed above the mains. Right, auxiliary power comes from two 125-kW John Deere 6068 gensets.**

hold 2,500-feet of 2.25-inch wire rope in its starboard drum and 1,500 feet in its port drum. The brake's holding capacity maxes out at 645,000 pounds, and an emergency "come home" drive motor can activate during a power failure.

The 50-hp DEPC-48 hawser winch on the bow — slightly smaller than *Bob Franco's* hawser — is spooled with 500 feet of 9-inch synthetic HMPE line. Brake capac-



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Harley Marine Services

**Earl W. Redd can perform long-distance towing or ship docking work, offering Harley Marine maximum flexibility.**

ity is greater than 610,000 pounds and line speeds range from 100 to 291 feet per minute. The hawser also offers Markey's render/recover system to maintain consistent line tension and a freewheel for rapid line payout, said Markey sales engineer Mark Jessup.

Earl W. Redd will operate with up to 13 crew. It has accommodations spread across six bunkrooms with two heads and two showers. Floating floors absorb engine

### EARL W. REDD

#### SPECIFICATIONS

**OWNER / OPERATOR:** Harley Marine Services  
**BUILDER:** Diversified Marine  
**DESIGNER:** Jensen Maritime Consultants  
**DIMENSIONS:** 120' x 35' x 19'  
**MISSION:** Ocean towing, ship assist, salvage towing  
**CREW SIZE:** Up to 13

#### PROPULSION

- ◆ Engines: (2) Caterpillar 3516E Tier 4 engines each producing 2,675 hp at 1,600 rpm
- ◆ Ballard pull: 75 tons ahead, 70 tons astern (estimated)
- ◆ Z-drives: (2) Rolls-Royce US 255-P30 FP
- ◆ Propellers: (2) 102" stainless-steel propellers
- ◆ Vessel speed: 8 knots
- ◆ Auxiliary generators: (2) 125-kW John Deere 6068AFM85 gensets

#### DECK EQUIPMENT

- ◆ Winches: Markey TESD-34 100-hp double-drum tow winch; Markey DEPC-48 50-hp hawser
- ◆ Cordage: 2,500' and 1,500' of 2.25" towing wire; 500' of 9" HMPE synthetic line
- ◆ Fendering: Schuyler Cos.

#### NAVIGATION GEAR

- ◆ Radar: (2) Furuno FAR2117BB
- ◆ Electronic chart display: Rose Point Navigation Systems

- ◆ Compass: Furuno SC50 satellite compass

- ◆ AIS: Furuno FA150
- ◆ Loud hailer: Furuno LH3000
- ◆ Autopilot: Simrad AP80

#### COMMUNICATIONS

- ◆ Radio: SAILOR VHF
- ◆ Satellite: Furuno Felcom-18 Inmarsat-C; Cobham SAILOR 6130

#### CAPACITIES

- ◆ Fuel: 127,000 gallons
- ◆ Water: 6,534 gallons
- ◆ Lube oil: 1,137 gallons
- ◆ Urea: 8,200 gallons

#### FIREFIGHTING

- ◆ Monitors: (2) Stang monitors, one forward, one aft of the pilothouse
- ◆ Pumps: Flowsolve 6LR-18A split-casing pump capable of 1,400 gpm
- ◆ Onboard fire detection system: Fireboy-Xintex Elite RSM
- ◆ Onboard fire suppression system: Kidde FM-200

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vibration, while insulation in crew spaces keeps noise at manageable levels.

“It’s one of the quietest boats I have been on,” Brian Appleton, director of engineering/special projects, said of *Bob Franco*, which is outfitted similarly to *Earl W. Redd*. “There are a lot of creature comforts.”

The wheelhouse consists of Furuno navigation and communications supplied by Radio Holland USA, Rose Point Navigation Systems software and a Cobham SAILOR satellite connection.

The Llebroc helm chair and windows offer 360-degree views.

*Earl W. Redd* has extensive IT infrastructure built in that rivals some offices. There are computer and Internet ports installed in key spaces, and the tug has wireless Internet connectivity. The KVH IP-MobileCast entertainment service is available in every bunkroom. Twelve closed-circuit cameras installed throughout the vessel transmit to a wheelhouse display.

“All of our newbuilds have been com-

ing out with camera systems to monitor the integrity and safety of the engine room, so if there is a fire or some sort of issue they have the ability to monitor that from the bridge,” Godden said.

Schuyler Cos., based in nearby Woodinville, Wash., provided fendering on the bow and stern. Up front, there is 126 square feet of upper bow fender welded to the hull and 84 square feet of conical lower bow fender, Schuyler regional salesman Ben Beierle said. Schuyler Model 114 fenders were applied around the stern. The entire ship set is made from post-consumer rubber, which kept 350 tires from the landfill and saved more than 4,500 gallons of oil.

Those details no doubt appeal to Harley Marine. The company has long focused on reducing its environmental footprint. For example, it retrofitted several of its tugs working in the Alaska trade with Tier 3 engines despite the lack of tier requirements there. Having the first Tier 4 tractor tug is a real point of pride.

“I’d like to distinguish ourselves as a green leader,” Harley Franco, chairman and CEO, said in a video marking the tug’s delivery. “From all of our research and discussion with Cat, we felt that we chose the right engine to give us both the horsepower and cleanness we wanted in our air.”

“We’re doing things other companies just don’t do,” he added.

These efforts go beyond altruism. Harley, which moves oil along the East and West coasts and in the Gulf of Mexico, has found being environmentally friendly makes good business sense.

“It’s been part of our commitment to our customers and part of the marketing and growth strategy to move toward greener technologies,” Godden said. “As Harley (Franco) always describes, he wants to be a green, emissions-focused, environmentally friendly operator, and we found it to be a good commercial selling point for us.”

*Earl W. Redd* is one of 11 vessels Harley will take delivery of this year. These include two Tier 3 and two Tier 4 articulated tug-barge units. Conrad Shipyard of Morgan City, La., has delivered the tug *Bill Gobel* and is building the 116-foot tugs *Min Zidell*, *OneCURE* and *Todd E. Prophet*, which will be powered by GE engines. ●



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**CAPT. BRIAN A. MCALLISTER/ROSEMARY MCALLISTER** | McAllister Towing and Transportation Co., Staten Island, N.Y.

## McAllister solidifies fleet with new Tier 4 tugs

Story by John Gormley Photos by Brian Gauvin

**M**cAllister Towing and Transportation decided to build *Capt. Brian A. McAllister*, the most powerful docking and escort tug in its fleet, to handle big containerhips expected in East Coast ports following the recent expansion of the Panama Canal.

This spring, the 6,772-bhp *Capt. Brian* was nearing completion at Horizon Shipbuilding in Bayou La Batre, Ala. A sister vessel, *Rosemary McAllister*, was scheduled for delivery this summer, and McAllister has exercised an option on a third tug. The lead boats, named after the company's chairman and his wife, were designed by Seattle-based Jensen Maritime Consultants.

Martin Costa, McAllister's engineering manager, said *Capt. Brian* "is set up for extra-large container vessels."

The canal's new locks are 1,400 feet long, 180 feet wide and 60 feet deep, permitting ULCVs (ultra large container vessels) to pass between

*Above, Capt. Brian A. McAllister* undergoing final outfitting at Horizon Shipbuilding in early May. Delivery is set for June. The tug is built to handle ultra large container vessels now calling on the East Coast. Right, McAllister installed a Markey TES-40-75 winch on the stern to provide versatility as towing jobs arise.

the Atlantic and Pacific oceans. East Coast ports served by McAllister could see containerhips up to 1,200 feet long with beams up to 160 feet. When they arrive, *Brian* and *Rosemary* will be ready to escort them safely in and out of the harbor and assist them to and from their berths.

In addition to handling containerhips, these tugs are set up for rescue operations and can work

with LNG.

McAllister wants these boats to be as versatile as possible. *Capt. Brian* is equipped with a powerful Markey Machinery bow winch. The 100-hp electric single-drum hawser winch boasts 350,000 pounds of line pull and an adjustable brake holding force of 253 tons. It also features Markey's render/recover automatic tensioning system.

Costa said that winch is more



★ Most powerful tugs in McAllister's fleet ★ First Tier 4 tractor tug working on East Coast ★ Urea stored in climate-controlled area



than enough for ship escorting and docking, meaning the tug will be well suited to handle larger ships at the port of New York/New Jersey, where *Capt. Brian A. McAllister* is expected to work.

Even if large ships don't materialize in the numbers East Coast ports are expecting, these tugs will have other ways to earn their keep. Consider the electric Markey winch on its stern, a single-drum towing winch that can hold 2,500 feet of 2.5-inch wire. Less visually striking but just as important is the hydraulic three-pin towing system on the stern with its hold-down block and stern roller.

These crucial elements let *Capt. Brian* serve as a rescue vessel. While the primary mission is ship assist and escort, if a ship loses propulsion or steering, or a barge breaks loose and could run aground, these tugs can tow it to safety. "If one breaks down, we can go get it," Costa said. "We can do ocean towing if necessary."

These tugs also have the ability to escort liquefied natural gas tankers (LNG). With the glut in domestic natural gas production, existing LNG import terminals were being mothballed and plans for new ones were cancelled. But in early 2016, the Sabine Pass LNG terminal in Texas began exporting LNG, raising hopes for a new market for LNG escort tugs.

To qualify for that work, *Capt. Brian* has a firefighting system that earned an FFW1 rating. The tug has two remotely controlled FFS fire monitors, each rated at 5,284 gallons per minute. The monitors have adjustable fog tips with foam capability. Two FFS fire pumps are each rated at 5,980 gallons per minute at 185 pounds per square inch. They are powered by two Caterpillar diesels generating 831 hp each.

The tug has a deluge system that envelops the tug in mist as a defense against heat and flames to protect the tug and its crew while fighting a fire on another vessel or on shore.

The tug's fendering system is also specially designed for safely handling LNG vessels. On the bow, the tug has Shibata cylindrical fendering on top with Viking soft-loop material below. The design lets the tug exert no more than 17 metric tons per square meter of pressure against a ship's hull.

A Jason's cradle (for man-overboard rescues) has been installed to enhance LNG escort capabilities. For the same reason, the boat's galley can be quickly converted to a medical triage facility.



**Above left, Jensen Maritime Consultants designed Rosemary McAllister, shown here under construction at Horizon Shipbuilding, and sister vessel Capt. Brian A. McAllister. McAllister picked up the option on a third tug in the class, Ava M. McAllister. It will be delivered from Horizon next year. Above right, Schottel SRP4000 FP thrusters before installation.**

## CAPT. BRIAN A. MCALLISTER/ ROSEMARY MCALLISTER

### SPECIFICATIONS

**OWNER/OPERATOR:** McAllister Towing and Transportation Co.

**BUILDER:** Horizon Shipbuilding

**DESIGNER:** Jensen Maritime Consultants

**DIMENSIONS:** 100' x 40' x 18'

**MISSION:** Assist, escort and rescue

**CREW SIZE:** Up to 7

### PROPULSION

- ◆ Engines: (2) Caterpillar 3516E Tier 4 diesels, 3,386 bhp each at 1,800 rpm
- ◆ Thrusters: (2) Schottel SRP4000 FP bottom-mount units
- ◆ Propellers: (2) 2,800-mm nibral 4-blade props in nozzles
- ◆ Ballard pull: 80 metric tons ahead (estimated)
- ◆ Vessel speed: 12 knots cruising, 14 knots maximum
- ◆ Gearbox: Lufkin 2:1
- ◆ Auxiliary generators: (3) Caterpillar Tier 3 C7.1 keel-cooled diesels driving 118-kW generators

### DECK EQUIPMENT

- ◆ Bow winch: Markey DESF-48 single-drum 100-hp hawser winch, capacity of 800' of 10" line
- ◆ Stern winch: Markey TES-40 75-hp electric single-drum towing winch, capacity of 2,500' of 2.5" wire
- ◆ Cordage: 800' of 10" HMPE Samson Saturn-12 line
- ◆ Bow staple: Flat A-staple with .25" stainless-steel hard-face cladding on inner radius, H-bitt incorporated into A-staple
- ◆ Fendering: Viking Rubber soft loop with 36" x 50" Shibata cylindrical on forward and aft bulwarks; D-fendering port and starboard

### NAVIGATION GEAR

- ◆ Radar: (2) Furuno FR8122 with ARPA and 4' antenna
- ◆ Chartplotter: Furuno TZtouch2
- ◆ Compass: (2) Anschutz Standard 22 gyro compass, Ritchie Globemaster magnetic compass
- ◆ AIS: Furuno FA310 series
- ◆ E-nav software: Rose Point Navigation Systems
- ◆ Autopilot: Anschutz PilotStar D
- ◆ GPS: (2) Furuno GP32

### COMMUNICATIONS

- ◆ Radio: (3) Standard Horizon GX2200
- ◆ Loud hailer: Standard Horizon VLH-3000
- ◆ CCTV cameras located bow, port, starboard, stern and engine room

### CAPACITIES

- ◆ Fuel: 58,710 gallons
- ◆ Lube oil: 545 gallons
- ◆ Urea: 2,500 gallons
- ◆ Waste oil: 1,444 gallons
- ◆ Foam water: 750 gallons
- ◆ Potable water: 3,075

### FIREFIGHTING

- ◆ Monitors: (2) FFS 1200LB fire monitors rated at 5,284 gpm, adjustable fog tip with foam capability
- ◆ Pumps: (2) FFS SFP 250x350 rated at 5,980 gpm, 185 psi; powered by (2) Caterpillar C18 Tier 4 diesels, 831 hp at 1,800 rpm
- ◆ Deluge system: Stainless-steel piping with stainless nozzles positioned around superstructure exterior
- ◆ Machine space fire suppression system: FM-200 fixed system
- ◆ Fire stations: (3) hose stations with 50' of hose; nozzle and wrench with (3) additional 50' of hose

### COATINGS

- ◆ Exterior below waterline: PPG Amerlock 2/400 and ABC 3 antifouling coating
- ◆ Exterior above waterline: PPG 302 H Zinc, Amerlock 2/400, PSX 700 zinc primer
- ◆ Tank and interior: PPG Amerlock 2/400, PSX 700 in engine room

### CERTIFICATIONS AND CLASSIFICATIONS

- ◆ Hull: ABS Maltese Cross A1 Towing Vessel - Escort Service, ballard pull and FFW1 notations
- ◆ Machinery: ABS Maltese Cross AMS, ACCU notation





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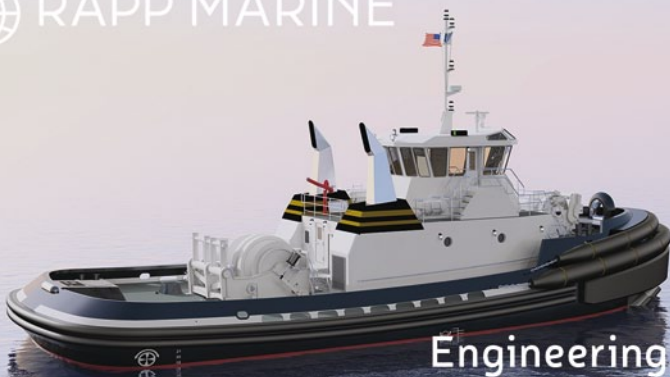
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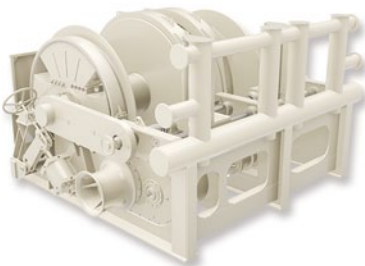
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Given the tug's versatility, it should be able to handle a wide range of work as markets change or opportunities arise. "If you're building a boat, you try to make it as functional as possible," Costa said.

In addition to being the most powerful escort tug in McAllister's fleet, *Capt. Brian A. McAllister* will also be its first powered by Tier 4 diesel engines. The two Caterpillar 3516E engines will each generate 3,386 bhp at 1,800 rpm. They will power two Schottel SRP4000 FP thrusters with four-blade 2,800-mm nibral props in nozzles. Bollard pull is 80 metric tons.

McAllister and Jensen Maritime Consultants have a long working relationship. Jensen designed two 96-footers for McAllister, the sister vessels *Buckley McAllister* and *Eric McAllister*, which entered service in 2014.

McAllister stayed with the Jensen design for several reasons. One is the hull shape. Some competing designs rely on skegs to enhance escorting capabilities. *Capt. Brian A. McAllister* and sister tug *Rosemary McAllister* will, by contrast, take advantage of their wide beam.

"We're relying more on hull shape, greater beam, rather than the skeg," Costa said. The new 100-foot boats will have a beam of 40 feet, making them 4 feet wider than *Buckley* and *Eric*.

Jonathan Parrott, Jensen's vice president/new design development, said the firm's super 96-footers were in the 4,000- to 5,000-hp range. Tugs of 6,000 hp and higher necessitated a bigger boat. The super 96s can accommodate 6,000 hp, but their size limits the deck equipment they can carry and the 36-foot beam limits the size of the nozzles that can be installed.

Much bigger containerships started calling West Coast ports more than a decade ago. Jensen responded to the need for bigger tugs with its 100-foot-long, 40-foot-beam Valor class design. "That seemed to be where a lot of people were headed," Parrott said, noting that the extra beam provides significantly more indirect force for steering and braking.

The new McAllister boats are different in appearance from the earlier 100-footers Jensen designed for West Coast operators, notably in their distinctive upright plumb bows.

To meet EPA Tier 4 standards, the new



McAllister boat will have an SCR (selective catalytic reduction) system using urea injection to control stack emissions. The urea is injected into the exhaust stream, not into the engine itself.

"We kept finding out little peculiarities of the urea system," Parrott said.

One of them was its corrosiveness. Jensen determined that using a normal steel tank with an interior coating would not do. In addition to being corrosive, urea is slippery and will seep through even the smallest cracks. "Any microscopic hole and it is going to leak out," Parrott said. Jensen specified a 2,500-gallon stainless steel tank that allows inspection for leaks along all the tank's surfaces.

Urea degrades at higher temperatures, and McAllister and Jensen put the urea tank in a separate air-conditioned space inside the engine room to counteract this problem. Cooling urea keeps it "fresh," ensuring the emissions control system functions properly and prevents spoilage.

Previously, engine manufacturers tinkered with engine timing to meet emissions standards, particularly when moving from Tier 2 to Tier 3. With Tier 4, engine timing returns to settings that optimize fuel consumption. "You're back to a normal engine," Costa said. "The reduction in fuel cost will pay for the urea. You're not penalized for doing Tier 4."

Schottel redesigned the z-drives on the new tugs to increase efficiency. The nozzles have been opened up a bit where the water exits and made a little longer. The props have been given "a tremendous amount of shape," Costa said. The result should be a 3 percent increase in efficiency.

The hull paint from PPG is expected to last 15 years. "We've been upgrading the painting system," Costa said. "We don't want to repaint two or three times a year."

Crew comfort concerns played a big role in the design. Normally crew will be four to five: captain, mate, engineer and one or two deck hands. The new boats have four crew cabins: three doubles and one single. That means that when the tug is operating with a crew of four, each person would have his or her own space. The boat has a full galley. The adjoining mess/lounge is an open and spacious L-shaped area made possible by the boat's wide beam.

To isolate noise emanating from the

engine room, bulkheads were lined with 4.5-inch-thick mineral wool insulation panels with a lead sheet embedded inside. "It goes all the way around the engine room," Costa said. "It keeps the heat in here. It keeps the noise in here."

One noise-reduction element is the drive room containing the three generators located aft of the engine room. This places machinery that runs when the vessel is tied up in a separate space, as far as possible from areas crew would occupy when off duty.

The tug's larger size also allowed the designers to use straight shafts instead of cardan shafts to connect the engines to the thrusters. Straight shafts create less noise and vibration.

Capt. Brian A. McAllister and Rosemary McAllister are tugboats, of course, not cruise ships. Still, Parrot said, "We're very much aware how important crew comfort is."

Or as Costa observed, "This boat is going to be very comfortable, crew-wise." ●



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JT Marine

**CADEN FOSS** | Foss Maritime, Seattle

# Foss puts spec-built Tier 4 tug to work in California

Story and photos by Brian Gauvin

Perhaps not surprisingly, one of the first EPA Tier 4 emissions-compliant tugboats is destined for California, a state where residents and regulators are passionate about clean air.

JT Marine in Vancouver, Wash., is building the 110-foot *Caden Foss*, named after Caden Hansen, a great-great-grandson of company founders Andrew and Thea Foss. Foss Maritime has chartered the 6,772-hp azimuth stern drive (ASD) vessel, owned by Vessel Chartering LLC, a subsidiary of Baydelta Navigation Ltd. Delivery is sched-

*Caden Foss coming together at JT Marine in late May, above, and in March, right. Below, Baydelta's Vice President Peter Zwart (left) with company CEO Capt. Ron Charlesworth during a vessel tour this spring.*

uled for late June 2017.

*Caden Foss* is a multipurpose tugboat designed and equipped for standby, ship-assist and escort assignments. It is also available for rescue towing. The vessel will work from Chevron Long Wharf in Richmond, Calif., for Foss client and energy giant Chevron.

"Chevron committed to put a Tier 4 tugboat into service as part of the Richmond Refinery Modernization Project approved by the city of Richmond in 2014, so that was the driver for us to look for a Tier 4 boat," said Foss Chief Operating Officer Scott Merritt.

Foss worked to develop a tugboat design that could be built quickly and also meet Chevron's specifications and deadlines. Within days of choosing a shipyard, Foss learned about the Tier 4 tug Vessel Chartering was building on spec at JT Marine.

Merritt said the vessel was similar to the one Foss designed but with several improvements. Given the good business history between Foss and Vessel Chartering, as well as the

capabilities and delivery date of the spec vessel, Foss decided to charter it for three years with an option to buy.

"It gave us a little more comfort in the timeline, but also, in our minds, provided a little bit better platform for what we wanted to do. So it was kind of a win-win," Merritt said.

Jensen Maritime Consultants and Vessel Chartering jointly designed *Caden Foss*, which is essentially a stretched version of Jensen's proven 100-foot ASD tug. Initially, the tug will assist and escort tankers to and from San Francisco Bay refineries. Merritt is confident in the design.

Increasing fuel capacity for ocean and rescue towing is a primary reason for stretching the hull. But the



safer aft deck area for crew making up the tows is an added bonus. "By stretching it out 10 feet, you put the tow point in a better place as it relates to the propellers and steering, and it gives more afterdeck area for the crew to work on," Merritt said.

As a standby and harbor tug, the additional length adds to the vessel's overall comfort. Two captains, the engineer and AB have the luxury of their own stateroom. For ocean towing and rescue missions, *Caden Foss* can carry enough crew for three-man watches.

Finally, the extra 10 feet allows for a more direct shafting arrangement between the main engine and the ASD unit at the stern. It also creates additional space for the urea tank and selective catalytic reduction (SCR) system needed to meet Tier 4 emissions standards.



★ Built on spec by Vessel Chartering LLC ★ Under charter with Foss for three years ★ Outfitted for harbor and ocean towing work



The SCR system injects a liquid reductant agent, usually automotive-grade urea known as diesel exhaust fluid (DEF), through a catalyst into the exhaust stream of a diesel engine. The DEF sets off a chemical reaction that converts nitrogen oxides into nitrogen, water and tiny amounts of carbon dioxide, and sends them up the vessel's stacks.

The SCR modules, dosing pump, dosing cabinet and DEF tank can be configured in a number of ways, dependent on the available space. Richard Floyd, marine sales for Peterson Power Systems of San Leandro, Calif., said the units can be positioned in front of, in back of or above the main engines.

The SCR units are directly above the main engines on *Caden Foss*. JT Marine built the 4,600-gallon urea tank and located it aft of the main engines.

Designing the tug on spec presented Baydelta Navigation and

Vessel Chartering with several questions. In particular, the company wondered where the tug would work and what mission it would perform.

The answer was to build a multi-purpose tug capable of handling multiple assignments, said Peter Zwart, Baydelta's vice president of operations and new construction. They started with the basics — ship-assist and escort duties — then looked for ways to make the tug more appealing

Right, Baydelta CEO Ron Charlesworth examines the large skeg on *Caden Foss*, which will improve its escort abilities. Below, Rolls-Royce US 255 FP z-drive units awaiting installation.



to potential customers.

“Originally, not knowing yet where the tug would end up, we decided to also set her up for ocean towing,” Zwart said during a March inspection alongside Capt. Ron Charlesworth, CEO of Baydelta Navigation and Vessel Chartering.

Vessel Chartering has worked with Jensen Maritime Consultants since 2006, designing six Delta-class tugs built by Nichols Brothers Boat Builders of Whidbey Island, Wash. To better withstand heavy seas,



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Jensen raised the bow and pilot-house 4 feet. A watermaker also was installed to boost its long-range capabilities.

“The main reason for stretching the boat from 100 to 110 feet was to get more fuel capacity for ocean towing,” Charlesworth said. “The 100-foot Delta-class tugs have 73,000 gallons of fuel capacity. This one has 123,000 gallons. We are getting 90 to 95 tons of bollard pull from the 100-foot Delta-class boats and we expect we’ll get the same from this one.”

Two Caterpillar 3516E Tier 4 diesel engines rated at 3,386 hp at 1,800 rpm provide propulsion. Carbon-fiber Centa shafts connect the mains to Rolls-Royce US 255 z-drives with fixed-pitch nibral propellers. Two Caterpillar 150-kW gensets and a Caterpillar 65-kW unit provide auxiliary power.

A massive shipyard-built staple on *Caden Foss*' bow fronts a single-drum Markey Machinery DEPCF-52 electric hawser winch wound with 450 feet of Cortland 3-inch-diameter Plasma 12x12 rope and a 12x12 LoCo pendant.

This is the seventh Baydelta tug Markey has outfitted with a bow winch. This model is powered by a 75-hp electric motor and generates 30,800 pounds of line pull at 378 fpm. It features wheelhouse controls with on-deck emergency stop and freewheel pushbuttons, and has a digital/analog line tension display system.

“This particular winch, with the latest Markey NexGen Controls and Markey Render/Recover, represents

the best available technology for ship-assist and escort duty,” said Blaine Dempke, president of Seattle-based Markey Machinery. “We trust this winch will serve our customer well for decades to come.”

On the aft deck, Rapp Marine developed a double-drum electric towing winch wound with 2,500

feet of 2.5-inch wire. Both drums can spool 90 feet of 3-inch chain on top of the steel wire. Merritt said the ability to spool up to a shot of chain on the

winch drum is a significant safety feature, especially during rescue towing.

“You don’t have to mess around with a bunch of chain on deck, probably the most dangerous interface when you’re making a connection to a tow and getting a wire up,” he said. “This will allow for a much safer operation on the afterdeck and more flexibility.”

Another feature of the Rapp winch is an electric “come home” drive, which will serve as a backup to the main drive train.

Johann Sigurjonsson, president of Rapp Marine US, said the winch is driven by a single 100-hp motor that can pull over 75 tons on the first layer. It utilizes pneumatic cylinders in place of hydraulics, keeping fluid off of the deck. The sturdy brakes offer a force of 250 tons on the barrel layer.

The main winch controls, located in the wheelhouse, employ Rapp Marine’s PTS Pentagon Control System. The Pentagon system features a touch screen with tension and wire-length readouts, auto-tension capability and automated haul-in and pay-out settings, as well as capacity for logging data, with a secondary set at the winch. There is a second set of controls located at the winch. At the extreme stern of *Caden Foss*, Rapp supplied twin 14-inch tow pins.



The SCR after-treatment system on *Caden Foss* is installed over the Caterpillar 3516E Tier 4 mains. Caterpillar supplied the aftertreatment system and JT Marine built the 5,116-gallon urea tank.

“Working closely with Baydelta has resulted in developing an ideal tow winch for the market,” said Sigurjonsson. “We view this project as a big step forward.”

With new EPA and Coast Guard ballast water treatment requirements on the horizon, the tug was designed without ballast tanks, said Jensen Maritime Vice President Johan Sperling. This eliminates the need for ballast water discharge and the potential transfer of invasive species. In lieu of ballast tanks, the tug will transfer fuel as necessary to maintain proper trim.

“We are excited to get the boat,” Merritt said. “*Caden Foss* will be positioned in our San Francisco fleet and work within our pool of tugs in the Bay area, performing standby general ship-assist and tanker escort duties.”

## CADEN FOSS SPECIFICATIONS

**OWNER/OPERATOR:** Vessel Chartering LLC/Foss Maritime

**BUILDER:** JT Marine

**DESIGNER:** Jensen Maritime Consultants/Vessel Chartering LLC

**DIMENSIONS:** 110' x 40' x 18'

**MISSION:** Ocean towing, ship assist, salvage towing  
**CREW SIZE:** 4-5 escort, up to 10 ocean towing in five cabins

**DELIVERY:** June 2017

### PROPULSION

◆ Engines: (2) Cat 3516E

Tier 4 mains each producing 3,386 at 1,800 rpm

◆ Bollard pull: 95 tons

◆ Vessel speed: 13-14 knots

◆ Z-drives: Rolls-Royce US 255 FP z-drives, Centa carbon-fiber shafting and nibral props

◆ Auxiliary generators: (2) Caterpillar C7.1 producing 150 kW; (1) Caterpillar C4.4 producing 65 kW

### DECK EQUIPMENT

◆ Winches: Markey DEPCF-52 electric hawser winch on the bow; Rapp double-drum electric towing winch on the stern

◆ Cordage: 450' of Cortland 3" Plasma 12x12 rope and 12x12 LoCo pendant on the bow; 2,500' of 2.5" wire on the stern

◆ Fendering: Schuyler Cos.;

double Shibata bow fenders; (2) rows M-rubber and D-rubber along shear plus an additional row of D-rubber

### NAVIGATION GEAR

◆ Radar: (2) Furuno

◆ Electronic chart display: Furuno

◆ Compass: Furuno satellite compass and Simrad gyro compass

◆ AIS: Furuno

◆ Autopilot: Simrad

### COMMUNICATIONS

◆ Radio: Icom

◆ Satellite connection: Thrane & Thrane

### CAPACITIES

◆ Fuel: 123,000 gallons

◆ Water: 6,530 gallons plus watermakers

◆ Urea: 5,116 gallons

### CLASSIFICATION

◆ ABS Class & Load Line, Maltese Cross A1, Towing Vessel, Escort Notation





**FISHING CREEK** | Vane Brothers, Baltimore

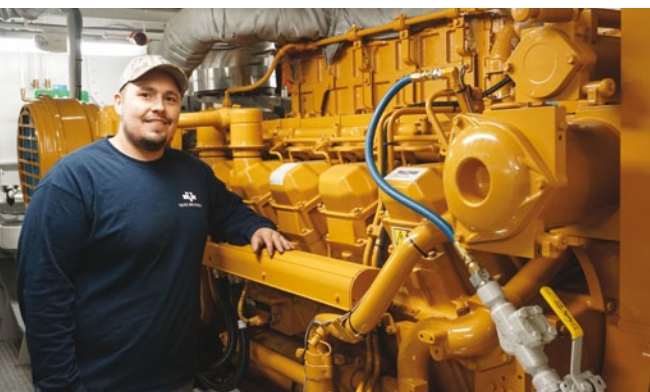
# Vane Brothers welcomes another model-bow workhorse

Story and photos by Casey Conley

In an era where more operators are using articulated tug-barge units to move oil and fuel, the model bow tugboat might seem like a throwback. Vane Brothers defies this notion, however, having built a modern fleet of versatile model bows working along the East Coast.

Within the past year, the Baltimore towing company has taken delivery of six model bow tugboats from shipyards in Maryland

**Above, Fishing Creek passes through downtown Baltimore in the city's Inner Harbor. Below, licensed engineer Wesley West stands alongside one of two Caterpillar 3512C Tier 3 mains aboard the tug.**



and Florida. It also has contracts to build at least 10 more in the coming years across two vessel classes.

Senior Port Capt. Jim Demske, who oversees Vane's construction program, said this design was chosen out of necessity. Years ago, Vane used barges of different sizes for bunker work, terminal deliveries and coastal runs. The company needed a tugboat that could handle different jobs efficiently.

"We found model bow tugs to be the most effective solution," Demske said recently. "Most of our modern model bow tugs can grab any barge at any time and safely tow barges astern, push barges, tow barges alongside or assist other tugs and barges."

*Fishing Creek* is the latest Sassafras-class tugboat built by Chesapeake Shipbuilding of Salisbury, Md. The yard has delivered 13 of the vessels since 2008 when the lead boat *Sassafras*

was completed. Seven more are planned. *Fishing Creek* arrived at Vane's Baltimore headquarters in late February and soon departed for Philadelphia, where it now handles bunkering barges.

"They're fast, they're efficient and they're great-handling boats," Demske said of the Sassafras class. "For that reason, they are particularly well-suited for bunkering work."

Renowned naval architect Frank Basile designed the Sassafras class more than a decade ago to handle 30,000- and 35,000-barrel tank barges. *Fishing Creek* and its sister vessels feature classic model bow design: narrow beam, forward superstructure and pointed bow.

## FISHING CREEK SPECIFICATIONS

**OWNER/OPERATOR:** Vane Brothers  
**BUILDER:** Chesapeake Shipbuilding  
**DESIGNER:** Frank Basile, Entech Designs  
**DIMENSIONS:** 94' x 32' x 15' with a 12.5' draft  
**MISSION:** Ocean towing of fuel and bunkering barges  
**CREW SIZE:** 5-7

### PROPULSION

- ◆ Engines: (2) Caterpillar 3512C Tier 3 engines each producing 1,500 hp at 1,600 rpm
- ◆ Ballard pull: 40 tons (estimated)
- ◆ Vessel speed: 13 knots light, 11.5 knots loaded
- ◆ Propellers: (2) 89" Troost-style wheels
- ◆ Gearbox: Twin Disc MGX-5600 reverse reduction gears at 6:1 ratio
- ◆ Auxiliary generators: (2) John Deere 4045 Tier 3 engines, (1) John Deere 4045 engine driving the hydraulic towing winch

### DECK EQUIPMENT

- ◆ Winches: JonRie Series 500 towing winch
- ◆ Cordage: 2,100' of 1.75" towing wire; 2.25" Spectra line for push mode
- ◆ Capstan: JonRie Series 421 30-hp electric marine capstan
- ◆ Fendering: M&M Bumper Service

### NAVIGATION GEAR

- ◆ Radar: Simrad solid state radar displayed through 3-D monitors on upper and lower pilothouse

- ◆ Electronic chart display: Simrad
- ◆ Compass: Simrad gyro compass, Ritchie YB-500
- ◆ AIS: Simrad
- ◆ E-nav software: Rose Point Navigation Systems
- ◆ Autopilot: Simrad AP70
- ◆ Radio: (3) Icom VHF radio
- ◆ Satellite connection: Intellian satellite TV; portable Iridium satphone

### CAPACITIES

- ◆ Fuel: 56,000 gallons
- ◆ Water: 4,000 gallons
- ◆ Lube oil: 1,200 gallons

### FIREFIGHTING

- ◆ Monitors: (1) 15-hp Deming fire pump and (1) 5-hp Deming fire pump
- ◆ Onboard fire suppression systems: Kidde fixed CO2 system

### ADDITIONAL INFORMATION:

- ◆ Lapeyre alternating tread stairs; (2) stern-facing cameras; RFD 10-person life rafts; International coatings; Dex-O-Tex flooring and Llebroc helm chairs

★ Versatile design allows for towing, bunker work ★ *Fishing Creek* is the 13th tug from 20-boat order at Chesapeake Shipbuilding



Dimensions are 94 feet by 32 feet, with a 12.5-foot operating draft. Key design features include the

oily-water separators. Basile has retired and sold his firm to Kimia Jalili, who renamed it

Entech Designs. Jalili said recent Sassafras-class tugs remained true to Basile's design.

Vane assigned Capt. Earl Paul to *Fishing Creek* after his work on the 2,200-hp tugboat *Endeavor*. Paul found the

*Left, Fishing Creek has a comfortable galley with stainless steel appliances, granite countertops and mahogany cabinets. Below, there are four cabins with accommodations for seven people.*



upper wheelhouse with a height of eye of 38 feet, accessible by Lapeyre alternating tread stairs. The vessel has tall wheelhouse windows, high ceilings in crew spaces and an engine-room floor dropped as low as possible for maximum space. These zero-discharge tugs have Simplan dripless shaft seals and



new vessel plenty impressive during the 10-hour run across Chesapeake Bay from the shipyard to Vane's Baltimore Harbor headquarters.

"The boat performed excellent," Paul said during a February interview from *Fishing Creek's* wheelhouse. "It is one of the smoothest tugboats I've ever been on."

Propulsion on *Fishing Creek* comes from twin Caterpillar 3512C Tier 3 engines each producing 1,500 hp at 1,600 rpm. Those mains are linked with Twin Disc MGX-5600 reverse reduction gears at a 6:1 ratio turning 89-inch Troost-style open-wheel propellers. Operating speed is 13 knots light or 11.5 knots while towing a barge.

Twin 99-kW John Deere 4045 Tier 3 gensets provide ship service power, and a Carrier unit provides vessel heating and cooling. The bow and hull are protected by rubber fendering from M&M Bumper Service. Onboard firefighting consists of one

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15-hp and one 5-hp fire pump, and a Kiddle fixed CO2 fire suppression system in the engine room.

The spacious lower wheelhouse is equipped with a full Simrad electronics suite with solid-state radar, AIS and electronic chart display. Three LCD screens — two with touch-screen capability — hang from the ceiling, displaying navigation systems and images from two stern-mounted cameras. The con-

sole, walls and accents are made from rich mahogany.

Demske said the electronics are above and beyond what's found on most tugs performing bunker work. "This is state of the art. This is what you see on a megayacht."

The smaller upper wheelhouse is outfitted with similar electronics and components. Liebroc seats are installed on both levels. The vessel also has an enclosed aft-facing con-



**Above, Senior Port Capt. Jim Demske oversees Vane Brothers' new construction program. Left, Fishing Creek Capt. Earl Paul perched in a Liebroc helm chair in the tug's lower wheelhouse.**

trol station affectionately called "the doghouse."

Like many operators, Vane Brothers has adopted a uniform wheelhouse layout across much of its roughly 50-boat fleet. This ensures consistency and also allows crew to easily transition from one tug to another, particularly when first stepping on board overnight.

*Fishing Creek*, like its sister vessels, is designed to tow, push and operate with barges at the hip. On deck it has a JonRie InterTech Series 500 towing winch installed at



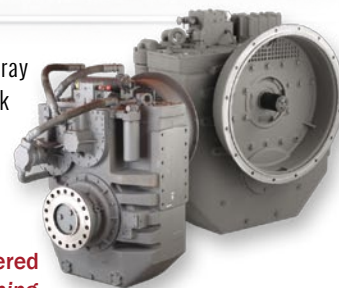
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Twin Disc and Great Lakes Power are honored to have partnered with Vane Brothers and Chesapeake Shipbuilding on the *Fishing Creek* tugboat, and Great Lakes Towing and Great Lakes Shipyard on the *Cleveland* tugboat. Congratulations to both on being a Top Tug for Professional Mariner's American Tugboat Review 2017.



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the stern spooled with 2,100 feet of 1.75-inch towing wire. The winch, coupled with a 30-hp JonRie Series 421 electric capstan, is powered by a John Deere 4045 engine.

When towing, the wire runs over a Texas bar fitted with two circular “doughnuts” to prevent chafing. In push mode, 2.25-inch Spectra line runs off the cable, through shivs mounted at the stern and around the bow to tie off with the barge. The aft-mounted capstan and aft bitts port and starboard let the tug maneuver with a

barge alongside.

“Vane’s 3,000-hp tugs married with a 30,000-barrel barge are versatile, as they can tow or push and have a capstan to allow them to also work off the hip,” said JonRie President Brandon Durar. “The smaller barges allow for them to get into more shallow places and also allow them to transit rivers pushing up and towing back down. When contracts change, the tugs can adapt.”

Vane Brothers’ crew work a two-weeks-

on, two-weeks-off schedule, and the company has made comfort a priority. *Fishing Creek* has four bunkrooms with accommodations for seven, although the standard crew consists of five. Each room has satellite hookups and flat-screen TVs, and one double has TVs built into each bunk.

The spacious mess features a large, comfortable dining table facing a big-screen TV. The adjacent galley has stainless-steel appliances, granite countertops and mahogany cabinets. The nonslip Dex-O-Tex poured flooring and heavy wall insulation dampen vibration and engine noise. The vessel has on-demand hot water, which is both a luxury and a necessity given its relatively small 4,000-gallon water tank, Demske said.

*Fishing Creek*, like several other Vane tugs, is named for a waterway on Maryland’s Eastern Shore — a region where Vane Brothers President C. Duff Hughes has family ties. Sassafras-class vessels were the first Maryland-built tugs in 30 years, which Hughes considers a matter of great pride.

“The workmanship is impeccable, and the delivery of these hardworking 3,000-horsepower tugboats ensures that the Vane fleet remains thoroughly modern, with the latest enhancements for the safest, most productive operation,” he said.

*Fishing Creek’s* reign as the newest tugboat in Vane’s fleet was short-lived: The company took delivery of the fifth 4,200-hp Elizabeth Anne-class tugboat *Philadelphia* in April from St. Johns Ship Building in Palatka, Fla. *Philadelphia* marks the sixth tugboat delivery for Vane Brothers since May 2016 — a figure that includes the 3,000-hp Sassafras-class *Fort McHenry* that arrived in August 2016.

More vessels are in the works. Conrad Shipbuilding is constructing three ATB tugs for Vane Brothers at its Orange, Texas, yard. The first, *Assateague*, is expected in late summer 2017. Demske considers these ATB tugs paired with 80,000-barrel barges a natural progression for the company.

“Now that Vane is refining its fleet even more,” he said, “it’s logical that we will continue to build more articulated tug-barge combinations to serve our customers while still maintaining a strong fleet of proven hawser tugs.”

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Great Lakes Shipyard

**CLEVELAND** | Great Lakes Towing Co., Cleveland

# Great Lakes' new tug class designed for simplicity, versatility

Story by Casey Conley

**W**hen the time came to upgrade Great Lakes Towing Co.'s fleet, company President Joe Starck wanted a design that matched the existing boats' capabilities while adding power and versatility.

With the Damen Stan 1907 ICE class, a 65-foot workhorse already working ports around the world, he found what he was looking for. Great Lakes is building the first vessel, *Cleveland*, at its Cleveland shipyard along Lake Erie. Delivery is set for June 2017.

The company plans to build at least nine more of the twin-screw, 2,000-hp tugs in the coming years. Each vessel in this Great Lakes class will be built to ABS Class A1 towing vessel rules. *Cleveland* is expected to be the first such vessel operating in the United States built specifically to meet U.S. Coast Guard Subchapter M standards.

"The boat is really a modern-day version of the simple tug that we have been operating for over 100 years," Starck said in a recent interview at the company's Cleveland headquarters.

"It's very similar in size (to our existing tugs), it's twin-screw as opposed to single-screw, 2,000 hp as opposed to most of our tugs, which are in the 1,500-hp range, and it's nearly doubling

Above, Great Lakes Shipyard launched *Cleveland* on May 25. Damen Vice President of new construction Jan W. van Hogerwou attended the ceremony.

Right, the channel cooler visible on *Cleveland's* hull required "well over 1,000 man-hours" to install.

Left, the Work Horse logo pays homage to Great Lakes Towing Co.'s tugs from the early 1900s, which were known as "the workhorses of the Great Lakes."

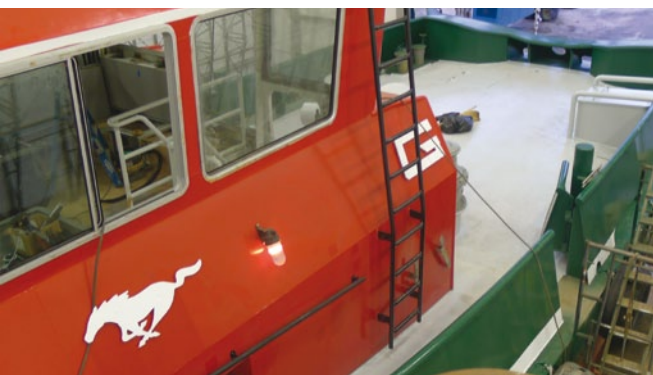


Great Lakes Shipyard

firefighting," said Mark Honders, manager of design and licenses with Damen Shipyards in Gorinchem, Netherlands. "It's pretty versatile. It can be used for any type of operation you want to do in the harbor."

Great Lakes Towing operates roughly 30 harbor tugs in 11 U.S. ports between Duluth, Minn., and Buffalo, N.Y. Many of its tugs work in shallow water bodies or rivers where debris is a concern, making conventional propulsion advantageous. The harsh Great Lakes winters also required tugs with sturdy, reinforced hulls to break ice more than a foot thick.

Shipping slows down considerably during the winter months, but during roughly nine months of open water, the company handles about 1,500 towing jobs. This includes Great Lakes ships known as "lakers," articulated tug-barge units pushing



Douglas Barrow

★ First U.S. tug built specifically to Subchapter M ★ Design adapted from Damen plans ★ Exhaust leaves through the stern rather than stacks

oil products, and “salties” that arrive from around the world via the St. Lawrence Seaway.

The tug *Cleveland*, which will work in and around its namesake city, also must navigate the Cuyahoga River, which has a series of S-curves as it enters Lake Erie. Cleveland-based tugs can handle ships up to 700 feet long, usually with a single tug out front and sometimes with a second at the stern. Given the narrow river, the tugs tow ships back out into the lake stern-first.

Harbor tugboat crews used to operating in the Gulf of Mexico or along either coast might be skeptical of a 2,000-hp vessel for ship handling. But Starck said the company has never had complaints

about horsepower. If a specific ship requires more than a single tug can offer, a second tug will be deployed. “If that’s still not enough, we’ll add another,” he said.

Great Lakes has typically hired Jensen Maritime Consultants to



Great Lakes Shipyard

design its newbuilds, most recently its 74-foot, 3,400-hp HandySize tugboats. The shipyard completed its fourth HandySize-class tug in September 2016 for a customer in Guatemala.

This time around, however, Great Lakes wanted to start with a proven design rather than develop an entirely new concept. The Damen Stan 1907 ICE-class design dates back to 2007, Honders said, and it evolved from an earlier design that goes back even further.

The ICE-class variant of the Damen Stan 1907 has bigger shafting and an ice belt of reinforced steel installed around the waterline. It also features extra plate thickness, extra brackets and extra fendering. The frame distance is 275 mm instead of 550 mm for additional vertical stiffness.

The design has two distinguishing elements. One is the channel cooler system welded along the underside of the hull to cool the engines and generators while also reinforcing the hull. The other is the lack of exhaust trunks and stacks, which improves the captain’s view astern. Instead of piping carrying the dry exhaust up and out, it runs straight back and leaves through the stern.

The exhaust ends are located

Above, Great Lakes-class tugs send engine and generator exhaust out through the stern. There are no exhaust stacks. Right, the H-bit on the bow is “canted” to prevent hull damage when working in a ship’s flare.

above the waterline and the piping is designed such that water will not flow back into the engines, according to shipyard General Manager Douglas Barrow. The exhaust design was a first for Barrow, who came to Great Lakes about 15 months ago after a long career at several prominent Gulf Coast shipyards.

“It basically maxes your visibility by eliminating any stacks going up and blocking your view aft. Especially for relatively smaller tugs, you have to look up or aft quite a bit because you’re often working from the aft end,” Honders said of the exhaust system that is standard on Damen tugs this size.

The channel coolers, which also are part of the standard design, could be removed from subsequent boats in the Great Lakes class. Barrow said installing them required “well over 1,000 man-hours.” Future vessels may use grid coolers to sim-



Casey Conroy

ply construction and reduce cost.

Although the Damen design is effectively “off the shelf,” adapting the plans to U.S. regulations and building techniques required extensive re-engineering and redrawing. For example, Starck said the Damen package called for four or five different hull plates where one would do.

“We have redrawn the entire boat and relofted the whole thing, eliminating all those seams,” he said, adding that the initial design-build process created a learning curve for the shipyard and the Damen team.

“They are much less sensitive to labor costs than we are. In the U.S.,

## CLEVELAND

### SPECIFICATIONS

**OWNER/OPERATOR:** Great Lakes Towing Co.  
**BUILDER:** Great Lakes Shipyard  
**DESIGNER:** Damen Shipyards Group  
**ENGINEERING:** Genoa Design International Ltd.  
**DIMENSIONS:** 64' x 24' x 11'  
**MISSION:** Ship handling, ice breaking, harbor and coastal towing  
**CREW SIZE:** 2 for harbor work; accommodations for up to 4; Joiner system manufactured and installed by Marlin Industrial

### PROPULSION

- ◆ Engines: (2) MTU 8V 4000 Tier 3 producing 1,000 hp at 1600 rpm
- ◆ Ballard pull: 27.5 metric tons (estimated)
- ◆ Vessel speed: 10.5 knots
- ◆ Propellers: 3-bladed 71" Kaplan style in Kort nozzles
- ◆ Gearbox: Twin Disc MGX-5321 with 5.46:1 ratio
- ◆ Auxiliary generators: (2) Kohler Power 65EOZCJ 65-kW diesel genset

### DECK EQUIPMENT

- ◆ Cor dage: Spectra
- ◆ Capstan: Schoellhorn-Albrecht, 15-ton rating
- ◆ Fendering: Damen-supplied W-fenders on bow; aircraft tire fendering on sides and transom wrap

### NAVIGATION GEAR

- ◆ Beier Electronics total suite including pilothouse consoles with remote diagnostics capability
- ◆ Radar: Furuno FR8065 with 4' open array
- ◆ Electronic chart display: Furuno DRS6AX

- ◆ Sat compass: Furuno SC303
- ◆ Compass: Ritchie YB-600
- ◆ AIS: Furuno FA150
- ◆ Autopilot: Simrad AP70

### COMMUNICATIONS

- ◆ Radio: (2) Icom MC-604

### CAPACITIES

- ◆ Fuel: 6,800 gallons
- ◆ Water: 1,162 gallons
- ◆ Lube oil: 292 gallons
- ◆ Dirty oil: 271 gallons

### FIREFIGHTING

- ◆ Pumps: Griswold HH 4x3 (15 hp) supplied by APO Pumps and Compressors
- ◆ Onboard fire suppression systems: FM-200 fixed fire suppression system, supplied by The Hiller Companies
- ◆ Microm fire alarm system

### ADDITIONAL INFORMATION

- ◆ First U.S.-flag tug built to meet ABS Subchapter M standards; construction attended by ABS; enclosed water-lubricated stern tube with stainless shaft; coatings by Sherwin-Williams



we are very sensitive to labor costs and Great Lakes Shipyard is doing everything we can to squeeze every man-hour out of the construction process, so there were a lot of changes made,” Starck said. “Most of the changes we made were to reduce the cost of construction.”

*Cleveland* has a forward pilothouse common in Damen designs with a split-level layout to maximize space. From the outer deck, one can walk up a short staircase to the wheelhouse or down a stair to the accommodations deck. From there, crew can step down into the engine room.

The wheelhouse is equipped with Furuno radars and navigation equipment and a Simrad autopilot system in a console provided by Beier Electronics with remote diagnostics capability. Pilothouse windows provide 360-degree visibility.

*Cleveland* is designed as a day boat, so it has minimal accommodations. The forward accommodations spaces include pipe racks for berthing, but the space also can be used for storage. There is also a small galley with a settee.

“There is not a lot of fluff in the vessel. It’s simple and straightforward,” Barrow said. “That makes it easier to operate and easier to maintain. We’re looking forward to putting her into service in our fleet.”

In the small but functional engine room, there are two MTU 8V 4000 Tier 3 engines each producing 1,000 hp, and twin Kohler 65-kW generators. The mains turn 71-inch props in Kort nozzles through Twin Disc reduction gears. The Damen package for this vessel included the props and rudders, as well as rubber fendering protecting the bow.

Lloyd’s has approved the Damen design. Revised drawings were reviewed by ABS, which also has been in attendance throughout construction at the *Cleveland* shipyard. All 10 of the tugboats will be built to Coast Guard Subchapter M standards.

*Cleveland* is scheduled to join the Great Lakes fleet in June and it will be assigned, not surprisingly, to work in *Cleveland*. Future deliveries will be assigned to *Cleveland* and other high-volume Great Lakes ports such as Detroit, Toledo, Duluth and Chicago. The com-

pany plans to retire two existing vessels for each new tug it builds. Some of its current tugs are pushing 120 years old.

Great Lakes is treating *Cleveland* as a prototype vessel. Crews will get the chance to work on the boat and determine what they like and do not like about design elements and features. The company will take this input into account when it adjusts or modifies the design for subsequent tugs in the class. Construction on the second boat will likely begin in summer 2017 with deliv-

ery expected about nine months later.

“We will make whatever changes to improve the package and implement them in the second tug, and that will really be the first of the series,” Starck said. “This prototype is really like version zero, and then we’ll go to version one and try to keep them all identical.”

“We will keep the same machinery package, the same hull form and basically the same nav package,” he continued. “It is really a simple boat.”



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Photos courtesy Moran Towing

**CLAYTON W. MORAN** | Moran Towing Corp., New Canaan, Conn.

# Moran bolsters Norfolk fleet with beamy 93-footer

Story by Casey Conley

**E**ast Coast ports are competing for the larger containerships now moving through the Panama Canal, and tugboat companies that work these harbors are bulking up to meet demand. Moran Towing's 6,000-hp *Clayton W. Moran*, which arrived in the Port of Virginia in March, is the latest example.

*Clayton* is the 12th boat in a proven line of 93-by-38-by-15.5-foot z-drive tugboats designed and built by Washburn & Doughty of East Boothbay, Maine. The 13th boat and the first with Tier 4 Caterpillar engines is under construction now.

Like its predecessors, *Clayton W. Moran* features twin EMD 12-710 mains paired with Schottel 1515

FP z-drives turning 102-inch props in nozzles. All tugs are rated for at least 80 tons of bollard pull with an ABS escort certification. Ship service power comes from a pair of John Deere 99-kW gensets, while a Caterpillar C32 engine drives the FFS fire pump capable of 10,200 gallons per minute.

**Above, Moran Towing's 6,000-hp Clayton W. Moran** undergoing trials along the Maine coast.

**Right, two aft-facing FFS monitors** can be deployed during emergencies.

**Left, Capt. David Culbertson** pictured at the controls.



Moran Towing Corp., headquartered in New Canaan, Conn., operates tugs in 17 ports along the East Coast and Gulf of Mexico, and its 93-foot tugs are currently working in Miami, New York, Norfolk and Savannah, among others. *Clayton* adds another beefy workhorse to Moran's 13-tug Norfolk operation, which already has two 6,000-hp siblings in *Maxwell Paul Moran* and *Jack T. Moran*. Moran's New York operation has four of these escort-

★ 12th and final tug in 93-foot class with Tier 3 engines ★ Built to escort and dock large containerships ★ Assigned to Norfolk, Va.



rated tugs.

“The *Clayton* will complement our already expansive fleet in Norfolk and prepare us for handling larger deep-draft vessels,” Ron Droop, a Moran vice president, said recently.

The Port of Virginia was one of the first ports called by the 10,000-TEU MOL *Benefactor* last year, and the vessel now makes regular stops there. Meanwhile, the port is expecting regular calls from the 13,000-TEU COSCO *Development* starting in May.

“The big ships are here,” Joe Harris, spokesman for The Port of Virginia, said.

Moran’s 93-by-38-foot tugboats were designed with an enhanced escort keel, winch and increased beam to handle these types of vessels. This tug type evolved from an earlier class of 92-by-32-foot tugboats also built by Washburn & Doughty. Bruce Washburn,

the yard’s naval architect, said the 38-foot beam allows for more powerful engines and also better indirect escort stability. Additional freeboard on deck also helps with escort performance.

“They also wanted a good, wide bow to minimize the forces they put on a ship when pushing on it with full power. We did that with a well-rounded bow plus a fairly high, long length of fendering, between two 24-inch cylindrical fenders and soft laminate below that,” Washburn



Right, engineer Josh Wiggins makes his rounds in the engine room. *Clayton*’s 38-foot beam allows for comfortable crew and mechanical spaces. Below, Moran installed a Markey DEPCF-52 winch on *Clayton*’s bow.



said in a recent interview, referring to Moran.

The wider beam also translates into more space for the crew. In the z-drive compartment and parts of the engine room, for instance, it’s

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*Pictured: the 6,000-hp JRT Moran and 6,000-hp James D. Moran*



possible to reach one's arms straight out and spin 360 degrees without bumping into machinery.

The 93-foot class has evolved bit by bit since the lead boat, *James A. Moran*, was delivered in late 2011. All new tugs must undergo a robust safety performance review after each delivery. Many additional enhancements come from an ergonomics expert who reviews and recommends changes on board in regard to human interaction. This

*Clayton W. Moran* will operate with four to six crew for most jobs. Pictured from left are Capt. David Culbertson, deck hand Ricky Davis, engineer Josh Wiggins and mate Lee More.

includes items such as crew comfort, electronics and engineering system interaction, ladders and handrails. Recent deliveries are outfitted with performance-monitoring equipment aimed at finding efficiencies and reducing environmental impacts, the company said.

Crews in busy harbor tugs spend long periods on board, putting a premium on comfort. *Clayton's* amenities include TV and high-speed Internet in the four cabins. There are three heads and two showers, a washer-dryer unit and separate climate controls in each cabin.

Vibration and engine noise are absorbed through acoustic ceiling tiles and flooring consisting of Endura tiles on top of fireproof plywood and Soundown urethane foam inserts.

Improvements to Moran's earlier 93-foot tugs made it into *Clayton* as well. These include closed-circuit camera systems that let crew see



## CLAYTON W. MORAN

### SPECIFICATIONS

**OWNER/OPERATOR:** Moran Towing Corp.  
**BUILDER:** Washburn & Doughty  
**DESIGNER:** Washburn & Doughty  
**DIMENSIONS:** 93' x 38' x 15.5'  
**MISSION:** Ship assist, escort and docking  
**CREW SIZE:** 4-6

### PROPULSION

- ◆ Engines: (2) EMD 12-710 mains each producing 3,000 hp
- ◆ Bollard pull: 80 tons
- ◆ Vessel speed: 14 knots
- ◆ Z-drives: (2) Schottel 1515
- ◆ Auxiliary generators: (2) 99-kW John Deere 4045 gensets

### DECK EQUIPMENT

- ◆ Winches: Markey DEPCF-52 hawser winch
- ◆ Cordage: 400' of 9" line
- ◆ Capstan: Markey CEW-60 capstan
- ◆ Fendering: (2) 24" Morse Rubber cylindrical bow fenders; Viking laminated fenders below; Morse 14' x 12" D-fender on sides and stern

### NAVIGATION GEAR

- ◆ Radar: Furuno NavNet 3D radars and electronic chart displays
- ◆ Compass: Furuno SC30 satellite compass; Ritchie Globemaster YB-600
- ◆ AIS: Furuno FA150
- ◆ Radio: Icom MC-604 VHF radio

### COMMUNICATIONS

- ◆ Fuel: 38,800 gallons
- ◆ Water: 4,134 gallons
- ◆ Lube oil: 1,000 gallons
- ◆ Firefighting: (2) stern-facing FFS monitors
- ◆ Fire pump: FFS pump capable of 10,200 gpm, driven by Caterpillar C32 pump engine

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what's happening above, below and on deck from the helm, and brighter, more efficient LED lights in crew spaces, for navigation and for use as floodlights.

The wheelhouse layout and equipment on *Clayton W. Moran* are virtually unchanged from recent deliveries in the series, a deliberate move aimed at consistency across the fleet. It features the same tall windows with 360-degree visibility and Furuno navigation equipment. The Furuno package includes NavNet 3D touch-screen radars and electronic chart displays, an FA150 AIS and SC30 satellite compass.

*Clayton* has a 75-hp Markey DEPCF-52 Class II electric hawser winch on the bow with render-recover to maintain constant line tension. The drum is capable of holding 400 feet of 9-inch line. Also on deck is a two-speed Markey CEW-60 electric capstan. To meet the operational demands of handling larger ships, this winch is a step up from the winches installed on the earlier 93-foot tugs.

*Clayton's* sister vessel *Cooper Moran* was delivered in fall 2016. It currently works in Savannah, where it has performed well.

Ships in the 10,000-TEU range regularly call on Savannah, and Droop said *Cooper Moran* has the power and bollard pull to safely handle the new Panamax ships with deeper drafts. He expects the same performance from *Clayton*, a near-identical twin.

"As it is a larger horsepower tug with efficient escort capability, it gives the pilot and bridge team a useful tool and asset for them in doing their jobs safely and without worrying about minimizing the horsepower on their ship," he said in a recent interview.

The 13th boat in the 93-foot series is under construction now. But as a Tier 4 boat, it required another foot of hull depth to accommodate larger engines and the urea-based aftertreatment system. Unlike the Tier 3 class powered by EMD mains, the Tier 4 tug will have more powerful Caterpillar 3156E engines, each producing 3,385 hp. The additional foot of depth also maximizes escort performance based on a computational fluid dynamics (CFD) study conducted by Glosten Associates of Seattle.

*Moran's* 93-foot tugs have received complimentary reviews from crews, customers and pilots over the years. In many ports where *Moran* works, these are the most powerful tugs in the harbor. ●

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**CHRISTINE S** | Petchem Inc., Cape Canaveral, Fla.

## Petchem tug turning heads in busy Florida port

Story and photos by Brian Gauvin

**W**ith larger ships now calling in at many East Coast ports, tugboat operators have responded by building more powerful azimuthing stern drive (ASD) tugboats that are more

capable of safely docking, undocking and escorting the massive vessels.

Answering the call, Tony and Alex Savas, owners of Petchem Inc., had *Christine S* built for the company's Port Canaveral, Fla.,

**Above, the 5,000-hp *Christine S* is the first ASD tug in Petchem's fleet. Inset, Petchem installed a JonRie InterTech Series 230 hawser winch on the bow.**

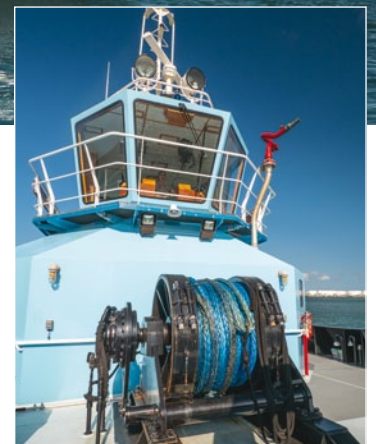
**Left, Capt. Walt Morgan helming *Christine S* in the Port Canaveral turning basin.**

fleet. Boasting 72.5 tons of bollard pull, the 5,000-hp, 80-foot tug packs abundant power for its size.

"It's crazy nice, that boat," said Alex Savas. "Everyone in the port is fascinated by the boat and I get nothing but good comments. It's the most powerful permanent tug in the port."

The new vessel, named for Tony's daughter, is the first ASD tug in Petchem's fleet. It replaces the original *Christine S*, a 96-foot utility boat with which the company began operations in Port Canaveral in 1983.

The Savas brothers landed a Navy contract in 1984 and added submarine fendering to their fledgling fleet of two older conventional tugs. The original *Christine S* was assigned the task of transferring submarine personnel. In 2004, after



★ Most powerful permanent tug in Port Canaveral ★ First U.S. tug with ZF 8000 z-drives ★ Fendering installed to handle Navy subs



securing a permit to compete with Seabulk Towing in Port Canaveral, Petchem hired Farrell & Norton Naval Architects of



Newcastle, Maine, and B&B Boat Builders of Bayou La Batre, Ala., to design and build the conventional tugs *Elizabeth S* and *Michael S*. Both were equipped for ship-assist work with a forward H-bitt but no winch.

To rationalize building a new tug with z-drive propulsion and a bow winch, Petchem sold *Michael S* to Mohawk Northeast of Groton, Conn. Mohawk, primarily a marine construction company, shortened the name to *Michael*. It also equipped the tug with a JonRie

Above, propulsion comes from twin 2,500-hp Cummins QSK60 engines. Right, *Christine S* is the first U.S. tug with ZF 8000 z-drive units.

InterTech Series 515 towing winch.

Once again, Petchem engaged Farrell & Norton to design *Christine S*, and Gulf Coast Steel, formerly B&B Boat Builders, to build the new tug. *Christine S* is fitted with two 2,500-hp Cummins QSK60 Tier 3 mains and ZF 8000 Series z-drives. Electrical power comes from two John Deere 99-kW units.



"The main design requirement was just to optimize the boat to fit into Petchem's existing business operation," said Tom Farrell, senior

### CHRISTINE S SPECIFICATIONS

**OWNER/OPERATOR:** Petchem Inc.  
**BUILDER:** Gulf Coast Steel  
**DESIGNER:** Farrell & Norton Naval Architects  
**DIMENSIONS:** 80' x 34' x 15' with 15.5' draft  
**MISSION:** Ship escort and docking  
**CREW SIZE:** 3

#### PROPULSION

- ◆ Engines: (2) 2,500-hp Cummins QSK60 Tier 3 mains
- ◆ Bollard pull: 72.5 tons
- ◆ Vessel speed: 12 knots
- ◆ Propellers: ZF Marine 8000 Series propulsion units
- ◆ Auxiliary generators: (2) 99-kW John Deere

#### NAVIGATION GEAR

- ◆ Radar: Furuno FR-8125
- ◆ Electronic chart display: Furuno GP32 GPS receiver and display
- ◆ Compass: Ritchie HB-845 Steel Boat compass
- ◆ AIS: Koden KAT-0100
- ◆ E-nav software: Furuno GP32 GPS receiver and display
- ◆ Autopilot: Simrad AP70

#### DECK EQUIPMENT

- ◆ Winches: JonRie Series 230 bow winch
- ◆ Cordage: 450' of Samson 2.5" rope
- ◆ Fendering: M&M Bumper Service

#### COMMUNICATIONS

- ◆ Radio: Icom M506 VHF

#### FIREFIGHTING

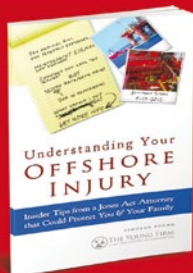
- ◆ Onboard fire suppression: Hiller Companies carbon dioxide firefighting system

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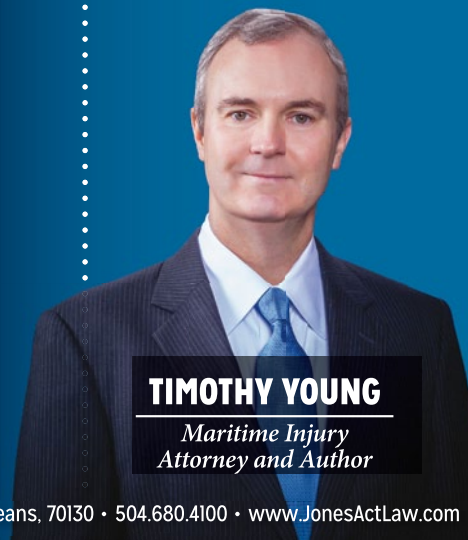


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naval architect at Farrell & Norton. “The horsepower and bollard pull were definitely major factors in the design. The engines and z-drives were chosen by the owner, and we worked the design of the hull around those two major components.

“Originally we had a little less horsepower and smaller z-drives, but when the decision was made to go with the larger equipment, we had to widen the boat to handle the increased power and size of the units,” he continued. “The increased width

also helped meet the stability criteria.”

*Christine S* is the first tugboat in the U.S. equipped with the huge ZF 8000 drive. These well-mounted z-drives give the tug a wide operational range. It can escort large ships and even Navy submarines, said Ed Schwarz, ZF Marine’s commercial thruster products manager.

The tug’s engineer, Billy Golding, noted the smooth operation and rapid response time of the ZF drives. He also described the spaciousness of the engine room despite the

beefy main engines.

“It is so clean and quiet,” Golding said. “At 5,000 hp at 1,900 rpm, these engines are so powerful for being so quiet.”

The bridge was designed around achieving 360 degrees of visibility and the best lines of sights for the operator, Farrell said. The result is great visibility and a surprisingly roomy space with a tight console arrangement that keeps electronics, propulsion and winch controls close at hand. The electronics components include Furuno radars, chart display, GPS and e-nav software. Other electronics include a Koden AIS, Simrad autopilot and Icom radios.

Like *Elizabeth S*, Petchem’s latest tug is equipped with an H-bitt on the bow. But unlike its predecessor, *Christine S* has a hawser winch on deck. The Savas brothers chose a JonRie Series 230 bow winch wound with 450 feet of Samson 2.5-inch rope.

“The JonRie Series 230 is a ‘super series’ winch, having a larger brake and more drum capacity to handle larger ships,” said Brandon Durar, president of Manahawkin, N.J.-based JonRie InterTech.

The ship set includes JonRie’s auto-tension system and an active heave compensation system utilizing a controlled freewheel option. The line pull of the winch is 30,000 pounds with a line speed of 100 fpm. The brakes are rated for 600,000 pounds.

The winch’s foot pedal controls are a notable safety feature, according to Capt. Rusty Vasbinder.

“It’s a great winch and having the foot pedals is very handy because you have your hands full while maneuvering,” he said. “After the deck hand gets a line up on a ship, he can then get out of the way. He isn’t in the bite of the line and can get away from it when it’s working.”

Vasbinder and fellow Capt. Walt Morgan found much to like on *Christine S*.

“It’s a sturdy and stable boat that is built very well,” said Vasbinder. “The electronics work very well and the (closed-circuit) system with four cameras is great for monitoring everything aboard. And this boat, with the Cummins engines, is so quiet and fun to drive. It’s a blast.”

“I love running this boat,” said Morgan, adding, “I like everything it does, the way it handles, and whatever you ask it to do, it does.”

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**DOUGLAS B. MACKIE** | Great Lakes Dredge and Dock Co., Oak Brook, Ill.

## GLDD considers versatile dredge ATB a 'game changer'

Story by John Gormley Photos by Brian Gauvin

**G**reat Lakes Dredge and Dock Company describes its new articulated tug-barge unit as “a game changer” and it’s easy to see why.

The 15,442-bhp tug *Douglas B. Mackie* and its hopper dredge barge *Ellis Island* are indeed unusual vessels. As they enter service this year, the barge will be the largest of its kind in the U.S. fleet. Together, the tug and barge represent the first ATB hopper dredge built in the U.S.

Another feature sets them apart: They will be remarkably fast for vessels of this type, capable of 14 knots

**Above, Eastern Shipbuilding crews working on the 15,442-hp ATB tug Douglas B. Mackie in late April. Right, the hopper dredge barge Ellis Island has a capacity of 14,788 cubic yards.**

with the barge fully loaded.

Speed might not seem like a major concern when deepening a

navigation channel or pumping sand onto a low-lying coastal area threatened by rising sea levels. Yet moving briskly between the dredging site and the dumping spot will be crucial to the ATB’s success.

“In dredging, to be competitive you want to be the low-unit-cost provider. In our research and development, that was our goal,” said Steve Becker, GLDD’s senior vice president, plant and equipment.

The amount of dredged material a vessel can carry in its hopper is a big factor in unit costs. *Ellis Island* has a capacity of 14,788 cubic yards — roughly 18 percent more than the next largest U.S. hopper dredge, according to Becker.

Time spent moving the hopper is also a major contributor to unit costs. On a land reclamation project, for example, the distance between the offshore source of the sand and land being reclaimed may be 50 miles. The dredge also will load and unload multiple times a day. “To be competitive, you need to be able to sail long distances at a given speed,” Becker said.

GLDD went to great lengths to achieve optimal hull forms for the tug and barge. The two hulls of an ATB are not as efficient as the single hull of a conventional ship. GLDD performed tank testing at MARIN (Marine Research Institute Netherlands) in Wageningen, Netherlands.

As a dredge, the GLDD ATB



★ First ATB hopper dredge built in the U.S. ★ Largest hopper dredge barge in U.S. fleet ★ Unit capable of 14 knots loaded



**DOUGLAS B. MACKIE**  
SPECIFICATIONS

**OWNER/OPERATOR:** Great Lakes Dredge & Dock Co.  
**BUILDER:** Eastern Shipbuilding Group  
**DESIGNER:** Ocean Tug/Barge Engineering, Ship Architects  
**DIMENSIONS:** 158.4' x 52' x 27.3' (draft)  
**MISSION:** Dual-mode ATB tug, power unit for trailing suction hopper dredge barge  
**CREW SIZE:** 26

**PROPULSION**

- ◆ Main engines: (2) Tier 3 MaK 12M32C producing 7,721 bhp each
- ◆ Propulsion gears: (2) OCG SA382-2S
- ◆ Shaft generators: (2) 6,600-volt Indar LSA-630S/4
- ◆ Bollard pull: 118 ST (tested to 100 tons)
- ◆ Vessel speed: 14 knots (loaded)
- ◆ Propellers: Schottel SCP 109/4XG CP in nozzles
- ◆ Rudders: (2) Van der Velden Barke flap type 530 BRA 45-40-15-CC-ABS
- ◆ Auxiliary generators: Tier 3 Caterpillar C32, 1,047 bhp
- ◆ Emergency generator: Tier 3 Caterpillar C18, 803 bhp

**DECK EQUIPMENT**

- ◆ Coupler system: Aricouple FRC 80
- ◆ Winches: Aft capstan, Coastal Marine C95-30-127-131; forward capstan, Coastal Marine C17-15-61-131

**NAVIGATION GEAR**

- ◆ Radar: Furuno FAR2117BB X-band; FAR21377BB

S-band

- ◆ Electronic chart display: Furuno FMD-3200
- ◆ Compass: Cassens & Plath Reflecta 1
- ◆ AIS: Furuno FA150
- ◆ E-nav software: Saab R5 Supreme
- ◆ Autopilot: Simrad AP70
- ◆ DP/DTE: Beier Radio IVCS 2000 single-station DP system

**COMMUNICATIONS**

- ◆ Radio: Furuno FM8900S
- ◆ Satellite connection: Furuno SC50 sat compass; KVH TracVision HD7 sat TV; SAILOR 900 sat Internet

**CAPACITIES**

- ◆ Fuel: storage, 236,000 gallons; day tanks, 15,000 gallons
- ◆ Water: 9,100 gallons

**FIREFIGHTING**

- ◆ Pumps: Goulds 3196 and 3796
- ◆ Onboard fire suppression systems: Hiller Companies Securiplex Fire-Scope 5000 water mist protection system

**COATINGS**

- ◆ Hull: International Marine Coatings

has operating characteristics that set it apart from typical ATBs — many of which transport oil products. Such ATBs are loaded and unloaded at the dock in static conditions, and the tug can disconnect from the barge as its draft changes. By contrast, the GLDD unit takes on and discharges its loads at sea in a variety of conditions. That means the GLDD ATB dredge has to adjust the connection in varying sea states as the relative elevation between the tug and the barge changes.

Another complication: This ATB will spend most of its time in shallow water, defined as no more than 1.5 times the vessels' draft. The tug's load-line draft is 27.3 feet.

Consequently, "all the model testing was done in shallow-draft conditions," Becker said. "The lines of the stern of the tug and bow of the barge are designed to be very efficient in the 1.5-times-draft range."

Shallow-water operations create the potential for diminished water flow to the tug's propellers, reducing speed and efficiency. Computerized fluid dynamic studies and tank testing helped GLDD optimize hull lines to counteract that problem. The combination of a twin gondola tug stern and spacing the props further apart than normal helps guide water to the props by creating

*Ellis Island (background) is equipped with engines generating more than 11,000 hp. Twin EMD diesels each producing 5,000 hp drive the dredge pumps. Douglas B. Mackie gets propulsion from twin MaK engines producing 7,721 hp each.*

"a nice smooth laminar flow." The result was an ATB exhibiting more ship-like efficiency when moving through the shallow water.

In addition to respectable speed (for a dredge), the ATB also boasts size. As noted, the 433-by-92-foot hopper dredge barge is the biggest in the industry. The rest of the ATB is sized proportionally. The company wanted "a bigger, better, stronger vessel," Becker said.

The two dredging suction pipes on the barge are 36 inches in diameter. The discharge pipes have 34-inch diameters. Each dredge pump is powered by a 5,000-bhp EMD diesel engine. Adding the 1,260 bhp from the Caterpillar C32 auxiliary generator gives the barge a total installed diesel capacity of 11,260 bhp.

The 158.4-foot tug is powered by two 7,721-bhp MaK 12M32C diesels producing a total output of 15,442 bhp. Each main engine connects to a gearbox with two outputs: a propulsion shaft and a generator shaft. Each main shaft generator has an output capacity of 4,189 bhp, for a total of 8,378 hp.

Two Caterpillar generators on the tug add 1,850 bhp for a total installed diesel capacity of 17,292 bhp. All this power from the tug is available for propulsion, the tug's various other systems, the bow thrusters on the barge and all dredging operations except the dredge pumps. Those are powered by the direct-drive EMD diesel engines on the barge. The tug also powers two jet pumps used to stir up the bottom when dredging and liquefy material in the hopper during unloading.

With all the diesel engines powering the systems aboard the tug and the barge, managing fuel becomes an important factor. The tug has "a very sophisticated load management program optimizing fuel consumption," Becker said.

The tug's controllable-pitch props play an important role in that system. Its diesel engines achieve optimal fuel consumption levels

Editor's note: For the *Ellis Island* specs go to: [professionalmariner.com/american-tugboat-review](http://professionalmariner.com/american-tugboat-review)



operating between 600 and 720 rpm near 100 percent load, Becker said.

Since the main engines are driving both the props and the main shaft generators, adjusting the pitch of the CP props makes it easier to distribute power needed for propulsion and other systems while keeping the engines at their optimal speed and load.

Economics are, of course, central to the ATB's success. So too is performing the dredging work correctly, especially when it comes to navigation channels. The location, depth and width of these channels must be executed with great precision. The barge is equipped with two variable-speed, fixed-pitch bow thrusters and two Van der Velden Barke flap rudders.

"In dredging, you need a great deal of maneuverability," Becker said. The powerful oversized rudders, combined with the bow thrusters, allow the ATB to maintain a precise course, while the CP props help the ATB carefully adjust its speed in the water.

The ATB is also equipped with a dynamic positioning/dynamic tracking (DP/DT) system. The DP helps the dredge hold position for discharging, while the DT allows for track dredging for more precise dredging or trenching.

The ATB crews (who will be members of the Seafarers International Union) will work on a four weeks on, four weeks off schedule — meaning comfort will be of great importance. The exact crew size has not been determined, but the tug can accommodate up to 26 people in 18 single cabins and four doubles. Common spaces will include a lounge, exercise room, galley and mess. The boat also will carry a full-time cook.

Insulating material to minimize vibration and noise has been installed throughout. GLDD hired a consultant to evaluate those issues and advise how to come up with a design that mitigates noise and vibration. To enhance crew safety, there are no steep stairs or ladders. All accessways are built along angles of 45 degrees or less.

Two ladders connect the tug and the barge. To ensure the safest possible transfers, the ladders — one on each side of the tug — are placed at different elevations. The starboard lower ladder is for loaded barge conditions, while the higher port-side ladder is for light barge conditions. Both

ladders are normally retracted on the tug. Strict communication protocols will be followed to initiate a transfer.

The firefighting system on the tug employs water mist. "We didn't want to risk CO2 with the manned spaces," Becker said. There is a CO2 system in the barge's unmanned engine room.

The tug is named after a GLDD chief executive officer who served in that post from 1995 until retiring in 2010. The barge is named after the island in New York harbor that was the U.S. entry point for millions of immigrants until 1954.

GLDD is the country's largest provider of dredging services. The ATB should stay busy once it enters service. Many East and Gulf Coast ports have deepened their channels to accommodate big post-Panamax ships passing through the Panama Canal's enlarged system of locks. Miami recently deepened its channels, Savannah is currently undergoing dredging, and several other ports are expected to seek bids soon.

The ATB will spend time on the Gulf Coast where large areas are being lost to erosion, subsidence and rising sea levels. The ATB's first job is expected to be a beach replenishment project on the East Coast.

GLDD originally announced in 2012 that it had contracted with Signal International to build the ATB in Orange, Texas, using a design by Ocean Tug/Barge Engineering. In 2013 work stopped at the request of GLDD, which later settled with Signal.

In 2014, GLDD hired Eastern Shipbuilding Group in Panama City, Fla., to finish construction. Detailed engineering of the tug was done by Ship Architects and of the barge by Bay Engineering. Becker said GLDD also contributed to the design.

In spring of 2017, that effort was nearing completion at Eastern.

"This project has been a challenge," said Steven J. Berthold, Eastern's vice president of sales and marketing. "We're a diversified shipyard and not afraid to take risks to help customers get their projects out the door. No matter how difficult the project, we've always delivered the vessel."

When delivered this year, ATB *Douglas B. Mackie/Ellis Island* will get to prove itself in the U.S. dredging industry. ●



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Marine Group Boat Works

**WORKBOAT 38** | General Dynamics NASSCO, San Diego

# New workboat replaces venerable NASSCO yard tug

by Rich Miller

**W**hen it came time to replace the venerable *Mr. Ed*, a yard tug that has served General Dynamics NASSCO for more than 35 years, there was no need to reinvent a proven performer — a couple of tweaks here, an equipment upgrade there and cleaner-burning engines filled the bill.

And the San Diego shipbuilder didn't have to look far to find a production partner. Marine Group Boat Works, located less than five miles from NASSCO, built the new *Workboat 38* at its solar-powered facility in National City. The 38-footer, designed by Jensen Maritime Consultants of Seattle, is unofficially called *Workboat 38*. It was still awaiting an official name at press time as it neared completion.

The new boat's duties will be much the same as *Mr. Ed*'s: repositioning hulls into dry docks, moving barges, deploying booms and helping to control newly launched ships. Like *Mr. Ed*, *Workboat 38* is

compact and has a flying bridge. Unlike its predecessor, the new boat has flanking rudders in addition to conventional rudders for increased maneuverability, and there are closed chocks in the hull form.

The biggest change is in the engine room. *Workboat 38* has a pair of Cummins QSL9M Tier 3 diesels delivering a total 810 hp, a bollard pull of 16,000 pounds and a service speed of 8 knots.

"That was one of the drivers, getting cleaner environmentally with the regulations that we have," said Vincent Magers, dockmaster for NASSCO in San Diego. "With *Mr. Ed*, we have the older diesel engines and they're being regulated more and more out here. What we have in there right now are 1979 Detroit Diesels. They're workhorses, but they're old dirty diesels."

Magers said *Workboat 38* has a slightly different hull form than *Mr. Ed*, featuring a more rounded bow. The designers also gave the new boat a 300-degree unobstructed

*Workboat 38*, shown at Marine Group Boat Works in National City, Calif., before final outfitting, will replace *Mr. Ed* at NASSCO's San Diego shipyard. Local children will help choose the vessel's permanent name.

line of sight from the pilothouse to complement the flying bridge.

"For what we do, flying bridges are great for visibility as long as you're not out in bad weather and stormy conditions," Magers said. "We tend not to go out too much in those, and in San Diego we don't have that too often."

Before the *Workboat 38* project, Marine Group Boat Works had a brief history with NASSCO dating back to when the builder of naval auxiliaries, tankers and container-ships tapped its neighbor for heavy steel construction, said Todd Roberts, president of Marine Group. The smaller yard has earned a reputation for superyacht refits but also is experienced in commercial work and the production of tugboats and dive boats for the U.S. Navy.

"When I first got to the yard in 2000, we were building the stack houses for the T-AKE (the Navy's dry cargo and ammunition ships)," he said. "We did that because they were so big you can only move them by water. So we'd build them in our yard and barge them up to NASSCO."

## WORKBOAT 38

### SPECIFICATIONS

**OWNER/OPERATOR:** General Dynamics NASSCO  
**BUILDER:** Marine Group Boat Works  
**DESIGNER:** Jensen Maritime Consultants  
**DIMENSIONS:** 38' x 15' x 5.5'  
**MISSION:** Harbor towing  
**CREW SIZE:** 2

### PUSPULSION

- ◆ Engines: (2) Cummins QSL9M, 405 hp each
- ◆ Bollard pull: 16,000 pounds
- ◆ Vessel speed: 8 knots
- ◆ Propellers: Michigan Wheel 38" diameter, 30" pitch
- ◆ Gearboxes: (2) ZF Marine 325-1, 2.97:1 reduction ratio
- ◆ Auxiliary generator: Northern Lights M673 LD3

### DECK EQUIPMENT

- ◆ Fendering: 8" Westflex D-fendering

### COMMUNICATIONS

- ◆ Radio: (2) Icom IC-M324 VHF

### CAPACITIES

- ◆ Fuel: 1,000 gallons

### FIREFIGHTING

- ◆ Pumps: Barnes ICU Series
- ◆ Onboard fire suppression system: Fireboy MA2-1000-227

### COATINGS

- ◆ Hull paint: International Marine Coatings

★ Tug will move hulls into dry dock, control launched vessels, deploy boom ★ Local children will choose permanent name



Roberts said both yards do a lot of Navy work but are also commercial-minded. The result is that that both companies “kind of look at things the same way,” which improved collaboration from the outset of the project, he said.

“It’s not a lot of boat, but it’s very unique,” Roberts said about *Workboat 38*. “Being a small builder, we were able to listen to what our customer said. The guys who run the boat around the yard and do a lot of work, they knew exactly how they wanted it, and we were able to take that vision and craft it into a design.”

NASSCO paid a lot of attention to the placement of the helm and chocks on *Workboat 38*, Roberts said, and all of the hardware that secures the fixed fendering is stainless steel and welded to the hull. “They were very specific about that,” he said.

The ability to build those ideas into a boat that is easy to operate and maintain can be traced to the repair side of Marine Group’s business, which accounts for three-quarters of the company’s work, Roberts said.

“People say, ‘The builder just can’t quite get my vision, they don’t understand how to do it.’ I hear that all the time,” he said. “We come out of the repair side of the house, so when we build our boats there is a way for the muffler to get out. We don’t stack a pump on top of something else — our boats are totally serviceable. When we showed the equipment layout to NASSCO, one of the first observations they made was, ‘Wow, we’re going to be able to get to everything.’ Well, that’s the way we build boats.”

Roberts said it also was critical for the new boat to be a zero-discharge vessel, a point of pride for both companies.

“NASSCO is just like Marine Group and all of us in San Diego, we run a very tight ship environmentally,” he said. “The new boat has fuel overflows for capture. Its sewage is all tanked — there is no valve, it can’t go over the side. It also has the ability to discharge its bilge water to the deckhead versus just going overboard. NASSCO definitely put forward their environmental stewardship as part of this program.”

Delivery of *Workboat 38* is expected this summer. In May, NASSCO announced it was holding a contest for local schoolchildren to choose its permanent name. ●

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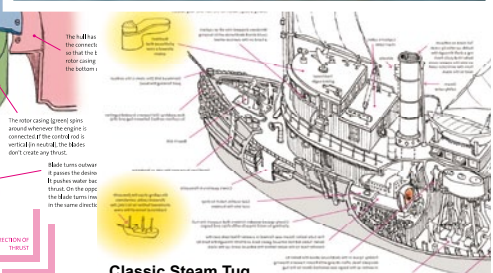
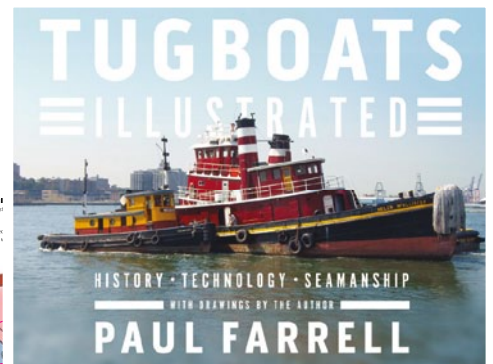
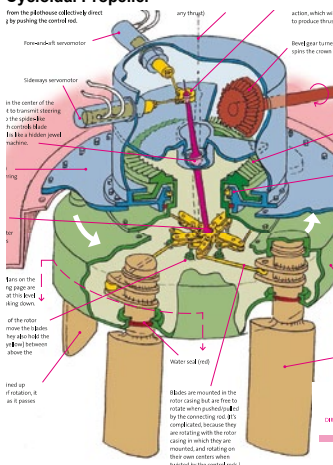
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### Cycloidal Propeller



A lifetime love of tugs, their design, their work and, yes, their beauty, shows through on every page of *Tugboats Illustrated*. It captures that elusive character of tugs that so many, who have spent lifetimes working on them, have so often been unable to explain — the magic that kept drawing them back even after retiring to a life ashore. Farrell’s training and career as an architect show through in the richly detailed illustrations. For mariners simply wanting to reflect on their worlds, or those wanting to explain their work to families and friends, this will be an essential addition to their nautical library. No one, shoreside observer or onboard mariner, will be able to put this book aside once they have delved into the drawings, photos and text that make this the most comprehensive tug book that this reviewer has ever seen. Alan Haig-Brown - *Professional Mariner February 2017*

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**INDEPENDENT** | Marine Towing of Tampa, Tampa, Fla.

## Marine Towing of Tampa's latest tractor tug arrives right on time

Story and photos by Casey Conley

Three years ago, after having taken delivery of *Patriot*, Marine Towing of Tampa co-founder Capt. James C. Brantner suggested the company would order another tugboat within “a couple of years.”

Based on his prediction, *Independent* arrived right on schedule: Washburn & Doughty delivered the 5,000-hp ASD tug in May 2017, and the East Boothbay, Maine, shipyard also provided plans for the vessel.

The 93-by-38-foot *Independent* has plenty in common with its

sister vessel *Patriot*, although it is by no means a carbon copy. Both have twin Caterpillar engines, Rolls-Royce z-drives, a JonRie InterTech double-drum hawser winch and a 75-ton bollard pull rating. But Marine Towing omitted the advanced firefighting equipment required for a FiFi-1 rating, and the JonRie stern winch is also absent from the latest build.

Capt. James R. Brantner, Marine Towing's port captain and CSO, said the company rarely performs ocean towing, making the stern winch unnecessary. Should such a need arise, *Patriot* could handle the job.

“It's not the kind of work we do. We just do the harbor work here in Tampa. We are not really geared up to go out and tow things, so we left the winch off it,” he said of *Independent*.

Marine Towing of Tampa operates four tugboats in and

**Top, *Independent* undergoing final outfitting dockside at Washburn & Doughty's East Boothbay, Maine, shipyard in late April. Sea trials began about 10 days later. Above right, Marine Towing installed a Timberland Equipment capstan on the stern, alongside a shipyard-built H-bitt. Left, the double-drum JonRie Series 220 hawser winch is wound with 400 feet of 9-inch Spectra line.**

around Tampa Bay and occasionally in Key West, Fla., about 250 miles south. The tugboats typically perform ship-handling work for tankers, bulk carriers and the occasional containership calling in Tampa Bay.

*Independent* is the company's fifth tugboat and its fourth from Washburn & Doughty. In addition to *Patriot*, the firm operates the 92-by-32-foot *Liberty* and *Freedom*, delivered in 2007 and 2005, respectively. It also oper-



ates *Endeavor*, a 90-by-50-foot ship-docking module built in 2000.

“The only difference between (*Independent*) and the other two boats, the *Freedom* and the *Liberty*, is she is 6 feet wider, so it gives you a lot more room inside for the crews, and she has a keel on her that is good for escorting,” Brantner said. “It is a lot more stable boat than the narrower ones.”

Washburn & Doughty delivered its first 93-foot tug six years ago, and the design has found wide acceptance across the industry. Moran Towing has ordered 13 93-footers, many of which are assigned to high-volume East Coast ports, and McAllister Towing and Seabulk Towing also have built tugs to this design.

Bruce Washburn, naval architect and executive vice president at the Maine shipyard, said the 93-foot tug represents an evolution from the 92-by-32-foot design. The enhanced keel and



★ Sister tug to *Patriot* delivered in 2013 ★ Updated design omits the stern winch ★ Tug joins Marine Towing of Tampa's z-drive fleet

wider beam translate to better escort performance and indirect escort stability. The wider bow also reduces direct pressure on a ship's hull.

"Compared to the other boats, it's got a much bigger fendering footprint to reduce the pressures imparted to the ships they are docking," Washburn said, referring to the Morse Rubber fendering applied at the bow.

Another benefit: The wider beam allows for roomier crew spaces, particularly in the engine room. The tug is powered by twin Caterpillar 3516C Tier 3 engines producing 2,500 hp each, and the port main also drives an FFS fire pump linked with an aft-facing FFS monitor located on the upper deck. A JonRie 75-hp hydraulic power unit for the bow winch sits between the two mains.

Alongside each engine are two Weka box coolers. Washburn said

**Propulsion aboard Independent comes from twin Caterpillar 3516C engines each generating 2,500 hp linked with Rolls-Royce US 205 z-drives through Centa carbon fiber shafting.**

the units are as effective as grid keel coolers but are located inside a sea chest in the hull, reducing drag in the water.

Aft of the main engine room is another room separated by a bulkhead. Inside are two John Deere 99-kW gensets providing ship service power, and twin Rolls-Royce US 205 z-drives. Those drives are connected to the Cat engines via carbon fiber Centa shafting.

Tim McLean, Washburn &



Doughty's project manager, said putting the generators in a separate space lets the engineer work in relative peace and quiet when

### INDEPENDENT SPECIFICATIONS

**OWNER/OPERATOR:** Marine Towing of Tampa  
**BUILDER:** Washburn & Doughty  
**DESIGNER:** Washburn & Doughty  
**DIMENSIONS:** 93' x 38' x 17'  
**MISSION:** Ship assist and docking  
**CREW SIZE:** 4-6

#### PROPULSION

- ◆ Engines: (2) Caterpillar 3516C mains producing 2,500 hp each
- ◆ Bollard pull: 75 tons
- ◆ Vessel speed: 12-14 knots
- ◆ Propellers: (2) Rolls-Royce US 205 azimuthing stern drives
- ◆ Auxiliary generators: (2) John Deere 4045 engines producing 99 kW

- ◆ Capstan: Timberland Equipment 10-ton capstan
- ◆ Fendering: Morse Rubber

#### NAVIGATION GEAR

- ◆ Radar: (2) Furuno NAVnet TZtouch 14" with chartplotter/AIS and radar overlay
- ◆ AIS: (1) Furuno transceiver
- ◆ Weather system: Furuno Ultrasonic weather station

#### DECK EQUIPMENT

- ◆ Winches: JonRie InterTech Series 220 double-drum hawser winch
- ◆ Cordage: 400' of 9" Spectra line

#### COMMUNICATIONS

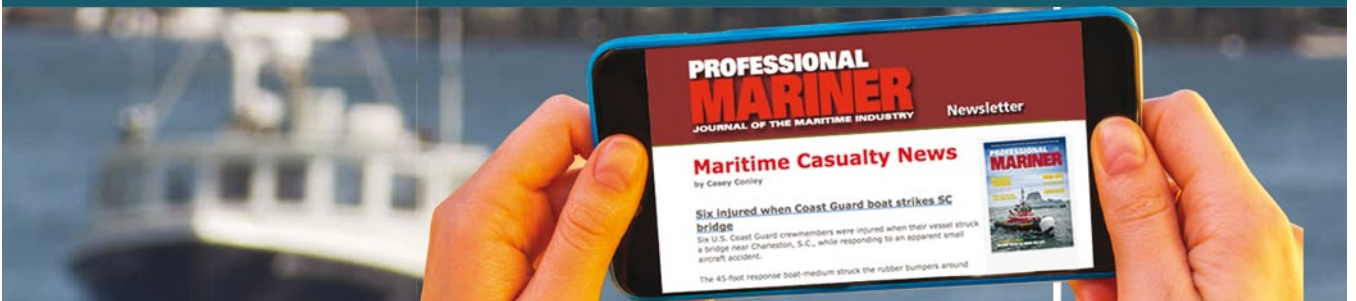
- ◆ Radio: (3) VHF units

#### CAPACITIES

- ◆ Fuel: 38,000 gallons
- ◆ Water: 4,000 gallons

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the vessel is tied up. Shutting the bulkhead door also muffles generator noise to other parts of the boat.

*Independent* will operate with four crew: captain, mate, engineer and deck hand. Crew spaces above the engine room consist of four cabins — two singles and two doubles — and two full heads with showers, one of which is attached to the captain's quarters. There is also a day head. The galley has stainless steel appliances and cabinets made by Senecal Construction Services of Brunswick, Maine.

The vessel has satellite TV and Internet access for crew, who typically work a week on and a week off. During that time they live on board. Consequently, the vessel is “decked out” to keep them comfortable during on and off hours, Brantner said.

In a cabinet alongside the galley, a server rack holds much of the vessel's IT and telecom infrastructure, including equipment for a 13-camera closed-circuit TV system. Images from the cameras appear on a pilothouse monitor, alongside Furuno electronics and navigation equipment.

“The captain can easily look at all the cameras in the engine room and see where the engineer is at,” Brantner said. “In the past, they didn't have anything like that and they would have to call around and wait for a response.”

“The whole engine room is covered,” he added. “There are two pan-tilt-zoom cameras on the mast, and a couple of them fixed looking forward and one fixed looking aft.”

Although there is no towing winch on the stern, Marine Towing installed a Timberland Equipment capstan rated for 20,000 pounds alongside a shipyard-built steel H-bitt. The decks are coated in an aggressive poured rubber non-skid coating. The coating works as expected — traction was no problem during a vessel tour on a cool, damp spring morning.

Forward of the pilothouse is a JonRie Series 220 double-drum hawser winch spooled with 400 feet of 9-inch Spectra line. JonRie President Brandon Durar said the double drum allows for a second line to be connected with the ship.

“This concept, used on the Panama

Canal for many years as a redundant line tethered to the ship, also acts as an escort bridle, making the tug more stable in prop wash during long escorts,” Durar said. “The twin drums also afford less loading on each rope under braking.”

The winch features foot-pedal controls for hands-free operation and constant tension capabilities, and it has an auto-abort system. It offers line speed of 100 feet per minute, a 600,000-pound brake rating and 18 tons of line pull.

Marine Towing has typically replaced an existing vessel after taking delivery of a new tug. As of early May, it wasn't clear how *Independent's* arrival would affect the company's fleet. In any case, Brantner was looking forward to getting its latest boat in the water.

Asked to describe what he liked most about *Patriot's* performance, Brantner responded, “Is ‘everything’ too broad?” He has similar expectations for *Independent*.



## OCEAN TUG & BARGE ENGINEERING



Courtesy www.boatherd.com

“MARIYA MORAN, from Bay Shipbuilding, in Wisconsin (6000 HP Intercon Connection)



Courtesy Tugboat Graffiti 2016

“HEATH WOOD” from Bay Ship in Wisconsin (6000 HP, Intercon Connection)



Courtesy Tugboat Graffiti 2016

“GRACIE REINAUER” Owner Rein-aer Transportation, LAUNCHED AT Senesco in North Kingstown, RI, (4000 HP, Intercon Connection)



Courtesy Nichols Bros.

“ABUNDANCE”, Owner, Savage Marine Services, launched at Nichols Bros. in Freeland, Washington (8000 HP, Articouple Connection)

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# TRACTOR TUGS IN NORTH AMERICA

Operator Tugboat	Year	Length	Builder	HP	Propulsion/Company	Engine
<b>Amak Towing, Ketchikan, Alaska</b>						
Brian T (ex-Escort Eagle)	1995	109 ft	Nichols Brothers	3,100	z-drive aft/Aqua	Cat
Anna T (ex-Pacific Explorer)	1998	105 ft	Marco Shipyard	4,400	z-drive aft/Aqua	Cat
<b>AmNav Maritime Services, San Francisco (Marine Resources Group/Foss)</b>						
Pacific Combi	1967	95 ft	Martinlich Shipbuilding	3,600	Combi-tug	EMD
Liberty (ex-Peter Foss)	1999	97 ft	Main Iron Works	4,000	z-drive aft/Ulstein	Cat
Revolution	2006	78 ft	Foss/Rainier	5,080	z-drive aft/Rolls-Royce	Cat
Independence	2007	78 ft	Foss/Rainier	5,080	z-drive aft/Rolls-Royce	Cat
Sandra Hugh	2008	78 ft	Foss/Rainier	5,080	z-drive aft/Rolls-Royce	Cat
Patricia Ann	2008	78 ft	Foss/Rainier	5,080	z-drive aft/Rolls-Royce	Cat
Freedom	2009	90 ft	Honolulu Marine	4,400	z-drive/Rolls-Royce	Cat
<b>ArcelorMittal Mines Canada, Port Cartier, Quebec</b>						
Brochu	1973	100 ft	Star Shipyard	3,600	cycloidal/Voith	Alco
Vachon	1973	100 ft	Star Shipyard	3,600	cycloidal/Voith	Alco
<b>Atlantic Towing Ltd., Saint John, New Brunswick, Canada</b>						
Atlantic Spruce	1997	101 ft	East Isle Shipyard	4,004	z-drive aft/Aqua	Cat
Atlantic Hemlock	1996	95 ft	East Isle Shipyard	4,004	z-drive aft/Aqua	Cat
Atlantic Willow	1998	95 ft	East Isle Shipyard	4,004	z-drive aft/Aqua	Cat
Atlantic Larch	2000	101 ft	East Isle Shipyard	4,004	z-drive aft/Aqua	Cat
Atlantic Oak	2004	101 ft	East Isle Shipyard	5,000	z-drive aft/Aqua	Cat
Atlantic Fir	2005	101 ft	East Isle Shipyard	5,000	z-drive aft/Rolls-Royce	Cat
Atlantic Cedar	2005	101 ft	East Isle Shipyard	5,000	z-drive aft/Aqua	Cat
Atlantic Beaver	2008	101 ft	East Isle Shipyard	5,800	z-drive aft/Aqua	Cat
Atlantic Bear	2008	101 ft	East Isle Shipyard	5,800	z-drive aft/Aqua	Cat
Spitfire III	2008	101 ft	East Isle Shipyard	5,800	z-drive aft/Aqua	Cat
Atlantic Legacy, Guapo Warrior	2014	94 ft	Damen Shipyard	5,000	z-drive aft	Cat
Kairi, Manatee	2014	94 ft	Damen Shipyard	5,000	z-drive aft	Cat
<b>Baydelta Maritime, San Francisco</b>						
Delta Billie	2009	100 ft	Nichols Brothers	6,850	z-drive aft/Rolls-Royce	Cat
Delta Cathryn	2009	100 ft	Nichols Brothers	6,850	z-drive aft/Rolls-Royce	Cat
Delta Audrey	2014	100 ft	Nichols Brothers	6,800	z-drive aft/Rolls-Royce	Cat
<b>Bay-Houston Towing, Houston</b>						
William M	1989	102 ft	North American Shipbuilding	4,000	z-draft fwd/Ulstein	EMD
Matthew K	2000	100 ft	Main Iron Works	4,300	z-drive aft/Ulstein	EMD
Wesley A	2007	98 ft	Main Iron Works	6,300	z-drive aft/Schottel	Cat
Rosemary	2008	96 ft	Eastern Shipbuilding	6,000	z-drive aft/Schottel	EMD
Lexie M, Hunter M	2008/9	98 ft	Orange Shipbuilding	6,300	z-drive aft/Schottel	Cat
Chloe K	2013	80 ft	Leevac	5,150	z-drive aft/Schottel	Cat
H. Douglas M	2016	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
Zyana K	2016	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
David B	2016	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
Laura B	2016	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
<b>Bisso Towboat, New Orleans</b>						
Cecilia B. Slatten	1999	100 ft	Main Iron Works	4,300	z-drive aft/Aqua	EMD
Alma S	2006	100 ft	Main Iron Works	4,300	z-drive aft/Rolls-Royce	EMD
Michael S	2009	100 ft	Main Iron Works	4,000	z-drive aft/Rolls-Royce	Cat
William S	2012	100 ft	Main Iron Works	4,000	z-drive aft/Rolls-Royce	Cat
Becky S	2015	100 ft	Main Iron Works	4,480	z-drive aft/Rolls-Royce	Cat
Mr. Ruben	2016	100 ft	Main Iron Works	4,480	z-drive/Rolls-Royce	Cat
<b>Boston Towing &amp; Transportation, Boston (Unit of Reinauer Transportation)</b>						
Freedom	2003	87 ft	Washburn & Doughty	4,400	z-drive aft/Rolls-Royce	Cat
Liberty	2003	87 ft	Washburn & Doughty	4,400	z-drive aft/Rolls-Royce	Cat
Independence	2009	120 ft	Derektor Shipyard	5,400	z-drive aft, CP props	MTU
Justice	2009	98 ft	Martinac Shipbuilding	5,400	z-drive aft, CP props	MTU
<b>Brusco Tug &amp; Barge, Longview, Wash.</b>						
Wynema Spirit	2001	78 ft	Diversified Marine	3,600	z-drive aft/Ulstein	MTU
Lulapin	2005	78 ft	Diversified Marine	4,000	z-drive aft/Rolls-Royce	Cat
Simone Brusco	2013	78 ft	Diversified Marine	4,000	z-drive/Rolls-Royce	Cat
Peter J Brix	2014	78 ft	Diversified Marine	4,000	z-drive/Rolls-Royce	Cat
Bo Brusco	2014	78 ft	Diversified Marine	4,750	z-drive/Rolls-Royce	Cat
Sarah	2015	78 ft	Diversified Marine	4,750	z-drive/Rolls-Royce	Cat
<b>Canadian Navy (Glen series of Voith-Schneider tugs)</b>						
Glendale, Glendyne	1975	95 ft	Yarrow Shipyard	1,750	Cycloidal/Voith-Schneider	
Glenbrook, Glenevis, Glenside	1976-78	95 ft	Georgetown Shipyard	1,750	Cycloidal/Voith-Schneider	
<b>Cook Inlet Tug &amp; Barge, Anchorage, Alaska (unit of Foss Maritime)</b>						
Stellar Wind	1993	85 ft	Tri-Star Marine	3,500	z-drive aft/Ulstein	Cat
Glacier Wind	1997	65 ft	Tri-Star Marine	2,450	z-drive aft/Ulstein	Cummins
<b>Crescent Towing, New Orleans (Unit of Cooper T. Smith)</b>						
Point Clear	1999	104 ft	Thoma-Sea	5,200	z-drive aft/Ulstein	GE
Savannah	2002	96 ft	Bollinger Shipyards	4,000	z-drive aft/Ulstein	Cat
Bulldog	2005	98 ft	Washburn & Doughty	6,700	z-drive aft/Rolls-Royce	GE
Lisa Cooper	2010	92 ft	C&G Boat Works	5,225	z-drive aft/Rolls-Royce	GE
J.K. McLean	2011	92 ft	C&G Boat Works	5,225	z-drive aft/Rolls-Royce	GE
David J. Cooper	2012	92 ft	C&G Boat Works	5,225	z-drive aft/Rolls-Royce	GE
Mardi Gras	2016	92 ft	Steiner Shipyard	5,500	z-drive aft/Rolls-Royce	GE
Arkansas	2017	92 ft	Steiner Shipyard	5,500	z-drive aft/Rolls-Royce	GE
South Carolina	2017	92 ft	Steiner Shipyard	5,500	z-drive aft/Rolls-Royce	GE
<b>Crowley Marine Services, Seattle</b>						
Tioga	1994	85 ft	Tri-Star Marine	4,500	z-drive aft/Ulstein	Cat
Profector, Guard	1996/7	120 ft	Nichols Brothers	5,500	cycloidal/Voith	Cat
Master, Admiral, Guide	1998	105 ft	Nichols Brothers	4,800	cycloidal/Voith	Cat
Leader, Scout, Chief	1999	105 ft	Nichols Brothers	4,800	cycloidal/Voith	Cat
Nanua, Tan'erliq	1999	153 ft	Dakota Creek	10,192	cycloidal/Voith	Cat
Alert, Aware, Attentive	1999	140 ft	Dakota Creek	10,192	z-drive aft/Ulstein	Cat
Response	2003	129 ft	Marco Shipyard	7,260	cycloidal/Voith	Cat
Goliath (ex:S/R Mare Is.)	1997	105 ft	Marco Shipyard	5,150	z-drive aft/Aqua	Cat
Valor, Vigilant, Veteran	2007/8	100 ft	Nichols Brothers	6,800	z-drive aft/Rolls-Royce	Cat
Hawaii	2013	120 ft	JT Marine Inc.	5,358	z-drive/Schottel	GE
Washington	2014	120 ft	JT Marine Inc.	5,358	z-drive/Schottel	GE
<b>Dunlap Towing, Everett, Wash.</b>						
James Dunlap	1995	101 ft	Hansen Boat	4,300	z-drive aft/Ulstein	EMD
Gretchen Dunlap	2015	101 ft	Hansen Boat	6,800	z-drive/Rolls-Royce	Cat
<b>E.N. Bisso &amp; Son, New Orleans</b>						
Josephine Anne	2007	96 ft	Eastern Shipbuilding	4,000	z-drive aft/Rolls-Royce	Cat
Beverly B	2010	96 ft	Eastern Shipbuilding	4,000	z-drive aft/Rolls-Royce	Cat
Elizabeth B	2010	96 ft	Eastern Shipbuilding	4,000	z-drive aft/Rolls-Royce	Cat
Aura	2013	87 ft	Great Lakes Shipbuilding	4,600	z-drive/Rolls-Royce	Cat



# TRACTOR TUGS IN NORTH AMERICA

Operator Tugboat	Year	Length	Builder	HP	Propulsion/Company	Engine
Archie T. Higgins	2015	96 ft	Eastern Shipbuilding	4,000	z-drive/Rolls-Royce	Cat
Gladys B	2016	80 ft	Signet Shipbuilding & Repair	5,300	z-drive/Rolls-Royce	MTU
<b>Edison Chouest Offshore, Galliano, La.</b>						
LOOP Responder	1992	155 ft	North American Shipbuilding	7,300	cycloidal/Voith	Cat
C-Tractor 2 - 5	1989-93	102 ft	North American Shipbuilding	4,200	z-drive aft/Ulstein	EMD
C-Tractor 6	1994	82.8 ft	North American Shipbuilding	4,800	z-drive aft/Ulstein	Cat
C-Tractor 7 - 10	1994	90 ft	North American Shipbuilding	2,400	z-drive aft/Ulstein	Cat
C-Tractor 11	1994	82.8 ft	North American Shipbuilding	4,800	z-drive aft/Ulstein	Cat
C-Tractor 12 - 14	1996/9	105 ft	North American Shipbuilding	4,000	z-drive fwd/Ulstein	Cat
C-Tractors 15-18	2007	110 ft	Gulf Ship	5,500	z-drive fwd	Cat
(Chartered to Cheniere Energy LNG as SP Amber, SP Coral, SP Ivory, and SP Pearl.)						
C-Tractor 19-22	2009	110 ft	Gulf Ship	5,500	z-drive fwd	Cat
<b>Express Marine, Camden, N.J.</b>						
Duty	2006	102 ft	Patti Shipyard	3,000	z-drive aft/SteerProp	Cat
<b>Foss Maritime, Seattle (Foss Marine Holdings)</b>						
Brynn Foss	1982/07	100 ft	Tacoma Boatbuilding	4,700	z-drive/Voith	EMD
Andrew Foss	1982	106.7 ft	Tacoma Boatbuilding	4,000	cycloidal/Voith	EMD
Arthur Foss	1982	107 ft	Tacoma Boatbuilding	4,000	cycloidal/Voith	EMD
P.J. Brix	1982	87 ft	Marine Industries	2,560	z-drive aft/Niigata	Cat
Henry Foss, Wedell Foss	1982/05	100 ft	Tacoma Boatbuilding	5,000	z-drive/Voith	EMD
Lindsey Foss	1993	155 ft	Trinity Marine	8,000	cycloidal/Voith	EMD
Daniel Foss	1998	95.2 ft	Conversion	3,300	z-drive aft/Ulstein	Cat
Marshall Foss, Lynn Marie	2001	98 ft	Halter Marine	6,250	z-drive aft/Ulstein	MTU
Garth Foss	1994	155 ft	Trinity Marine	8,000	cycloidal/Voith	EMD
Campbell Foss (hybrid)	2006	78 ft	Foss/Rainier	5,080	z-drive aft/Rolls-Royce	Cat
Pacific Escort	2007	100.2 ft	Foss/Rainier	3,000	z-drive aft/Voith	Cat
America, Pacific Star	2008	98 ft	J.M. Martinac	6,610	z-drive aft/Niigata	MTU
Alta June	2008	78 ft	Foss/Rainier	5,080	z-drive aft/Rolls-Royce	Cat
Carolyn Dorothy (hybrid)	2008	78 ft	Foss/Rainier	5,000	z-drive aft/Rolls-Royce	Cummins
Delta Lindsey	2010	100 ft	Nichols Brothers	6,850	z-drive aft/Rolls-Royce	Cat
Tiger 8,9	2009	86 ft	Kewalo Shipyard	4,400	z-drive aft/HRP	Cat
<b>Foss Maritime, Hawaii Region (Foss Marine Holdings)</b>						
Eleu	1989	73 ft	J.M. Martinac	2,800	z-drive aft/Niigata	Cat
Mamo	1996	78 ft	Trinity Marine	3,300	z-drive aft/Ulstein	Cat
Mikiala II	1977/01	100 ft	Main Iron Works/Foss	3,300	z-drive aft/Ulstein	Cat
Mikioi	2004	78 ft	Foss Rainier shipyard	4,700	z-drive aft/Rolls-Royce	Cat
Pi'ilani	2005	78 ft	Foss Rainier shipyard	5,080	z-drive aft/Rolls-Royce	Cat
<b>Fournier Tugs Inc., Belfast, Maine</b>						
Fournier Tractor	1984	85 ft	Main Iron Works	3,500	z-drive aft/Ulstein	EMD
Taurus (ex-Lesli M)	1952	101 ft	National Steel & Shipbuilding	4,600	z-drive aft	EMD
<b>Harbor Docking, Lake Charles, La.</b>						
Ted, George	2008/9	105 ft	Main Iron Works	6,140	z-drive aft/Rolls-Royce	EMD
Pat	2013	96 ft	Main Iron Works	6,300	z-drive/Rolls-Royce	Cat
<b>Harley Marine Services, Seattle</b>						
Gyrfalcon	1995	105 ft	Marco Shipyard	4,000	z-drive aft/Ulstein	Cat
Z-3, Z-4, Z-5	1999	94 ft	Marco Shipyard	4,000	z-drive aft/Ulstein	Cat
Millennium Falcon	2000	105 ft	Marco Shipyard	4,400	z-drive aft/Ulstein	Cat
Millennium Star	2000	105 ft	Marco Shipyard	4,400	z-drive aft/Ulstein	Cat
Millennium Dawn	2002	105 ft	Marco Shipyard	4,400	z-drive aft/Ulstein	Cat
Millennium Maverick	1996	100 ft	Trinity/Halter	4,300	z-drive aft/Aqua	EMD
Tim Quigg	2004	80 ft	Diversified Marine	4,500	z-drive aft/Rolls-Royce	Cat
John Quigg	2004	80 ft	Diversified Marine	4,800	z-drive aft/Rolls-Royce	Cat
Bob Franco	2013	100 ft	Diversified Marine	5,360	z-drive aft/Schottel	Cat
Robert Franco	2013	100 ft	Nichols Brothers	6,850	z-drive aft/Rolls-Royce	Cat
Ahbra Franco	2013	100 ft	Nichols Brothers	6,890	z-drive aft/Rolls-Royce	Cat
Lela Franco	2014	80 ft	Diversified Marine	5,150	z-drive aft/Rolls-Royce	Cat
Michelle Sloan	2015	80 ft	Diversified Marine	5,150	z-drive aft/Rolls-Royce	Cat
Earl W. Redd	2017	120 ft	Diversified Marine	5,350	z-drive/Rolls-Royce	Cat
<b>Knutson Towboat Company</b>						
Centennial (ex-Kamaehu)	1993	72 ft	Knutson Marine	3,000	z-drive aft/Schottel	Cummins
<b>Marine Towing of Tampa, Tampa, Fla.</b>						
Endeavor	2000	80 ft	Halter Marine	4,200	z-drive inline/Ulstein	Wärtsilä
Freedom	2005	92 ft	Washburn & Doughty	5,000	z-drive aft/Rolls-Royce	Cat
Liberty	2007	92 ft	Washburn & Doughty	5,000	z-drive aft/Rolls-Royce	Cat
Patriot	2013	93 ft	Washburn & Doughty	5,000	z-drive aft/Rolls-Royce	Cat
<b>McAllister Towing &amp; Transportation Co., Inc.</b>						
Steven McAllister	1963/07	109 ft	Southern Shipbuilding	4,000	z-drive aft/Schottel	Cat
Ellen McAllister	1966/07	109 ft	Marinette Marine	4,000	z-drive aft/Schottel	Cat
Dorothy McAllister	1971/06	109 ft	Marinette Marine	4,000	z-drive aft/Schottel	Cat
Stacy McAllister	1970/05	95.5 ft	Peterson Builders	4,000	z-drive aft/Schottel	Cat
Robert E. McAllister	1970/05	109 ft	Peterson Builders	4,000	z-drive aft/Schottel	Cat
Donal G. McAllister	1970/02	109 ft	Marinette Marine	3,000	z-drive aft/Schottel	EMD
Kaleen M. McAllister	1970/02	109 ft	Southern Shipbuilding	3,300	z-drive aft/Schottel	EMD
Timothy McAllister	1970/06	109 ft	Marinette Marine	4,000	z-drive aft/Schottel	Cat
Margaret McAllister	1970/06	109 ft	Marinette Marine	4,000	z-drive aft/Schottel	Cat
Patrick M. McAllister	1974/02	102 ft	Marinette Marine	5,150	z-drive aft/Ulstein	EMD
Beth M. McAllister	1974/03	109 ft	Peterson Builders	3,000	z-drive aft/Schottel	Cat
Matthew McAllister (ex-Orion)	1982	95 ft	Mid-Coast Marine	3,000	cycloidal/Voith	EMD
Alex McAllister	1985	95 ft	Eastern Shipbuilding	4,000	z-drive aft/Ulstein	EMD
Brooklyn McAllister	1986	115 ft	Offshore Shipbuilding	4,000	z-drive aft/Schottel	EMD
Erin McAllister	1996/01	95.5 ft	Trinity Marine	5,100	z-drive aft/Ulstein	Cat
Vicki M. McAllister	2001	96 ft	Eastern Shipbuilding	4,650	z-drive aft/Schottel	EMD
Emily Anne McAllister	2003	98 ft	Eastern Shipbuilding	4,650	z-drive aft/Schottel	EMD
A.J. McAllister	2003	98 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	EMD
Moir McAllister (ex-Independent)	2003	92 ft	Washburn & Doughty	5,000	z-drive aft/Rolls-Royce	Cat
Rainbow	2004	92 ft	Washburn & Doughty	5,000	z-drive/Rolls-Royce	Cat
Rosemary	2008	98 ft	Eastern Shipbuilding	6,000	z-drive aft/Schottel	EMD
Andrew McAllister	2008	98 ft	Eastern Shipbuilding	6,000	z-drive aft/Schottel	EMD
Gregg McAllister	2008	82 ft	Eastern Shipbuilding	4,000	z-drive aft/Schottel	Cat
Reid McAllister	2008	82 ft	Eastern Shipbuilding	4,000	z-drive aft/Schottel	Cat
Bridget McAllister (ex-Leo)	2006	78 ft	Foss Shipyard	5,080	z-drive aft/Rolls-Royce	Cat
Buckley McAllister	2014	96 ft	Senesco Marine	5,150	z-drive/Schottel	Cat
Eric McAllister	2014	96 ft	Senesco Marine	5,150	z-drive/Schottel	Cat
Tate McAllister	2014	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Janet M McAllister	2001	96 ft	Eastern Shipbuilding	4,650	z-drive aft/Schottel	EMD
Jeffrey McAllister	2017	96 ft	Eastern Shipbuilding	5,000	z-drive aft/Schottel	EMD
Capt. Brian McAllister	2017	100 ft	Horizon Shipbuilding	6,772	z-drive aft/Schottel	Cat
Rosemary McAllister	2017	100 ft	Horizon Shipbuilding	6,772	z-drive aft/Schottel	Cat

# TRACTOR TUGS IN NORTH AMERICA

Operator Tugboat	Year	Length	Builder	HP	Propulsion/Company	Engine
<b>McKeil Marine, Hamilton, Ontario</b>						
Leonard M	1986	110 ft	McTay Marine	4,000	z-drive aft/Rolls-Royce	
Sharon MI	1993	114 ft	Imamura Shipbuilding	4,000	z-drive aft/R expeller	
Beverly MI	1993	114 ft	Imamura Shipbuilding	4,000	z-drive aft/R expeller	
Lois M	1991/2014	107.5 ft	Matsuura Iron Shipbuilding	4,800	z-drive aft/R expeller	
Tim McKeil (ex Pannawonica I)	1991/2014	107.5 ft	Matsuura Iron Shipbuilding	4,800	z-drive aft/R expeller	
<b>Moran Towing, New Canaan, Conn.</b>						
Patricia Moran	1962/99	80 ft	Jakobson Shipyard	4,200	z-drive aft/Rolls-Royce	EMD
Sewells Point	1977/95	100 ft	Jakobson Shipyard	3,005	z-drive fwd/Mortrac	DD/EMD
Harriett Moran	1978/96	100.5 ft	Jakobson Shipyard	3,005	z-drive fwd/Mortrac	DD/EMD
Town Point	1978/98	100 ft	Jakobson Shipyard	3,005	z-drive fwd/Mortrac	DD/EMD
Drum Point	1986/97	100 ft	Jakobson Shipyard	3,005	z-drive fwd/Mortrac	DD/EMD
Z-One	1996	87.7 ft	Halter Marine	4,000	z-drive aft/Ulstein	BTA
Fort Bragg	1998	92 ft	Washburn & Doughty	4,400	z-drive aft/Ulstein	Cat
Elizabeth Turecamo	1998	110 ft	Eastern Shipbuilding	6,140	z-drive aft/Aqua	EMD
Marci Moran	1999	92 ft	Washburn & Doughty	4,200	z-drive aft/Rolls-Royce	EMD
Karen Moran	1999	92 ft	Washburn & Doughty	4,200	z-drive aft/Rolls-Royce	EMD
Kerry Moran	1999	100 ft	Jakobson Shipyard	4,200	z-drive aft/Ulstein	EMD
Susan Moran	1999	92 ft	Washburn & Doughty	4,200	z-drive aft/Rolls-Royce	EMD
Tracy Moran	2000	92 ft	Washburn & Doughty	4,200	z-drive aft/Rolls-Royce	EMD
Surrie Moran	2000	92 ft	Washburn & Doughty	4,200	z-drive aft/Ulstein	EMD
Wendy Moran	2000	92 ft	Washburn & Doughty	4,200	z-drive aft/Rolls-Royce	EMD
Diane Moran	2001	92 ft	Washburn & Doughty	5,100	z-drive aft/Ulstein	EMD
Gramma Lee T. Moran	2002	92 ft	Washburn & Doughty	5,100	z-drive aft/Ulstein	EMD
Kaye E. Moran	2003	92 ft	Washburn & Doughty	5,100	z-drive aft/Ulstein	EMD
James R. Moran	2004	92 ft	Washburn & Doughty	5,100	z-drive aft/Ulstein	EMD
Lynne Moran	2005	92 ft	Washburn & Doughty	5,100	z-drive aft/Ulstein	EMD
Edward J. Moran	2006	98 ft	Washburn & Doughty	6,500	z-drive aft/Rolls-Royce	EMD
April Moran	2006	92 ft	Washburn & Doughty	5,100	z-drive aft/Schottel	EMD
Eleanor F. Moran	2007	92 ft	Washburn & Doughty	5,100	z-drive aft/Schottel	EMD
Laura K. Moran	2008	92 ft	Washburn & Doughty	5,100	z-drive aft/Schottel	MTU
Capt. Jimmy T. Moran	2008	86 ft	C&G Boat Works	5,100	z-drive aft/Schottel	MTU
Shiney V. Moran	2009	86 ft	C&G Boat Works	5,100	z-drive aft/Schottel	MTU
Catherine C. Moran	2009	98 ft	Washburn & Doughty	6,000	z-drive aft/Rolls-Royce	EMD
Loretta B. Moran	2010	98 ft	Washburn & Doughty	6,000	z-drive aft/Rolls-Royce	EMD
Lizzy B. Moran	2010	92 ft	Washburn & Doughty	5,100	z-drive aft/Schottel	MTU
James A. Moran	2011	93 ft	Washburn & Doughty	6,000	z-drive aft/Schottel	MTU
Mark Moran	2012	86 ft	Washburn & Doughty	5,100	z-drive aft/Schottel	MTU
Katie T. Moran	2012	86 ft	Washburn & Doughty	5,100	z-drive aft/Schottel	MTU
Annabelle Dorothy Moran	2012	86 ft	Washburn & Doughty	5,100	z-drive aft/Schottel	MTU
Hayley Moran	2014	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
George T. Moran	2014	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Payton Grace Moran	2015	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Kirby Moran	2015	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
JRT Moran	2015	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
James D. Moran	2015	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Cooper Moran	2016	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Jonathan C. Moran	2016	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Maxwell Paul Moran	2016	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Jack T. Moran	2016	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
Clayton W. Moran	2016	93 ft	Washburn & Doughty	6,000	z-drive/Schottel	EMD
<b>Newfoundland Transshipment, Placentia Bay, Newfoundland</b>						
Placentia Pride	1998	125 ft	Marystown Shipyard	5,600	cycloidal/Voith	Bergen
Placentia Hope	1998	125 ft	Marystown Shipyard	5,600	cycloidal/Voith	Bergen
<b>Ocean Group, Quebec City, Canada</b>						
Escorte	1967	84.5 ft	Jakobson Shipyard	1,300	z-drive aft/Voith Schneider	
Ocean Intrepide	1997	82 ft	Ocean Industries	4,000	double z-drive/Niigata	Mitsub.
Ocean Jupiter	1998	82 ft	Ocean Industries	4,000	z-drive aft/Niigata	Mitsub.
Ocean Arctique	2005	101 ft	Ocean Industries	5,000	double z-drive/Rolls/CP	Rolls-Royce
Ocean Stevns	2003	108 ft	Ocean Industries	5,000	double z-drive/Rolls/CP	Rolls-Royce
Ocean K. Rusby	2005	98 ft	East Isle Shipyard	5,000	double z-drive/Rolls/CP	Cat
Ocean Raymond Lemay	2006	98 ft	East Isle Shipyard	5,000	double z-drive/Rolls/CP	Cat
Ocean Henry Bain	2006	98 ft	East Isle Shipyard	5,000	double z-drive/Rolls/CP	Cat
Ocean Bertrand Jeansonne	2008	98 ft	East Isle Shipyard	5,000	double z-drive/Rolls/CP	Cat
Ocean Georgie Bain	2009	82 ft	Ocean Industries	4,000	double z-drive/Niigata	Mitsub.
Ocean Serge Genois	2010	82 ft	Ocean Industries	4,000	double z-drive/Niigata	Mitsub.
Ocean Yvan Desgagnes	2010	98 ft	East Isle Shipyard	5,000	double z-drive/Rolls/CP	Cat
Ocean Ross Gaudreault	2011	98 ft	East Isle Shipyard	5,000	double z-drive/Rolls/CP	Cat
Ocean Pierre Julien	2013	82 ft	Ocean Industries	4,000	double z-drive/Niigata	Mitsub.
Ocean Tundra	2013	118 ft	Ocean Industries	8,160	double z-drive/Rolls/CP	MaK
Ocean Taiga	2016	118 ft	Ocean Industries	8,160	double z-drive/Rolls/CP	Mak
<b>Otto Candies, Des Allemands, La.</b>						
Devin Candies	2000	150 ft	Bender Shipbuilding	9,300	z-drive aft/Rolls-Royce	EMD
Kelly Candies	2000	150 ft	Bender Shipbuilding	9,300	z-drive aft/Rolls-Royce	EMD
<b>P&amp;R Water Taxi, Honolulu, Hawaii</b>						
Tiger 1	2002	94 ft	Kewalo Shipyard	4,400	z-drive aft/HRP	Cat
Tiger 2,3,4	2004	94 ft	Kewalo Shipyard	4,400	z-drive aft/Thrustmaster	Cat
Tiger 5,6,7	2007	94 ft	Kewalo Shipyard	4,400	z-drive aft/HRP	Cat
Tiger 10,11	2010/11	94 ft	Kewalo Shipyard	4,400	z-drive aft/HRP	Cat
<b>Polaris Materials, Vancouver</b>						
Numas Warrior	2008	58 ft	Sylte Shipyard	2,100	z-drive aft/HRP	MTU
<b>Rio Tinto-Alcan Inc., Quebec</b>						
Fjord Eternité	2006	101 ft	East Isle Shipyard	5,000	z-drive aft/Rolls-Royce	Cat
Fjord Saguenay	2006	101 ft	East Isle Shipyard	5,000	z-drive aft/Rolls-Royce	Cat
<b>Samson Tug Boats Inc., Delta, British Columbia (Canada)</b>						
Shuswap	2011	58 ft	Sylte Shipyard	3,200	z-drive aft	MTU
Kootenay	2012	64.3 ft	ABD Boats	5,000	z-drive aft	MTU
<b>Sause Brothers, Coos Bay, Ore. (Hawaii)</b>						
Tira Lani	1999	79 ft	Sause Brothers	4,000	z-drive aft/Ulstein	Cat
<b>Seabulk Towing, Port Everglades, Fla.</b>						
Eagle	1988	92 ft	Tampa Shipyards	3,200	z-drive fwd/Niigata	B&W
Broward	1995	100 ft	Atlantic Marine	5,100	z-drive fwd/Aqua	EMD
Hawk	1995	110 ft	Trinity/Halter	6,700	z-drive aft/Aqua	Wärtsilä
Condor	1996	110 ft	Halter Marine	6,700	z-drive aft/Aqua	Wärtsilä
SDM Escambia, SDM New River,						
SDM St. Johns	1997/98	90 ft	Halter Marine	4,000	z-drive inline/Ulstein	Cat
SDM Suwannee River	2000	90 ft	Halter Marine	4,200	z-drive inline/Ulstein	Cat
Gasparilla	2007	96 ft	Eastern Shipbuilding	5,000	z-drive aft/Schottel	Cat
Energy Hercules	2007	96 ft	Eastern Shipbuilding	5,000	z-drive aft/Schottel	Cat



# TRACTOR TUGS IN NORTH AMERICA

Operator Tugboat	Year	Length	Builder	HP	Propulsion/Company	Engine
Energy Zeus	2007	96 ft	Eastern Shipbuilding	5,000	z-drive aft/Schottel	Cat
Buccaneer	2007	96 ft	Eastern Shipbuilding	5,000	z-drive aft/Schottel	Cat
Sabine	2007	96 ft	Eastern Shipbuilding	5,000	z-drive aft/Schottel	Cat
Apollo, Athena	2013	93 ft	Washburn & Doughty	5,300	z-drive/Schottel	Cat
Atlas	2013	92 ft	Great Lakes Shipyard	4,640	z-drive/Rolls-Royce	Cat
Trident	2017	98.5 ft	Master Boat Builders	5,733	triple z-drive/Schottel	Cat
<b>Seaspan Marine, North Vancouver (Division of Washington Marine Group)</b>						
Seaspan Hawk, Falcon	1993	80 ft	Vancouver Shipyards	3,100	z-drive aft/Niigata	DD
Seaspan Resolution	2009	98 ft	Martinac Shipbuilding	6,000	z-drive aft/Niigata	EMD
Seaspan Raven, Eagle	2010	92 ft	Sanmar Denizcilik	5,000	z-drive aft/Rolls/CP	Cat
Seaspan Kestrel, Osprey	2011	92 ft	Sanmar Denizcilik	6,300	z-drive aft/Rolls/CP	Cat
<b>Shaver Transportation, Portland, Ore.</b>						
Portland	1981	107 ft	Nichols Brothers	4,000	z-drive aft	MTU
Vancouver	1993	76 ft	J.M. Martinac	3,000	z-drive aft/Niigata	DD
Deschutes	1997	91 ft	J.M. Martinac	3,600	z-drive aft/Aqua	MTU DD
Willamette	1999	91 ft	J.M. Martinac	3,600	z-drive aft/Aqua	MTU DD
Sommer S	2012	77 ft	Diversified Marine	5,360	z-drive aft/Schottel	MTU
Washington (ex-Falcon)	1990	92 ft	Tampa Shipyards	3,200	z-drive fwd/Niigata	B&W
<b>Signet Maritime, Houston, Texas</b>						
Signet Valiant	1994	81.5 ft	Signet Shipbuilding & Repair	3,000	z-drive aft/Ulstein	EMD
Signet Enterprise	1999	105 ft	Marco Shipbuilding	4,400	z-drive aft/Ulstein	Cat
Signet Intrepid	1999	105 ft	Marco Shipbuilding	4,400	z-drive aft/Ulstein	Cat
Signet Volunteer	2001	70 ft	Horizon Shipyard	1,200	z-drive aft/Rolls-Royce	Cummins
Signet Victory	2001	81.5 ft	Signet Shipbuilding & Repair	3,000	z-drive aft/Aqua	EMD
Signet Challenger	2003	104 ft	Thoma-Sea	4,200	z-drive aft/Rolls-Royce	Cummins
Signet Reliance	2007	98 ft	Signet Shipbuilding & Repair	5,000	z-drive aft/Rolls-Royce	Cat
America	2008	98 ft	J.M. Martinac	6,610	z-drive aft/Niigata	MTU
Pacific Star	2008	98 ft	J.M. Martinac	6,610	z-drive aft/Niigata	MTU
Signet Weatherly	2012	105 ft	Signet Shipbuilding & Repair	4,720	z-drive aft/Niigata	MTU
Signet Constellation	2012	100 ft	Trinity Offshore	6,834	z-drive aft/Rolls-Royce	Cat
Signet Stars & Stripes	2012	100 ft	Trinity Offshore	6,834	z-drive aft/Rolls-Royce	Cat
Signet Arcturus	2014	105 ft	Patti Marine	6,834	z-drive aft/Rolls-Royce	Cat
Signet Polaris	2014	105 ft	Patti Marine	6,834	z-drive aft/Rolls-Royce	Cat
Signet Magic	2013	80 ft	Signet Shipbuilding & Repair	5,150	z-drive aft/Rolls-Royce	Cat
Signet Vigilant	2014	72 ft	Signet Shipbuilding & Repair	2,460	z-drive aft/Rolls-Royce	MTU
<b>Saam Smit Towing, Vancouver, B.C.</b>						
Smit Mississippi	1998	102 ft	Damen Shipyard	4,900	z-drive	Wärtsilä 6L26
Smit Humber	2000	100 ft	Damen Shipyard	4,900	z-drive	Wärtsilä 6L26
Smit Spirit	1996	52 ft	Pacific Shipyard	3,000	z-drive aft/Aqua	MTU/DD
SST Tiger Sun	1999	72 ft	Sylte Shipyard	5,000	z-drive/Ulstein	MTU/DD
SST Orleans (ex-TP 3)	2009	100 ft	Nichols Brothers	6,850	z-drive aft/Niigata	Cat
Smit Clyde	2000	100 ft	Damen Shipyards	4,900	z-drive aft/Schottel	Wärtsilä 6L26
SST Capilano	2016	71 ft	ABD Boats	5,364	z-drive/Rolls-Royce	MTU
Smit Hunter	1989	50 ft	John Manly Shipyard	1,300	z-drive aft/Aqua	DD
Smit Pride	1997	52 ft	Pacific Shipyard	3,000	z-drive aft/Aqua	MTU/DD
SST Salish	2016	71 ft	ABD Boats	5,364	z-drive/Rolls-Royce	MTU
Smit Venta	2009	94 ft	Damen Shipyard	4,900	z-drive aft/Rolls-Royce	Cat
Smit Saba	2009	94 ft	Damen Shipyard	4,900	z-drive aft/Rolls-Royce	Cat
<b>Smith Maritime, Honolulu (unit of Kirby Offshore Marine)</b>						
Namahoe	1997	105 ft	Marco Shipyard	4,400	z-drive aft/Ulstein	Cat
Noke	2006	65 ft	Rozema Boatworks	950	z-drive aft/Thrustmaster	MTU
<b>Standard Towing Ltd., Port McNeill, B.C.</b>						
Numas Warrior	2008	58 ft	Sylte Shipyard	4,640	z-drive aft/HRP	MTU
Renegade	2012	63 ft	Main Iron Works	3,200	z-drive aft/ZF	Cummins
<b>Suderman &amp; Young Towing Co., Houston</b>						
Jess Newton	2001	100 ft	Main Iron Works	4,300	z-drive aft/Ulstein	EMD
Denia	2004	96 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	EMD
Thor	2007	98 ft	Main Iron Works	6,300	z-drive aft/Schottel	Cat
Evelena, Lamar	2008/9	98 ft	Orange Shipbuilding	6,300	z-drive aft/Schottel	Cat
Zeus	2013	80 ft	Leevac	5,150	z-drive aft/Schottel	Cat
Triton	2015	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
Neptune	2016	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
Oceanus	2016	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
Poseidon	2016	80 ft	Eastern Shipbuilding	5,150	z-drive aft/Schottel	Cat
<b>Svitzer Canada Ltd. (EcTug), Halifax, Nova Scotia</b>						
Point Chebucto	1992	110 ft	Halifax-Dartmouth	4,000	z-drive aft/Aqua	Cat
Point Valiant	1998	80 ft	AML-Ocean-Industries	4,000	z-drive aft/Niigata	Mitsub.
Svitzer Bedford	2005	105 ft	Arenav, Chile	5,000	z-drive aft/Schottel	Cat
Svitzer Nerthus	2009	94 ft	Irving East Isle Shipyard	5,000	z-drive aft	Cat
Svitzer Njal	2009	94 ft	Irving East Isle Shipyard	5,000	z-drive aft	Cat
Svitzer Cartier	2007	99 ft	Shanghai Harbour, China	5,000	Voith Schneider	Yanmar
Svitzer Montreal	2004	100 ft	Irving East Isle Shipyard	5,000	z-drive aft	Cat
<b>Thames Towboat, New London, Conn.</b>						
Paul A. Wronowski	1980	90 ft	Thames Shipyard	3,600	z-drive aft/Niigata	Cummins
John P. Wronowski	2004	96 ft	Eastern Shipbuilding	3,400	z-drive aft/Schottel	Cummins
<b>U.S. Navy, Seattle, Wash.</b>						
YT 802	2006	90 ft	Converted YTBs	3,600	z-drive aft/Schottel	Cat
YT 803 - YT 806	2009/11	90 ft	J.M. Martinac	3,600	z-drive aft/Schottel	Cat
YT 807	2012	90 ft	J.M. Martinac	3,600	z-drive aft/Schottel	Cat
<b>Western Towboat, Seattle</b>						
Westrac	1987	72 ft	Western Towboat	2,500	z-drive aft/Ulstein	Cat
West Point	1992	60 ft	Western Towboat	1,200	z-drive aft/Ulstein	Cat
Westrac II	1995	79 ft	Western Towboat	2,400	z-drive aft/Ulstein	Cat
Western Titan	1997	108 ft	Western Towboat	4,500	z-drive aft/Rolls-Royce	Cat
Pacific Titan	2000	108 ft	Western Towboat	4,500	z-drive aft/Rolls-Royce	Cat
Gulf Titan	2001	120 ft	Western Towboat	4,500	z-drive aft/Rolls-Royce	Cat
Ocean Titan	2004	120 ft	Western Towboat	5,000	z-drive aft/Rolls-Royce	Cat
Alaska Titan	2008	120 ft	Western Towboat	5,000	z-drive aft/Schottel	Cat
Arctic Titan	2012	120 ft	Western Towboat	5,000	z-drive aft/Schottel	Cat
Bering Titan	2015	120 ft	Western Towboat	5,000	z-drive aft/Schottel	Cat
<b>Wilmington Tug, Wilmington, Del.</b>						
Tina	1977	65 ft	Gladding-Hearn	1,800	z-drive aft/HRP	Lugger
Sally	1987	70 ft	Gladding-Hearn	2,400	z-drive aft/HRP	MTU
Lindsey	1989	70 ft	Gladding-Hearn	2,600	z-drive aft/Ulstein	Cummins
Capt. Harry	2002	80 ft	Washburn & Doughty	4,200	z-drive aft/Ulstein	MTU
Sonie	2007	80 ft	Washburn & Doughty	4,800	z-drive aft/Rolls-Royce	MTU
Madeline	2008	80 ft	Gladding-Hearn	4,800	z-drive aft/Rolls-Royce	MTU

# G&H Towing completes 8-boat Z-Tech order

by Casey Conley



Photo credits: *Ocean Taiga*/Ocean Group; *Laura B*/Eastern Shipbuilding; *Bering Titan*/Western Towboat; *Arkansas*/Brian Gauvin

Clockwise from top left: Ocean Group's *Ocean Taiga*; Bay-Houston's *Laura B*; Western Towboat's *Bering Titan* and Crescent Towing's *Arkansas*.

Following delivery of *Laura B* and *Poseidon* in late 2016, G&H Towing of Texas completed an eight-boat order of advanced Z-Tech tugboats. G&H is the operating company for Texas-based Suderman & Young Towing and Bay-Houston Towing, and each company received four tugs.

Eastern Shipbuilding of Panama City, Fla., built the 80-by-38-foot vessels based on a Robert Allan Ltd. design. The Z-Tech 2400 has a wide bow with aggressive fendering and low forward shear, allowing tugs to work in the flare of large ships.

"The wheelhouse is set well aft and inboard, offering excellent visibility over the entire working deck and to the sides. With the low bow, the tug is designed to make transit or open-water voyages stern-first in 'tractor mode,'" Robert Allan Ltd. said of the design.

Propulsion on these tugs consists of twin Caterpillar 3516 Tier 3 mains producing 5,150 hp at 1,600 rpm linked with Schottel SRP 1215 FP stern drives with 94-inch props

in nozzles. Ship service power comes from two 99-kW John Deere generators.

The wheelhouse is equipped with Furuno electronics and navigation equipment. On the bow is a 50-hp Markey DEPCF-48S hawser winch with a 36-inch drum and mid-drum brake strength of 300,000 pounds.

Suderman & Young took delivery of the lead boat in the series, *Triton*, in December 2015, and *H. Douglas M* was delivered to Bay-Houston in February 2016. Over the next 10 months, Eastern completed *Neptune*, *Zyana K*, *David B* and *Oceanus* followed most recently by *Laura B* and *Poseidon*.

## Bering Titan

Between 1997 and 2012, Western Towboat built six Titan-class tugboats designed for long-haul ocean towing. In December, the Seattle company welcomed the 5,364-hp ASD *Bering Titan*, the seventh tug in its vaunted Titan class.

Western Towboat built the 120-by-35-foot vessel at its Seattle shipyard based on an

in-house design developed with Jensen Maritime Consultants. *Bering Titan* has averaged about 10 knots while hauling a 420-foot barge loaded with rail cars and cargo containers between Seattle and Whittier, Alaska.

"Since she is our 7th Titan tug we have built, we have perfected each one to our needs to work in the challenging Alaskan environments," said Western Towboat Vice President Capt. Russell Shrewsbury. "Our captains and crews have given us input on each boat we have built to better suit the needs of the jobs we are performing."

*Bering Titan* is powered by twin Caterpillar C175 Tier 3 engines linked with Schottel SRP 1515 z-drives. Electrical power comes from dual John Deere generators supplied by MER Equipment in Seattle. On deck is a double-drum Rapp Marine towing winch. It also has stainless steel handrails, bulwark caps, pin box and plating on the stern to minimize long-term maintenance.

Western also has begun construction on the 80-foot,

4,000-hp harbor tug *Mariner*. This Westrac-class tug outfitted with Tier 3 Caterpillar engines is scheduled for delivery in March 2018.

## Ocean Taiga

Ocean Group President Gordon Bain describes the company's 8,160-hp tugboat *Ocean Tundra* as "the Beast." *Ocean Taiga*, a nearly identical sister vessel delivered in late October 2016, deserves an equally formidable nickname.

The Quebec City-based company built the 118-by-42-foot ice-class tug at its Isle-aux-Coudres, Quebec, shipyard from a Robert Allan Ltd. design. The tug works in Quebec City where it breaks ice and performs ship-assist work in the St. Lawrence River. But as Ocean spokesman Philippe Filion points out, the vessel can do just about any job around the world.

"It is built to do hard work," he said. "De-icing, docking, undocking, marine salvage, ship assist, pilot transfer and supply services. Those are the things it does ... but we can do more than that. We wait for occa-



sions to use this one and *Ocean Tundra* for bigger jobs.”

Like its predecessor, *Ocean Taiga* has twin MaK 9M25C diesel engines turning Rolls-Royce z-drives. Markey supplied a 200-hp hawser winch and 125-hp towing winch on the bow and stern, respectively. Electrical power comes from three Caterpillar C9 engines each producing 250 kW. Bollard pull exceeds 100 metric tons.

*Ocean Tundra* is considered the most powerful tugboat in Eastern Canada, but with the arrival of *Ocean Taiga* it has some company at the top.

#### **Baltimore/Delaware/ Philadelphia**

Vane Brothers’ steady construction cycle shows no signs of slowing. Since September, the Baltimore towing firm took delivery of three 4,200-hp Elizabeth Anne-class tugboats built by St. Johns Ship Building and based on a design by naval architect Frank Basile.

*Baltimore* was delivered in September 2016, followed by *Delaware* in January 2017 and *Philadelphia* four months later. The Palatka, Fla., shipyard is expected to deliver the final three boats of an eight-boat order by early 2018.

These 100-by-34-foot tugs are outfitted with two Caterpillar 3516 Tier 3 engines generating 2,100 hp each. Two John Deere PowerTech 4045 generators each produce 99 kW, while a third John Deere 4055 powers the stern-mounted Intercon DD200 towing winch. The tugs also feature Simrad electronics and navigation equipment.

*Baltimore* and *Delaware* are assigned to Vane’s Philadelphia fleet where they primarily tow petroleum barges. *Philadelphia* has been assigned to Vane’s

New York fleet.

#### **Rich Padden/Dr. Hank Kaplan**

Harley Marine Services of Seattle will take delivery later this year of two 80-by-36-foot ship-handling tugboats under construction at Diversified Marine in Portland, Ore.

The two 5,200-hp tugs are sister vessels to *Michelle Sloan* and *Lela Franco*, and upon completion will be assigned to Harley’s West Coast fleet for ship assist and escort jobs. The new tugs are named for longtime Harley Marine board member Rich Padden, and Dr. Hank Kaplan, a specialist at the Swedish Cancer Institute in Seattle.

Propulsion on the new ASD vessels will consist of two Caterpillar 3516 Tier 3 engines each producing 2,600 hp linked with Caterpillar stern drives — the first of their kind in the U.S. Ship service power will come from twin Caterpillar C7.1 generators. Bollard pull is estimated at 70 tons.

Markey winches will be installed on the bow and stern, and Shibata fendering will protect the steel hull. Closed-circuit cameras will let wheelhouse crew and shoreside staff monitor the engine room.

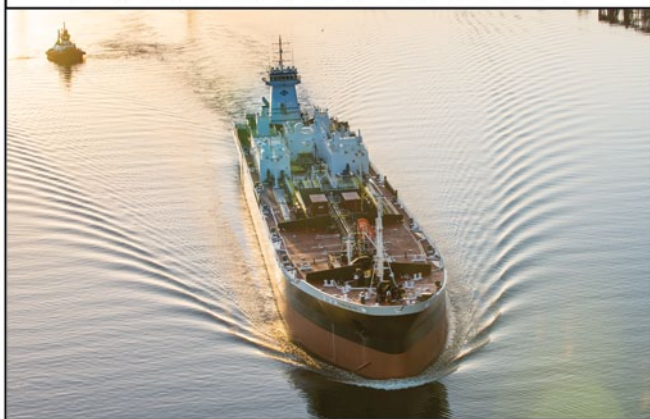
#### **Gladys B**

The 5,300-hp ship-handling tug *Gladys B* joined E.N. Bisso & Son’s fleet in December 2016 following delivery from Signet Shipbuilding & Repair of Pascagoula, Miss. *Gladys B* works on the Mississippi River between Baton Rouge and New Orleans, where E.N. Bisso is located.

The 80-by-38-foot tug is based on the RAport 2400 platform developed by Robert Allan Ltd. of Vancouver, B.C. The vessel is a sister to Signet Maritime’s *Signet Magic*, which

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## TUGBOAT ROUNDUP

was built almost four years ago. It is the first Robert Allan design in E.N. Bisso's fleet.

The tug, named for the wife of company founder Capt. Edwin Napoleon Bisso, has twin MTU 16V 4000 M64 Tier 3 engines driving two Rolls-Royce US 205 FP z-drives. Electrical power comes from two John Deere 6068 marine generators producing 99 kW each.

The hawser winch on the bow is a Markey DEPGF-42S, while a Markey DEPC-32 towing winch is installed on the stern. Bollard pull is 63 metric tons ahead and 60 astern. The crew complement is five people.

### Arkansas/South Carolina

Steiner Shipyard in Bayou La Batre, Ala., delivered two more 5,300-hp ASD tugboats to Crescent Towing of New Orleans in early 2017. *Arkansas* is working in Savannah while *South Carolina* operates in the Mississippi River along with the lead boat in the series, *Mardi Gras*.

Jensen Maritime Consultants designed the 92-by-38-by-19.5-foot vessels, which rely on twin GE eight-cylinder L250 Tier 3 engines and Rolls-Royce US 255 FP z-drives for propulsion. John Deere 4045 gensets producing 99 kW supply electricity. Bollard pull is 75 metric tons.

Both tugs have JonRie 230 escort winches on deck spooled with 550 feet of 9-inch synthetic line and a JonRie 424 hydraulic capstan. Schuyler Cos. provided the vessels' fendering, and the wheelhouse features Furuno electronics and navigation equipment.

"We are very pleased with the tug's abilities, specifically when assisting the larger container vessels calling Savannah,"

said Andrew White, Crescent's Savannah operations manager. "The smoothness of operation even at high rpms is a testament to the design and execution by Jensen, Crescent and Steiner, and in turn will assure a long service life."

### Mr. Ruben

In September 2016, Bisso Towboat Co. of Luling, La., took delivery of *Mr. Ruben*, a 4,480-hp ASD tugboat built by Main Iron Works of Houma, La., with an estimated 60 tons of bollard pull.

*Mr. Ruben*, measuring 100 feet by 38 feet, has twin Caterpillar 3516 Tier 3 engines each generating 2,240 hp at 1,600 rpm. Those mains drive Rolls-Royce US 205 z-drives with 90-inch props in stainless steel nozzles. Ship service power is provided by two 99-kW Marathon generators powered by John Deere 4045 engines.

The JonRie Series 230 hydraulic bow winch is spooled with 500 feet of Samson 8-inch AmSteel Blue line. The wheelhouse is equipped with Simrad electronics and the engine room and four crew cabins have soundproof insulation.

### Jeffrey McAllister

McAllister has christened the final vessel in its line of 96-foot Tier 3 tractor tugs following the January 2017 delivery of *Jeffrey McAllister*. Eastern Shipbuilding of Panama City, Fla., built the tug and Jensen Maritime Consultants designed it.

The ASD vessel features twin EMD 8-710 G7C engines producing 2,500 hp each at 900 rpm driving Schottel SRP 1215 FP z-drives. Ship service power comes courtesy of twin John Deere 4045 marine gensets rated for 99 kW each.



Jeffrey is equipped with a JonRie InterTech Series 250 hydraulic hawser winch on the bow and a JonRie Series 230 towing winch on the stern. A John Deere 6135 engine drives a 3,000-gpm FFS fire pump and two FFS monitors rated for 1,500 gpm each.

Jeffrey McAllister, named for a senior docking pilot based in New York, is assigned to McAllister's Charleston operation. It joins roughly 60 other tugboats in McAllister's fleet from Portland, Maine, to San Juan, Puerto Rico.

#### Nicole Foss

Foss Maritime of Seattle is preparing to take delivery this summer of its third Arctic-class tugboat. The company is building the 123-by-41-foot Nicole Foss at its Rainier, Ore., shipyard, and will enter the tug into service this summer. Glosten Associates, also of Seattle, provided the design.

Propulsion comes from twin Tier 2 Caterpillar C280-8 engines generating a combined 7,268 hp. The mains are linked with Reintjes WAF 3455 reduction gears turning 126-inch Sound propellers in Nautican nozzles with triple rudders. Bollard pull is estimated at 110 tons.

Markey Machinery of Seattle supplied a double-drum TDSD-40 towing winch at the stern and a Markey WEWD-22 winch at the bow. Firefighting equipment includes a Flowserve 10-hp water pump.

Nicole Foss is virtually identical to its two predecessors: Michele Foss, delivered in 2015, and Denise Foss, built last year.

#### San Jose

Great Lakes Shipyard of Cleveland built the HandySize-

class tugboat San Jose for harbor work in Puerto Quetzal, Guatemala. The Jensen Maritime-designed vessel was completed in September 2016 but was still in the shipyard in April 2017 pending final payment from the buyer.

Like its predecessors, the 74-foot-by-30-foot San Jose has twin Cummins QSK50-M1 Tier 3 diesel engines producing 1,700 hp each. Those Tier 3 mains turn 79-inch Kaplan-style props inside 80-inch nozzles through a Twin Disc MGX-5600 gearbox. Bollard pull is estimated at 50 tons.

Ship service power comes from one Kohler genset generating 65 kW, and a Cummins QSB6.7 marine diesel auxiliary engine driving a Bell & Gossett VSX off-ship firefighting pump delivering 2,000 gpm. The tug also has a forward-facing Akron Brass monitor.

On deck, San Jose has a JonRie 500 single-drum towing winch aft, and on the bow is a shipyard-built staple. The wheelhouse offers 360-degree views and is equipped with Simrad and Furuno electronics.

#### Shaver building Tier 4 tug

Shaver Transportation didn't have to look far for its first EPA Tier 4 tugboat. The longtime Portland, Ore., operator hired hometown shipyard Diversified Marine to build its 8,400-hp tractor tug. The vessel promises to be the most powerful tug on the Columbia Snake River System and one of the beefiest on the West Coast.

Jensen Maritime Consultants designed the 110-by-42-foot tug. It will come equipped with twin GE Tier 4 engines each producing 4,200 hp and twin Rolls-Royce US 305 z-drives. GE mains use an



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## TUGBOAT ROUNDUP

exhaust gas recirculation system to meet tougher EPA Tier 4 emissions standards, meaning they do not require urea.

“The boat is basically like the one JT Marine is building,” Shaver President Steve Shaver said recently, referring to *Caden Foss* (profile on page 28), although he noted the Shaver tug will have a wider beam and about 1,700 more hp.

At this point, few shipyards understand Tier 4 better than Diversified, which in January delivered the first U.S. Tier 4 tractor tug, *Earl W. Redd*, to Harley Marine Services (profile on page 18). The Shaver boat is expected for delivery by mid-2018.

### Young Brothers orders four new vessels

Conrad Shipyard is building four Tier 4 Kapena-class ocean towing tugboats for Young Brothers Ltd. of Honolulu, Hawaii. The first delivery is expected early next year. The \$80 million order should be completed by early 2019.

The Damen-designed vessels will measure 123 feet by 36.5 feet and have twin GE 8L250MDC Tier 4 engines producing a total 6,034 hp. GE engines use an exhaust gas recirculation system rather than a urea-based system to meet stricter EPA emissions rules.

Young Brothers' fleet hauls cargo between the Hawaiian islands seven days a week. The new vessels will be paired with barges delivered to Young Brothers within the last decade. The Kapena-class tugs will join Young Brothers' seven-tug fleet.

### Chouest building 13 Damen-designed tugs

Edison Chouest Offshore

(ECO) of Cut Off, La., is building up to 13 Damen-designed ASD tugboats to support energy transport products in the Gulf of Mexico and Alaska. The work is being done at shipyards owned by Chouest.

ECO will build four escort tugs with the Damen ASD 3212 design to work at an LNG terminal under construction in Texas, according to a Damen news release. The vessels will have 80 tons of bollard pull.

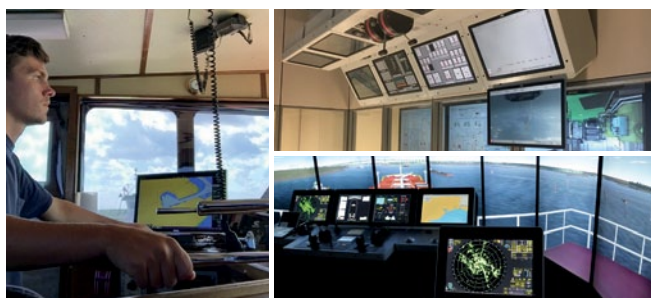
The company also will build nine new tugboats to perform ship escort/response duties out of Valdez, Prince William Sound. ECO begins the contract in July 2018, taking over for Crowley.

Chouest will build four ASD 3212 tugs with 70 tons of bollard pull and five ASD 4517 design tugs believed to be among the most powerful ASD tugs ever built, according to the Damen release. Bollard pull is expected to exceed 150 tons.

### Mount Baker

Nichols Brothers Boat Builders is building two tugboats for Kirby Offshore Marine using a Jensen Maritime Consultants design. The Freeland, Wash., shipyard launched the 120-by-35-foot *Mount Baker* on May 2 ahead of a scheduled delivery in late May. A sister tug, *Mount Drum*, is scheduled for delivery in November.

Both are powered by twin Caterpillar 3516C Tier 3 engines producing 2,447 hp at 1,600 rpm turning Nautican fixed-pitch props in nozzles through Reintjes reduction gears. John Deere generators provide electrical power. On deck, the tugs have a Markey TESD-34 towing winch and a Markey CEW-60 capstan. ●



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# SCF Vision marks new era for z-drive towboats

by Casey Conley

SCF Marine of St. Louis has set a new standard for inland towboats with its class of 160-footers outfitted with three z-drive units. These 6,600-hp vessels are the largest and most powerful z-drive towboats working on the Mississippi River.

SCF *Vision*, the first of three planned vessels, was delivered earlier this year by C&C Marine and Repair of Belle Chasse, La., using a design developed by The Shearer Group of Houston. It primarily works in the Lower Mississippi River between New Orleans and St. Louis, according to Myron McDonough, SCF's vice president.

Two additional vessels, SCF *Mariner* and SCF *Explorer*, are expected for delivery within the next year. All three are 160 by 50 by 11.5 feet with a draft of about 9.5 feet.

*Vision's* propulsion system consists of three Cummins QSK60 Tier 3 mains driving three Steerprop drives. Ship service power comes from two John Deere 250-kW generator sets. There are six Wintech 65-ton winches installed at the bow and midbody.

"We looked at six manufacturers of propulsion units. After reviewing each unit's drawings and/or features, we chose Steerprop. At that point we added several design

changes to meet our needs," McDonough said.

The Shearer Group used advanced computational fluid dynamics, or CFD, to maximize hull efficiencies and water reaching the z-drives. The firm also incorporated the barge train into the modeling to determine how the tow would affect performance.

"We found with the proper hull shape, the z-drive can increase the efficiency of the entire barge train," said Joshua Sebastian, engineering manager with The Shearer Group.

These vessels also have a wastewater management system supplied by Controlled Water System that recycles graywater. *Vision* and its sister vessels can essentially operate as zero-discharge vessels.

SCF *Marine*, a Seacor subsidiary, chose the triple-screw propulsion system to meet draft restrictions on the river, McDonough said. But the added power and maneuverability also lets *Vision* move cargo safely and efficiently.

Karl Senner LLC of Kenner, La., supplied the drives and other propulsion components. In a statement, the company said it was "proud to equip M/V *Vision* with three Steerprop SP25D azimuth thrusters with stainless steel propellers, high-efficiency HJ3 nozzles, Centa shaft lines, control system and



Photo credits: SCF Vision/SCF Marine; American Power/ACBL; St. Matthias/Brian Gauvin

Clockwise from top: The triple-screw z-drive towboat SCF *Vision*; the American Commercial Barge Line vessel *American Power*; Marquette Transportation's *St. Matthias*.

Voith Safeset torque-limiting couplings."

*Vision* has an 11-person crew and eight cabins spread across three decks. There are also six full heads and one day head. Crew amenities include satellite TV and Internet, a workout room and a comfortable galley/mess area.

## Ryan Point

Tidewater Transportation and Terminals of Vancouver, Wash., took delivery in June 2016 of *Ryan Point*, the third of three 102-by-38-foot towboats for barge handling on the Columbia-Snake River System in the Pacific Northwest.

Propulsion equipment consists of two Caterpillar 3516C Tier 3 engines each generating 2,240 hp at 1,600 rpm turning 92-by-100-inch stainless-steel props in Kort nozzles through Reintjes reduction gears. Running speed is 8 knots for the vessel, which has four steering rudders and four flanking rudders.

That equipment comes in handy when operating in the Columbia River Gorge and other sections of river where currents can reach 5 knots and winds can exceed 50 mph.

The full tow load for these vessels is four 274-by-42-foot grain barges for a total tow length of 650 feet. Those capacities are limited by the size of locks on the waterway.

Electrical power comes from two Caterpillar C7.1 gensets each rated for 200 kW. On the bow are seven Patterson 65-ton deck winches spooled with Samson 1-3/8-inch Turbo-75 synthetic line.

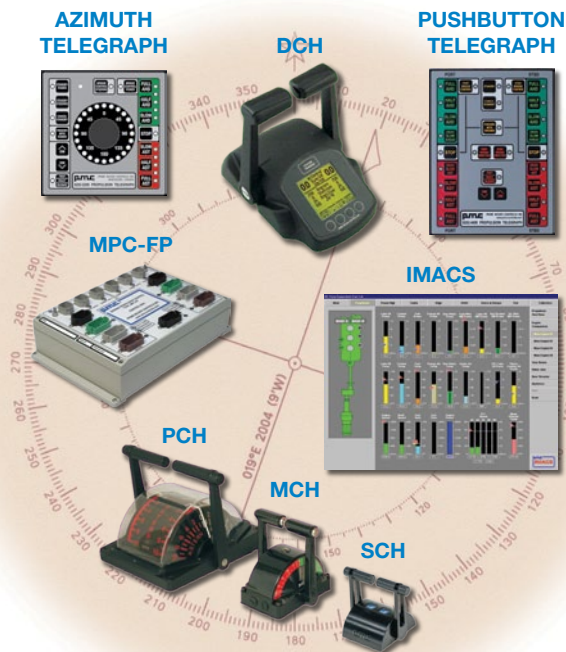
"We are really happy with boats, they have done everything we want them to do," said Marc Schwartz, manager of maintenance and engineering for Tidewater. "The performance is great, the build was solid and ... we are just really happy with the whole fleet of them."

*Crown Point* and *Granite Point*, delivered in 2015 and 2016 respectively, preceded this vessel. All three were built at Vigor's Portland shipyard with plans from CT Marine of Portland, Maine. This series of towboats is the newest in Tidewater's 16-boat fleet.

## St. Matthias/ Chad Pregracke

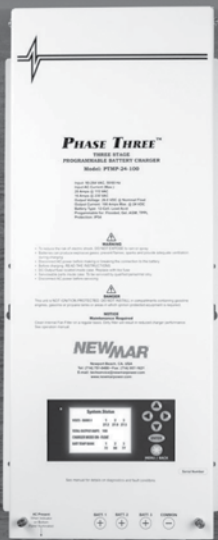
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## TOWBOAT ROUNDUP

pleted an 11-boat order of 2,000-hp ASD towboats for Marquette Transportation with the December delivery of *St. Matthias*, the final boat in the class. Entech Designs of Kenner, La., provided the vessel plans.

These 78-by-34-by-11-foot vessels assigned to Marquette's New Orleans-based Gulf-Inland division feature twin Caterpillar C32 engines each generating 1,000 hp at 1,800 rpm. The mains are connected to ZF Marine AT 5111 WM-FP z-drives turning 65-inch, four-bladed stainless steel props in nozzles.

Electrical power comes from John Deere 4045 engines driving Marathon 80-kW generators, and two Patterson 40-ton deck winches are installed on the bow to secure the tows. Master Marine completed the first boats in the class in 2014 and finished the order in December with delivery of *St. Matthias*.

Marquette also took delivery in October 2016 of the twin-screw *Chad Pregracke*, the third of three 180-by-48-by-11.5-foot vessels with 9,300 hp. Propulsion comes from twin EMD 20-710 G7C Tier 3 engines linked with Reintjes WAF 6755 gearboxes at a 4.762:1 reduction ratio turning 120-inch props in nozzles.

Gulf Island Marine Fabricators in Houma, La., built *Chad Pregracke* and its sister boats *Rick Calhoun* and *Loree Eckstein* using a design from CT Marine of Portland, Maine.

### American Power/ American Strong

American Commercial Barge Line (ACBL) has overseen a steady fleet modernization pro-

gram over the past 15 months, adding 10 new towboats to its already sizable fleet. These newbuilds include *American Power* and *American Strong*, delivered in November and December 2016, respectively, by the company's Jeffboat shipyard in Jeffersonville, Ind.

The 79-by-34-foot vessels have an 8.5-foot operating draft. Propulsion comes from twin Caterpillar C32 engines turning ZF Marine ZF 5000 z-drives with 63-inch props in nozzles. Electrical power comes from John Deere 4045 gensets each producing 65 kW. Boats in this class were designed to carry two 30,000-barrel liquid barges or 12 standard barges.

A pair of Patterson 40-ton electric deck winches are on the bow with a Wintech capstan. Six bunkrooms and a comfortable galley/mess can accommodate six to eight crewmembers for longer river voyages. Fuel capacity is 30,000 gallons.

In 2016, ACBL also took delivery of six 2,000-hp z-drive towboats built at Steiner Construction of Bayou La Batre, Ala., the most recent of which were *American Valor* and *American Skill*, both delivered in fall 2016. ACBL, headquartered in Jeffersonville, Ind., has more than 175 towboats working on U.S. inland waterways.

### A.B. York/Cullen Pasentine/ Victoria Pasentine

Florida Marine Transportation continued its feverish pace of new construction over the past year, taking delivery of five new vessels.

Largest of the Mandeville, La., company's newbuilds were *A.B. York*, a 120-foot conventional towboat, and *Marty Cullinan* and *Victoria Pasentine*,



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120-footers with jacking pilot-houses. Horizon Shipbuilding of Bayou La Batre, Ala., built these 4,000-hp vessels using plans from Gilbert Associates of Braintree, Mass.

“This design has been enormously successful for Florida Marine Transporters, having built nine vessels so far in the last 10 years, seven conventional and two with jacking pilot-houses,” naval architect John Gilbert said. “The boat’s success is probably due in part to the efficiencies garnered from the propeller tunnel design, and attention to steering and flanking rudder design.”

The tugs are equipped with twin Caterpillar 3512 Tier 3 engines linked with Twin Disc MG-5600 reduction gears turning 100-inch Sound propellers. Electricity comes from two John Deere 6090 gensets.

Eastern Shipbuilding of Panama City, Fla., also delivered the 90-by-32-foot *Capt. Ricky Torres* and *Cullen Pasentine*, bringing Florida Marine’s total order of 90-foot towboats to 65 over the last decade. The vessels have twin Caterpillar engines generating 3,000 total hp, Twin Disc MG-5600 gears and John Deere gensets.

The 90-foot class, believed to be the largest single-owner, single-builder vessel program in U.S. history, will soon grow even bigger. Florida Marine has ordered a 66th 90-footer expected for delivery later this year. Florida Marine also is building five 120-foot conventional towboats at its Harvey, La., shipyard.

**Margaret Anne/  
Mackenzie Hope**

Genesis Marine of Houston took delivery of five 2,680-hp

towboats from John Bludworth Shipyard in 2016. In February, the Corpus Christi, Texas, shipyard delivered *Margaret Anne*, the latest in the class of 84-by-32-by-11-foot towboats.

*Margaret Anne* and its siblings are powered by twin Caterpillar 3512 diesel engines generating 1,340 hp each linked with Twin Disc reduction gears at a 6.04:1 ratio and 82-inch props. These towboats have two steering rudders and four flanking rudders. Ship service power comes from twin John Deere 99-kW gensets, and the vessels can carry 37,000 gallons of fuel.

Since April 2016, Bludworth has delivered *Caroline Frances*, *Eleanor Hadley*, *Kaylin Nicole* and *Mackenzie Hope* in addition to *Margaret Anne*. Bludworth also delivered *Christopher Scott* in 2016. While similar in design, the vessel is 8 feet longer and has a retractable pilothouse along with an ABS Great Lakes load line certificate.

Genesis’ current newbuild program has lowered the average hull age of its inland fleet to less than 7 years for barges and less than 9 years for boats. The vessels *Garland Gaspard*, *Kylie Brown* and another as-yet unnamed towboat will also be delivered this year.

**David J. Bangert**

Gateway Dredging and Contracting of Old Monroe, Mo., took delivery in September 2016 of *David J. Bangert*, a 1,320-hp pushboat built by Barbour JB Shipyard in St. Louis. The Shearer Group of Houston provided the plans.

The 55-foot vessel is powered by two Cummins QSK19 engines that each produce 660 hp. The mains turn 64-inch



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props through Twin Disc gears at a 6:1 ratio.

Gateway Dredging operates four suction sand dredges on the Missouri and Mississippi rivers around St. Louis and has six towboats between 800 and 1,500 hp to support its dredging fleet. *David J. Bangert*, its latest vessel, replaces an aging fleet boat.

### Cole Guidry

Bollinger Shipyard in Amelia, La., delivered the triple-screw towboat *Cole Guidry* to Lorris G. Towing of nearby Cut Off, La., in December 2016. Bollinger provided the vessel plans.

*Cole Guidry* gets its propulsion from three Tier 3 Caterpillar C18 engines supplied by Louisiana Machinery, which are each rated for 670 hp and linked with Twin Disc MGX-5170DC reduction gears at a 6:1 ratio. Three Kohler generators, each producing 65 kW, provide electrical power for the 80-by-36-foot vessel, which has a 10-foot draft.

"This vessel exceeds our expectations. Bollinger's technology and craftsmanship are evident in the design and construction of this vessel. We can expand on this design to meet our future needs and the needs of our customers," Luke Guidry Sr., president of Lorris G. Towing, said in a prepared statement.

The towboat can hold 20,000 gallons of fuel and 7,400 gallons of potable water. Four cabins — three double and one single — can accommodate seven crewmembers. *Cole Guidry* is the 11th vessel in the Lorris G. Towing fleet and is currently working along the Gulf of Mexico pushing fuel barges.

### San Roberto/C.J. Studdert/ Nancy Marian/Lt. Dick Dowling

Buffalo Marine Service of Houston took delivery of four towboats from Southwest Shipyard LP within the last year, including two with retractable pilothouses. Advance Fabricating Inc. provided the designs.

The *San Roberto* and *C.J. Studdert*, which measure 87 by 32 feet, are powered by twin Cummins QSK38-M1 engines producing 1,000 hp each with Twin Disc MG-540 reduction gears at a 6:1 ratio turning 78-inch four-bladed Sound propellers, according to specs provided by shipyard project manager Johnny Rodriguez. Electrical power comes from two Cummins QSB 7D gensets.

The two retractables, *Nancy Marian* and *Lt. Dick Dowling*, are 65 by 30 feet. Propulsion comes from twin Mitsubishi S6R-Y3MPTAW engines producing 630 hp. The reduction gears are Twin Disc, Sound Propellers supplied the wheels, and two John Deere 65-kW generators provide electrical power. The pilothouse lift system was supplied by Rio Controls & Hydraulics.

All four vessels were outfitted with Eastpark Radiator coolers, Schuyler Cos. fenders and Carrier HVAC systems.

### Jackson Scott

Devall Towing & Boat Service of Sulphur, La., took delivery of the 64-by-27-foot *Jackson Scott* from Southwest Shipyard LP in April 2017. The pushboat was built based on plans from Advance Fabricating Inc.

Propulsion on the vessel comes from twin Mitsubishi S6R-Y3MPTAW engines

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Below is a list of the training classes currently offered by the Department of Professional Education and Training.

Please refer to course schedule online for availability and course fees. <http://www.sunymaritime.edu/page/professional-mariner-training>

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- Leadership and Teamwork Skills (LT) \*\*\*
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- Original Radar Observer (Unlimited) (RU)
- Radar Renewal (RR)
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- Tankship, Person-In-Charge (TPIC)
- Vessel/Facility/Company Security Officer (VSO/FSD/CSO)
- Vessel Personnel with Designated Security Duties (VPDSD)
- Visual Communications (Flashing Light) (FL)
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generating 630 hp each at 1,600 rpm turning 70-inch, four-blade, stainless steel Dominator props through Twin Disc MGX-5222 gears at a 6:1 ratio, according to a spec sheet provided by the Houston shipyard. Electrical power comes from twin John Deere 65-kW generators.

Eastpark Radiator provided the coolers and Schuyler Cos. provided fendering and hull protection. Three Carrier units provide onboard heating and cooling. Jackson Scott can hold 6,000 gallons of potable water and 12,500 gallons of fuel.

**Master Marine building four fleet boats**

Master Marine of Bayou La Batre, Ala., is building four 67-by-28-foot fleet boats for

Waterfront Services and CGB Enterprises. The vessels, with a 7.75-foot draft, will work in Cairo, Ill., and the lower Mississippi River fleeting areas with capabilities of fleeting and extended trip services.

These vessels will be powered by two Laborde Products Mitsubishi S6R2-Y3MPTAW Tier 3 engines generating a total 1,606 hp coupled with Twin Disc MGX-5321DC 4:98:1 gears. The pushboats will be set up for 10,400 gallons of fuel and 4,359 gallons of potable water.

The first delivery is set for summer 2017, and subsequent boats should be completed by mid-2018. The vessels will be built to comply with all Coast Guard Subchapter M requirements.

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# Harley Marine building Tier 4 ATB tugs

by Casey Conley

**E**arl W. Redd isn't Harley Marine Services' only Tier 4 project in 2017. The Seattle operator will take delivery of four ATB tugs in 2017, two of which will be equipped with GE Tier 4 engines.

These 116-by-36-foot tugs will be among the first U.S.-flagged ATBs that comply with the more stringent EPA emissions standards. Harley has ordered four ATB tugs and four 80,000-bbl ATB tank barges to transport fuels and other petroleum products.

Conrad Shipbuilding of Morgan City, La., delivered the lead boat in the series, *Bill Gobel*, in February 2017. The vessel has twin GE 6L250 Tier 3 engines each producing 2,261 hp at 1,000 rpm. The engines turn 116-inch-diameter stainless steel props through Reintjes WAF 1563 reduction gears at a 4.846:1 ratio.

Electrical power is courtesy of twin John Deere 99-kW generators. The tug and barge connect through an Articouple FRC 55 pin system. The sister ship *Min Zidell* shares similar specs.

Propulsion on the two Tier 4 tugs, *Todd E. Prophet*



Photo credits: Morton S. Bouchard Jr./Bouchard Transportation; Gracie M. Reinauer/Reinauer Transportation; Bill Gobel/Harley Marine Services; Abundance/Brian Gauvin

Clockwise from top left: Bouchard Transportation's Morton S. Bouchard Jr. and 110,000-bbl barge B. No. 210; Reinauer Transportation's Gracie M. Reinauer; Harley Marine Services' Bill Gobel and the ATB tug Abundance.

and *OneCURE*, comes from twin GE Tier 4 6L250 engines producing 2,280 hp each at 900 rpm. Those engines turn 116-inch-diameter four-bladed stainless steel props through Reintjes WAF 1963 reduction gears at a 4.467:1 ratio. Twin 99-kW John Deere 6068TFM generators provide auxiliary power.

"Harley Marine Services has a long commitment to the environment and pioneering new technology across its vessel fleets and our latest ATB build program is no exception," said Matt Godden, Harley Marine's senior vice president and chief operating officer.

"Harley Marine is taking its next step in what has been a long commitment to environmental responsibility, safety and quality," Godden continued.

*Earl W. Redd*, the company's versatile tractor tug working on the West Coast, is outfitted with Caterpillar 3516E Tier 4 engines with a urea-based exhaust aftertreat-

ment system. GE's Tier 4 engines do not require urea.

The four new tugs will be paired with four new tank barges. Gunderson Marine of Portland, Ore., is building *OneDREAM* and *All Aboard for a Cure*, while Zidell Marine, also of Portland, is building *Zidell Marine 277*. Conrad is building *Edward Itta*.

All four tugs have 100,000-gallon fuel tanks and capacity for 7,390 gallons of water. Height of eye from the wheelhouse is 51.5 feet. Deliveries of the next three tugs are expected by the end of the year.

## Frederick E. Bouchard

Bouchard Transportation of Melville, N.Y., has added two new ATB units to its fleet with the delivery of the 6,000-hp *Morton S. Bouchard Jr.* and *Frederick E. Bouchard*. VT Halter shipyard of Pascagoula, Miss., built and designed the boats.

Propulsion aboard the

130-foot-by-38-foot tugs comes from twin EMD 12-710 G7C-T3 engines generating 3,000 hp each at 900 rpm. The mains turn five-bladed, 140-inch manganese bronze props through Lufkin RS2800HG gears at a 4.9:1 ratio.

The vessels have Furuno electronics and navigation equipment in the wheelhouse and EMI steering and controls. Two Intercon capstans are installed on deck. The tugs are paired, respectively, with the 110,000-bbl petroleum barges *B. No. 210* and *B. No. 220* and are linked with Intercon coupler systems.

*Morton* entered service in February 2016 and transports clean oil in the Northeastern U.S., while *Frederick* joined the company's fleet in June 2016 and transports clean oil in the Gulf of Mexico. Both are named for Bouchard family descendants.

These ATB units follow the deliveries in 2015 and 2016 of the 10,000-hp, 150-foot

Kim M. Bouchard and Donna J. Bouchard, which are paired with 260,000-bbl barges.

**Gracie M. Reinauer/  
Tier 4 ATBs**

Reinauer Transportation Co. has added another "facet tug" to its fleet of ATBs with the delivery of *Gracie M. Reinauer* in August 2016. The 112-by-35-foot SOLAS-class tug built at Senesco Marine in North Kingstown, R.I., is paired with a 100,000-bbl barge.

*Gracie* is powered by twin MTU 16V 4000 Tier 3 engines each rated for 2,400 hp turning 104-inch Nautican props in nozzles with triple independent rudders through Lufkin RS2850HG reduction gears. Electrical power comes from three John Deere 99-kW 4045 Tier 3 generators, with one generator dedicated to the coupler system.

The tug and barge are paired through an Intercon Series C coupler system with 34-inch pins, and a JonRie InterTech capstan is installed on the tug's deck. Other components include an EMI steering system, Red Fox Sanitation system and Furuno GMDSS.

*Gracie* is the ninth facet tug in the Reinauer fleet. Robert Hill from Ocean Tug/Barge Engineering of Milford, Mass.,

provided the design.

Reinauer Transportation also has two 4,000-hp and one 8,000-hp Tier 4 ATB tugs under construction at Senesco. The largest, scheduled for completion in January 2018, will be mated with a newly constructed 150,000-bbl barge also from Senesco.

"It will be very similar to our existing Nicole-class tugs utilizing GE engines with on-engine technology to reduce NOx emissions (with no urea) required," said company vice president Christian Reinauer.

**Assateague**

Baltimore towing company Vane Brothers has ordered three Assateague-class ATB tugboats from Conrad Shipbuilding. The vessels are based on a design from Castleman Maritime. Delivery of the lead tug, *Assateague*, is expected in summer 2017.

Propulsion on the 110-foot-by-38-foot vessels will come from twin 2,200-hp Cummins QSK60 Tier 3 diesel engines turning 102-inch open-wheel propellers through Reintjes WAF 873 gears with a 7.087:1 reduction ratio. Ship service power comes from twin Cummins 125-kW generators, and a third Cummins generator producing 60 kW will provide

emergency power.

The tugs will be paired with 405-foot, 80,000-bbl barges through a Beacon Finland JAK-700 coupler system. Bristol Harbor Group of Bristol, R.I., designed the double-hulled barges. Conrad is building the tugs at its Orange, Texas, yard and the barges in Amelia, La.

**Abundance**

Nichols Brothers Boat Builders of Freeland, Wash., is building two 139-by-39-foot ATB Ocean-class tugboats for Savage Marine Services. The design is from Ocean Tug & Barge Engineering of Milford, Mass., and the first delivery is scheduled for mid-2017.

The ABS-classed vessels will be powered by twin EMD 16-710T13 engines each rated at 4,000 hp at 900 rpm. These Tier 3 mains will turn Rolls-Royce 133-inch propellers in Rolls-Royce InnoDuct nozzles through Lufkin RHS 3200 reduction gears. Auxiliary power comes from two 200-kW Caterpillar C7.1 Tier 3 generators and a Cat C9.3 200-kW generator with a mounted fire pump. A Cat C7.1 138-kW genset provides emergency power.

The SOLAS-compliant tugs will push 500-foot barges paired using an Articouple coupler

system. Vessel speed is estimated at 14 knots. The second tug will be named *Vision* and delivery is expected in fall 2017.

**Sea Power**

BAE Systems Southeast shipyard in Jacksonville, Fla. delivered the ATB tug *Sea Power* to Seabulk Tankers in August 2016. The 141-foot Jones Act-compliant vessel is paired with the 185,000-bbl chemical and petroleum barge *Sea-Chem 1* built in Erie, Pa., by Donjon Shipbuilding and repair.

BAE Systems and Guido Perla & Associates of Seattle collaborated on the ATB design. The 12,000-hp ATB tug is powered by twin Wärtsilä mains generating 6,000 bhp each.

**Heath Wood**

Kirby Corp. took delivery of the ATB tug *Heath Wood* from Fincantieri Bay Shipbuilding in November 2016. The 6,000-hp tugboat will be paired with the 155,000-bbl barge *Kirby 155-01*, which is outfitted for hauling petroleum and chemical products.

Houston-based Kirby, which already operates ATBs built by Fincantieri about a decade ago, will take delivery of a second ATB unit from the yard this summer. ●

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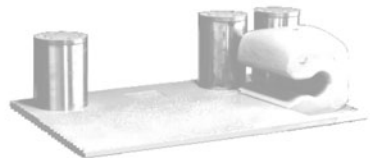
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## ARTICULATED TUG-BARGE UNITS IN SERVICE IN NORTH AMERICA

Following is a list of articulated tug-barge units (ATBs) in service in U.S. and Canadian waters. Listed alphabetically by company name. Updated as of May 2017.

**Karen Andrie**, owned and operated by **Andrie Inc.**, Muskegon, Mich.; 120 ft; 4,000 hp; built 1965, repowered 2008; converted to JAK coupler system 2009; matched with 50,000-bbl heated asphalt barge *Endeavour*, 2009, constructed at Jeffboat Inc.

**Buster Bouchard**, operated by **Bouchard Transportation Co.**; 127 ft; built 1979; 6,140 hp; Intercon coupler system; matched with 468-ft, 158,128-bbl barge *B. No 253* carrying black oil in Jones Act petroleum service.

**Marion C. Bouchard**, operated by **Bouchard Transportation Co.**; 127 ft; built 1979; 6,140 hp; Intercon coupler system; matched with 468-ft, 158,128-bbl barge *B. No 265* carrying black oil in Jones Act petroleum service.

**Capt. Fred Bouchard**, operated by **Bouchard Transportation Co.**; 127 ft; built 1982; 5,750 hp; Intercon coupler system; matched with 468-ft, 158,128-bbl barge *B. No 275* carrying black oil in Jones Act petroleum service.

**Ellen S. Bouchard**, operated by **Bouchard Transportation Co.**; 122 ft; built 1982; 3,900 hp; Intercon coupler system; matched with 399-ft, 80,000-bbl barge *B. No. 280* carrying clean oil in Jones Act petroleum service.

**Rhea L. Bouchard**, operated by **Bouchard Transportation Co.**; 112 ft; built 1982; 5,100 hp; Intercon coupler system; matched with 399-ft, 80,000-bbl barge *B. No. 284* carrying clean oil in Jones Act petroleum service.

**Ralph E. Bouchard**, operated by **Bouchard Transportation Co.**; 127 ft; built 1987; 6,140 hp; Intercon coupler system; matched with 467-ft, 138,000-bbl barge *B. No 230* carrying black oil in Jones Act petroleum service.

**Bouchard Girls**, operated by **Bouchard Transportation Co.**; 127 ft; built 1989; 6,140 hp; Intercon coupler system; matched with 468-ft, 158,128-bbl barge *B. No 295* carrying black oil in Jones Act petroleum service.

**Barbara E. Bouchard**, operated by **Bouchard Transportation Co.**; 127 ft; built 1992; 6,140 hp; Intercon coupler system; matched with 467-ft, 138,000-bbl barge *B. No 240* carrying clean oil in Jones Act petroleum service.

**Robert J. Bouchard**, operated by **Bouchard Transportation Co.**; 127 ft; built 1994; 6,140 hp; Intercon coupler system; matched with 468-ft, 158,128-bbl barge *B. No 285* carrying black oil in Jones Act petroleum service.

**J. George Betz**, operated by **Bouchard Transportation Co.**; 127 ft; built 1995; 6,140 hp; Intercon coupler system; matched with 483-ft, 138,000-bbl barge *B. No 235* carrying asphalt and black oil in Jones Act petroleum service.

**Danielle M. Bouchard**, operated by **Bouchard Transportation Co.**; 150 ft; built 1997; 10,000 hp; Intercon coupler system; matched with 580-ft, 252,000-bbl barge *B. No 245* carrying clean oil in Jones Act petroleum service.

**Brendan J. Bouchard**, operated by **Bouchard Transportation Co.**; 130 ft; built 1999; 6,140 hp; Intercon coupler system; matched with 424-ft, 110,000-bbl barge *B. No 215* carrying asphalt and black oil in Jones Act petroleum service.

**Jane A. Bouchard**, operated by **Bouchard Transportation Co.**; 130 ft; built 2003; 6,140 hp; Intercon coupler system; matched with 430-ft, 110,000-bbl barge *B. No 225* carrying clean oil in Jones Act petroleum service.

**Morton S. Bouchard IV**, operated by **Bouchard Transportation Co.**; 130 ft; built 2004; 6,140 hp; Intercon coupler system; matched with 467-ft, 138,000-bbl barge *B. No 242* carrying black oil in Jones Act petroleum service.

**Linda Lee Bouchard**, operated by **Bouchard Transportation Co.**; 130 ft; built 2006; 6,140 hp; Intercon coupler system; matched with 430-ft, 110,000-bbl barge *B. No 205* carrying asphalt and black oil in Jones Act petroleum service.

**Evening Star**, operated by **Bouchard Transportation Co.**; 112 ft; built 2012; 4,000 hp; Intercon coupler system; matched with 317-ft 59,000-bbl barge *B. No. 250* carrying clean oil in Jones Act petroleum service.

**Denise A. Bouchard**, operated by **Bouchard Transportation Co.**; 112 ft; built 2014; 4,000 hp; Intercon coupler system; matched with 399-ft, 80,000-bbl barge *B. No. 282* carrying clean oil in Jones Act petroleum service.

**Kim M. Bouchard**, operated by **Bouchard Transportation Co.**; 150 ft; built 2015; 10,000 hp; Intercon coupler system; matched with 628-ft, 260,000-bbl barge *B. No 270* carrying black oil in Jones Act petroleum service.

**Donna J. Bouchard**, operated by **Bouchard Transportation Co.**; 150 ft; built 2016; 10,000 hp; Intercon coupler system; matched with 628-ft, 260,000-bbl barge *B. No 272* carrying clean oil in Jones Act petroleum service.

**Frederick E. Bouchard**, operated by **Bouchard Transportation Co.**; 130 ft; built 2016; 6,000 hp; Intercon coupler system; matched with 404-ft, 110,000-bbl barge *B. No 220* carrying clean oil in Jones Act petroleum service.

**Morton S. Bouchard Jr.**, operated by **Bouchard Transportation Co.**; 130 ft; built 2016; 6,000 hp; Intercon coupler system; matched with 420-ft, 110,000-bbl barge *B. No 210* carrying clean oil in Jones Act petroleum service.

**Sam B.**, operated by **Brice Inc.**; Fairbanks, Alaska; 78 ft; 1,500 hp; triple screw; built 2007; Articouple connection system; matched with 224-foot flat deck barge *L.A. B* for operations in Alaskan waters and abroad.

**Aluq**, operated by **Brice Inc.**; Fairbanks, Alaska; 69.5 ft; 1,437 hp; triple screw; built 2013; JAK-200 coupling system; matched with 173-ft *Drift River*.

**Sea Reliance, Ocean Reliance, Sound Reliance & Coastal Reliance**, operated by **Crowley Maritime**; 9,280 hp; 126 ft; new 2002-2003; barges 550-1 through 550-4 carry refined oil products; U.S. West Coast; Intercon coupler systems; 155,000 bbls.

**Pacific Reliance & Gulf Reliance**, operated by **Crowley Maritime**; 9,280 hp; 127 ft; introduced 2006; operating with tank barges 650-1 & 650-2, 587 ft, 178,000 bbls.

**Resolve, Integrity, Courage & Commitment**, operated by **Crowley Maritime**; new 2007-2009; 9,280 hp; 135 ft; heavy fuel burners; Intercon coupler systems; with barges 650-3, 650-4, 650-5, 650-6; all 178,000-bbl capacity; petroleum products.

**Pride, Achievement, Innovation & Vision**, operated by **Crowley Maritime**; deliveries 2009-2011; 10,500 hp; 135 ft; heavy fuel burners; Intercon coupler systems; with barges 650-7, 650-8, 650-9, 650-10; all 185,000 bbl capacity; petroleum and chemical products.

**Legacy, Legend, & Liberty**, operated by **Crowley Maritime**; 148 ft; 16,320 hp; Intercon coupler systems; with barges 750-1, 750-2, 750-3; all 327,000 bbl capacity; petroleum and chemical products.

**Baltimore**, operated by **Express Marine**; 125 ft; 3,600 hp; converted to JAK pin system 2008; matched with 470-ft dry bulk barge *EMI 1850*, transports coal.

**Freedom**, operated by **Express Marine**; 115 ft; 6,000 hp with Steerprop ASD propulsion system; matched with 480-ft coal barge *EMI 2400*, both built 2010; JAK coupler system; transports coal.

**Honor**, operated by **Express Marine**; 106 ft; 4,000 hp; converted to JAK pin system 2015; matched with 470-ft dry bulk barge *EMI 2100*, transports rock.

**Strong**, operated by **Foss Maritime**; 6,800 hp; 150 ft; built 1978; Articouple system; barge *Mariner* carries ro-ro cargoes of trailers, cars, and deck cargo; 9,100-sq-ft deck area; Pacific routes in U.S., Hawaii & Alaska; 568 ft long; 13,375 gross tons.

**Thunder**, operated by **Foss Maritime**; 120 ft; 8,400 hp; built 1992; Bludworth coupler system; ro-ro barge *Lightning* carrying liquid cargo, deck cargo & containers, 7,164 dwt, 460 ft.

**Emery Zidell**, operated by **Harley Marine Services**, Seattle, Wash.; 4,492 hp, 116 ft; built 2014; Taisei Engineering Articouple FRC 55; matched with 80,000-bbl oil barge *Dr. Robert Beall*; West Coast service.

**Jake Shearer**, operated by **Harley Marine Services**, Seattle, Wash.; 4,492 hp, 116 ft; built 2014; Taisei Engineering Articouple FRC 55; matched with 83,000-bbl oil barge *FFA*.

**Barry Silverton**, operated by **Harley Marine Services**, Seattle, Wash.; 4,492 hp, 116 ft; built 2014; Taisei Engineering Articouple FRC 55; matched with 83,000-bbl oil barge *Fight A.L.S.*

**Dale R Lindsey**, operated by **Harley Marine Services**, Seattle, Wash.; 3,000 hp, 116 ft; built 2015; Taisei Engineering Articouple FRC 43M; matched with 28,450-bbl oil barge *Petra Mariner*.

**Dorothy Ann**, operated by **Interlake Steamship**; 7,200 hp; 124.25 ft; z-drive propulsion; 1999; Bark River articulation system; self-unloading barge *Puffininder*; carries bulk cargoes on Great Lakes; 26,700 tons; 606 ft.

**Adriatic Sea, Beaufort Sea, Java Sea, Kara Sea, Tasman Sea & Norwegian Sea**, operated by **Kirby Corp.**; 3,300 to 4,800 hp; converted to JAK 400 coupler systems; converted or new double-hull oil barges; deliver petroleum or liquid-bulk products; U.S. East & Gulf Coasts.

**Lincoln Sea**, operated by **Kirby Corp.**; New York; 7,000 hp; 124 ft; built 1999 by J.M. Martinac Tacoma, Wash.; Intercon coupler system; double-hull petroleum products; barge *DBL 140*, 140,000 bbls; 504 ft.

**Davis Sea**, operated by **Kirby Corp.**; approx. 2,000 hp; converted to JAK coupler system 2005; with barges *DBL-105*, *DBL-28* and *DBL-27*.

**Labrador Sea**, operated by **Kirby Corp.**; 2,400 hp; converted 2008 to JAK coupler system; matched with 30,000-bbl bunker barge.

**Irish Sea, Rebel & Viking**, operated by **Kirby Corp.**; 5,700 hp, 7,200 hp and 4,300 hp respectively; converted 2007 to JAK coupler system; matched with double-hull petroleum barges.

**Bismarck Sea**, operated by **Kirby Corp.**; 1976; 5,700 hp; matched with tank barge *DBL-106*, 100,000 bbls; JAK coupler system.

**Dublin Sea**, operated by **Kirby Corp.**; 10,000 hp; built 2009; Intercon coupler system; matched with 185,000-bbl petroleum barge, *DBL-185*; attached to K-Sea West Coast division.

**William J. Moore** (Canadian), operated by **Kirby Corp.**; 4,400 hp; 135 ft; Bludworth connection system; barge *McCleary's Spirit* carries refined petroleum products on Saint Lawrence River & Lake Ontario; 95,000 bbls.

**Sea Eagle**, operated by **Kirby Corp.**; 5,600 hp; 125 ft; built 1998; Bludworth coupler system; barge *TMI 17* carries chemical & petroleum products; 17,000 dwt.

**Sea Raven**, operated by **Kirby Corp.**; 7,200 hp; 120 ft; built 1978; Bludworth coupler system; barge *ATC 23* carries chemical & petroleum products coastwise U.S.; 19,946 dwt; 490 ft.

**Sea Hawk**, operated by **Kirby Corp.**; 8,000 hp; 124 ft; built 2002; Intercon connection system; barge *ATC 21* carries chemical product Gulf Coast & Eastern Seaboard; 129,000 bbls; 450 ft.

**Osprey**, operated by **Kirby Corp.**; 5,800-hp single screw with CP prop; with barge *ATC 25*, converted to double hull; 170,000-bbl petroleum/chemical products.

**Jason E. Duttiger**, operated by **Kirby Corp.**; 6,000 hp; 125 ft; built 2013; matched with barge *Winna Wilson*, Articouple connection system.

**Captain Donald Lowe Sr.**, operated by **Kirby Corp.**; 6,000 hp; 125 ft; built 2013; matched with barge *Margo Dale*, Articouple connection system.

**Heath Wood** operated by **Kirby Corp.**; 6,000 hp; 125 ft; built 2016; matched with 155,000-bbl barge *Kirby 155-01* outfitted for hauling petroleum and chemical products.

continued on next page

## Articulated Tug Barges

continued from previous page

**Samuel de Champlain**, owned by **LaFarge North America**, operated by Andrie Inc., 7,200 hp; 150 ft; converted 2006 to Bludworth connection system; operates with barge *Innovation*; 460 ft; 17,000 tons of cement products; operates on Great Lakes.

**GL Ostrander**, owned by **LaFarge North America**; operated by Andrie Inc., 7,200 hp; 140 ft; refit 1996; Bludworth coupler system; self-unloading barge *Integrity* carries cement on Great Lakes; capacity 14,000 tons; 460 ft.

**La Force**, operated by **Martin Midstream Partners**; 116.5 ft; built 1974; 5,100 hp; matched with 334-ft, 58,821-bbl tank barge *M 600* carrying diesel fuel.

**Texan**, operated by **Martin Midstream Partners**; 96 ft; built 1979; 7,130 hp; matched with 369.6-ft, 52,169-bbl tank barge *Ponciana* carrying liquefied petroleum gas and liquefied flammable gas.

**Martin Explorer**, operated by **Martin Midstream Partners**; 115.8 ft; built 1996; 7,130 hp; matched with 432-ft, 37,369-bbl tank barge *Margaret Sue* carrying bulk liquids and sulfur.

**Everlast** (Canadian), operated by **McAsphalt Marine Transportation**, Hamilton, Ontario; 6,000 hp; built in Japan; Articouple connection system; barge *Norman McLeod* carries heated asphalt products on Great Lakes & Saint Lawrence River; 70,000 bbls; 379 ft.

**Leo A. McArthur** (Canadian), operated by **McAsphalt Marine Transportation**, Hamilton, Ontario; 5,300 hp; built in China 2009; matched with 70,000-bbl product barge *John J. Carrick*, built in China, 2009; Articouple connection system, heated asphalt cargoes on Great Lakes.

**Paul T. Moran**, operated by **Moran Towing Corp.**, New York; 7,200 hp; 150 ft; Bludworth articulation system converted 1999; repowered 2010; with barge *Massachusetts*, 1982; double-hulled 2005; delivers petroleum products on Gulf Coast and Eastern Seaboard; 430 ft; 140,000 bbls.

**Barney Turecamo**, operated by **Moran Towing Corp.**, New York; 5,100 hp; 121 ft; converted 2005 to Intercon connection system; barge *Georgia*; 2005; carries petroleum products on Gulf Coast and Eastern Seaboard; 118,000 bbls; 425 ft.

**Scott Turecamo**, operated by **Moran Towing Corp.**, New York; 5,100 hp; 121 ft; converted 2004 to Intercon connection system; barge *New Hampshire*; 2004; carries petroleum products on Gulf Coast and Eastern Seaboard; 118,000 bbls; 425 ft.

**Pati R. Moran and Linda Moran**, operated by **Moran Towing Corp.**, New York; 121 ft; 5,100 hp; Intercon coupler system; new 2007 and 2008; matched with 118,000-bbl oil barges *Charleston* and *Houston*.

**Lois Ann L. Moran**, operated by **Moran Towing Corp.**, New York; built 2008; 121 ft; 5,100 hp; Intercon coupler system; barge *Philadelphia*; 2008; carries petroleum products on Gulf Coast and Eastern Seaboard; 118,000 bbls; 425 ft.

**Mary Ann Moran**, operated by **Moran Towing Corp.**; 121 ft; 5,100 hp; new 2010; coupled with converted dry bulk barge *Virginia*; built 1982; Intercon connection system; carrying grain cargoes between New Orleans and Puerto Rico.

**Mariya Moran**, operated by **Moran Towing Corp.**, New York; built 2015; 121 ft; 6,000 hp; Intercon connection system; barge *Texas*; 495 ft; 160,000-bbl; carries petroleum products on Gulf Coast and Eastern Seaboard.

**Leigh Ann Moran**, operated by **Moran Towing Corp.**, New York; built 2015; 121 ft; 6,000 hp; Intercon connection system; barge *Mississippi*; 495 ft; 160,000-bbl; carries petroleum products on Gulf Coast and Eastern Seaboard.

**Barbara Carol Ann Moran**, operated by **Moran Towing Corp.**, New York; built 2016; 121 ft; 6,000 hp; Intercon connection system; barge *Louisiana*; 468 ft; 122,000-bbl; carries chemicals and petroleum products on Gulf Coast and Eastern Seaboard.

**OSG Honour & OSG Enterprise**, operated by **OSG Ship Management**; 5,600 hp; converted to Bludworth connection systems; barges *OSG-209* & *OSG-214* carry petroleum products on East and Gulf Coasts.

**OSG Navigator & OSG Intrepid**, operated by **OSG Ship Management**; 5,600 hp; 136 ft; refits 1993 & 1986; Intercon coupler system; barges *OSG 252* & *OSG 254*; carry petroleum products East & Gulf Coasts.

**OSG Independence & OSG Columbia** operated by **OSG Ship Management**; 125 ft, 1980 and 1981, 5,600 hp and 6,140 hp; assigned to oil barges *OSG 243* & *OSG 242* with Bludworth connection systems; carry clean products on East and Gulf Coasts.

**OSG Vision, OSG Horizon**, operated by **OSG Ship Management**; 12,000-hp heavy fuel burners with CP props; matched with 342,000-bbl petroleum barges *OSG 350* and *OSG 351*; Intercon coupler systems; primarily carry crude in the Delaware Bay and River.

**OSG Courageous**, operated by **OSG Ship Management**; 8,000 hp; 139 ft; built 2011; Intercon coupler system; barge *OSG 244* carries petroleum products East & Gulf Coasts.

**OSG Endurance**, operated by **OSG Ship Management**; 8,000 hp; 139 ft; built 2011; Intercon coupler system; barge *OSG 192* carries dirty products on Gulf Coast.

**Amberjack** — converted to conventional tug, operated by **Penn Maritime**; 3,900 hp; 116 ft; built 1981; converted to Bludworth articulation system 1998; barge *Biscayne* (ex-*Morania 450*); carries heated oil products; 70,000 bbls; 405 ft; built 1981; conversion 1998.

**Eliza & Lucia**, operated by **Penn Maritime**; 7,000 hp; 127 ft; built 1995; Intercon coupler system; barges *Atlantic* & *Caribbean* carry asphalt; East & Gulf coasts; 18,000 dwt; 460 ft.

**Teresa & Julie**, operated by **Penn Maritime**; 7,000 hp; 127 ft; new 1997-98; Intercon coupler system; barges *Acadia* & *Yucatan* carry heated oil products; East Coast, Gulf Coast & offshore; 160,000 bbls; 490 ft.

**Valiant**, operated by **Penn Maritime**; 8,000 hp; acquired in 1998; converted to Bludworth connection system; barge *Everglades* carries heated petroleum products; 180,000 bbls.

**Capt. Hagen**, operated by **Penn Maritime**; 6,000 hp; 123 ft; built 2004; Intercon coupler system; barge *Key West*; 140,000 bbls; built 2004; carries petroleum products; Gulf of Mexico.

**Tarpon & Dolphin**, operated by **Penn Maritime**; 4,300 hp; converted to JAK coupler systems 2006; with barges *Potomac* and *Penn 410*; both 80,000 bbls; carrying heated oil and asphalt cargoes.

**Skipjack & Coho**, operated by **Penn Maritime**; 4,000 hp; 116 ft; JAK coupler system; new 2008/2009; matched with 90,000-bbl heated oil barges.

**Yellowfin, Bluefin & Mako**, operated by **Penn Maritime**, new 2009-2011; 4,000 hp; JAK coupler system, matched with 90,000-bbl heated asphalt barges.

**Prentiss Brown**, operated by **Port City Marine Services**, Muskegon, Mich.; 118 ft, 4,300 hp, built 1967; converted to Bludworth connection system 2008; matched with self-unloading 437-foot cement barge, *St. Mary's Challenger* (ex-*Medusa Challenger*, converted former steamer 2014, in Great Lakes service.

**Bradshaw McKee**, operated by **Port City Marine Services**, Muskegon, Mich.; 118 ft, 4,300 hp, built 1977; converted to Bludworth connection system 2008; matched with self-unloading 437-foot cement barge, *St. Mary's Conquest* (ex-*Southdown Conquest*), converted former steamer, in Great Lakes service.

**Invincible**, operated by **Rand Logistics** and Grand River Navigation, Cleveland, Ohio; 5,600 hp; 100 ft; built 1979; Bludworth coupler system; self-unloading barge *McKee Sans* carrying dry-bulk cargo; 579 ft; 20,000 tons.

**Victory**, operated by **Rand Logistics** and Lower Lakes Towing; 8,000 hp; upgraded with Hydroconn connection system and matched with 815-ft barge *James L. Kubler* (ex-*Steamer, Reserve*) 2008; carries bulk cargoes on Great Lakes.

**Olive L. Moore**, operated by **Rand Logistics** and Lower Lakes Towing; 125 ft; 5,830 hp; connected by Hydroconn coupler system to 621-ft barge *Lewis J. Kubler*; carries dry bulk cargoes on Great Lakes.

**Dace Reinauer, Joanne Reinauer, Lucy Reinauer**, operated by **Reinauer Transportation**; conversions 2007-08; JAK coupler systems; with petroleum transport barges; East Coast.

**Timothy L. Reinauer, Craig Eric Reinauer, Morgan Reinauer, Austin Reinauer**, operated by **Reinauer Transportation**; repowered and converted to Intercon C coupler system 2004-2009; with interchangeable 100,000-bbl barges; petroleum products on East Coast.

**Stephen Reinauer**, operated by **Reinauer Transportation**, New York; 108 ft; 3,000 hp; converted to ATB in 2007; with new oil barge; 80,000 bbls; JAK system; carries petroleum products Eastern Seaboard.

**Nicole Leigh Reinauer, Christian Reinauer & Meredith Reinauer** operated by **Reinauer Transportation**, New York; 7,200 hp; 124 ft; built 1999, 2001 & 2003 by Atlantic Marine, Jacksonville, Fla., & Mobile Ala.; Intercon coupler systems; barges *RTC 135*, *RTC 145* & *RTC 150* carry clean petroleum products on Eastern Seaboard; 135,000 to 150,000 bbls.

**Ruth M. Reinauer, Laurie Ann Reinauer**, operated by **Reinauer Transportation**, built Senesco Shipyard 2009-10; 4,000 hp; Intercon coupler systems, matched with new 80,000 to 100,000-bbl barges, also from Senesco Shipyard.

**Reinauer Twins**, operated by **Reinauer Transportation**; built Senesco Shipyard 2011; Intercon C coupler system; matched with new 100,000-bbl oil barge, also from Senesco Shipyard.

**B. Franklin Reinauer and Curtis Reinauer**, operated by **Reinauer Transportation**; built Senesco Shipyard 2012; with oil barges; 80,000 bbls, JAK system; carries petroleum products Eastern Seaboard.

**Dean Reinauer**, operated by **Reinauer Transportation**; built Senesco Marine 2013; with oil barge *RTC 106*; 100,000 bbls; Intercon coupler system.

**Haggerty Girls**, operated by **Reinauer Transportation**; 4,700 hp; built 2013; JAK coupler system.

**Dylan Cooper**, operated by **Reinauer Transportation**; built Senesco Marine 2015; Intercon coupler system; paired with 100,000-bbl fuel barge *RTC 108*.

**Gracie M. Reinauer**, operated by **Reinauer Transportation**; built Senesco Marine 2016; Intercon Series C coupler system; paired with 100,000-bbl fuel barge *RTC 109*.

**Seaspan Challenger** (Canadian), operated by **Seaspan Marine Corp.**, Vancouver; 3,600 hp; 131 ft; single screw; built 1970; converted to JAK coupler system 2002; barge *Coastal Spirit* deck cargoes servicing Vancouver Island, built in China, 2001.

**Arctic Taglu & Arctic Hooper** (Canadian), operated by **Seaspan Marine Corp.**, Vancouver; 2,250 hp; 110 ft; Sea Link articulation systems; ro-ro trailer barges *Georgia Link* & *Fraser Link*; servicing Vancouver & western Canada.

**Naida Ramil**, operated by **United Ocean Services LLC**; 7,000 hp; 124 ft; converted to Bludworth coupler system 2003; barge *Peggy Palmer* delivering dry-bulk cargoes Caribbean & worldwide; 34,000 dwt; 550 ft.

**Coastal 303**, operated by **United Ocean Services LLC**; 5,210 hp; 136 ft; built 1973; Bludworth coupler system; barge *Alabama Enterprise* delivers bulk cargo worldwide; 26,000 dwt; 547 ft.

**Freeport, Galveston, Brownsville & Corpus Christi**, operated by **U.S. Shipping Corp.**; 150 ft; 12,000 hp; Intercon coupler system; built 2007-09; matched with 146,000-bbl oil/chemical barges.

**Brandywine & Christiana**, operated by **Vane Brothers** of Baltimore; 123 ft; 6,000 hp; built 2006-2007; Intercon coupler system; matched with barge *DS-141* and *DS-143*, 480 ft, 135,000 bbls.

**Cavek**, operated by **Vitus Marine**, Anchorage, Alaska, for the Alaskan Village Electric Coop; 76 ft, 1,800 hp; built 2011; coupler, Taisei Engineering Articouple FRC-35; matched with 208-ft, 10,000-bbl oil barge that also carries deck cargo; serves Western Alaskan communities.

**Naniq**, operated by **Vitus Marine**, Anchorage, Alaska, for the Alaskan Village Electric Coop; 76 ft, 1,800 hp; built 2011; Taisei Engineering Articouple FRC-35; matched with 183-ft, 8,000-bbl oil barge that also carries deck cargo; serves Western Alaskan communities.

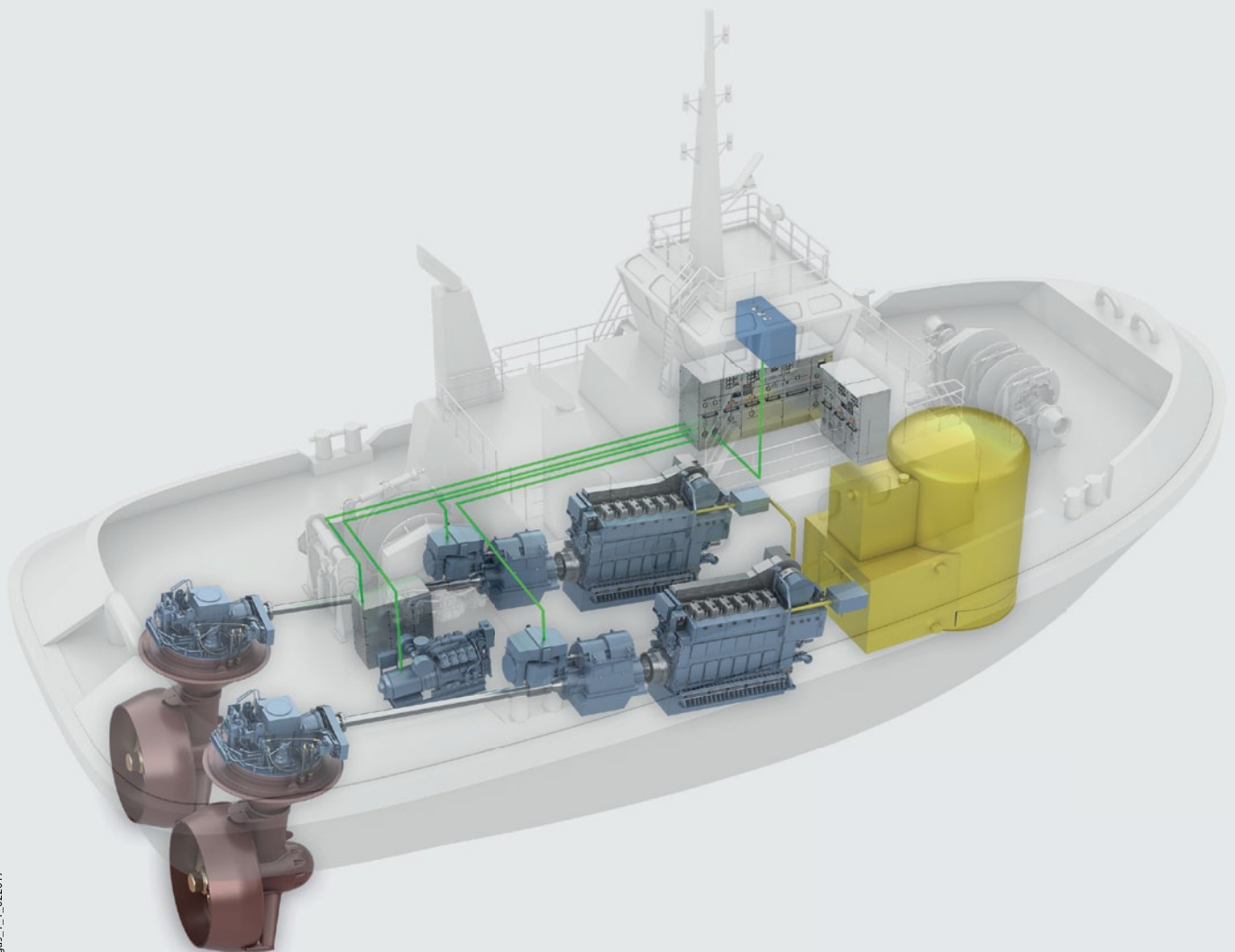


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