# FREIGHTERS

THE GREAT LAKES SHIPPING INDUSTRY PERIODICAL
EDITION #73 – WINTER 2024
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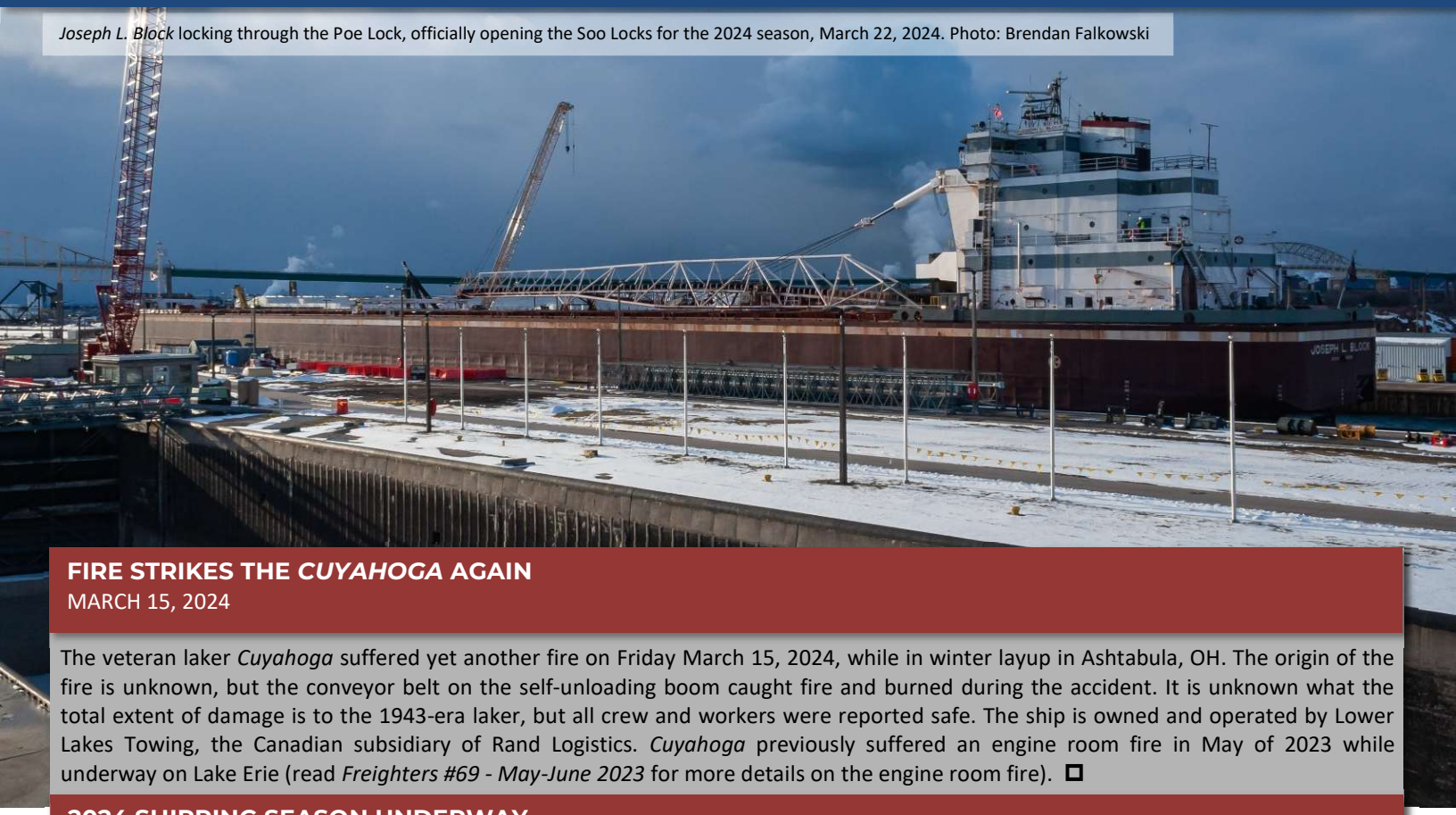
## STANDING TALL AGAINST THE SANDS OF TIME

THE HISTORY OF SAND PRODUCTS CORPORATION

- FIRE STRIKES *CUYAHOGA* AGAIN
- 2024 SHIPPING SEASON UNDERWAY
- *CANADIAN RANGER*: THE FIRST BOOM FORWARD BOAT
- IN THE DESIGN: DIESEL EXHAUST SCRUBBERS

# LAKER REPORTS

NEWS AND HAPPENINGS FROM AROUND THE LAKES



*Joseph L. Block* locking through the Poe Lock, officially opening the Soo Locks for the 2024 season, March 22, 2024. Photo: Brendan Falkowski

## FIRE STRIKES THE *CUYAHOGA* AGAIN

MARCH 15, 2024

The veteran laker *Cuyahoga* suffered yet another fire on Friday March 15, 2024, while in winter layup in Ashtabula, OH. The origin of the fire is unknown, but the conveyor belt on the self-unloading boom caught fire and burned during the accident. It is unknown what the total extent of damage is to the 1943-era laker, but all crew and workers were reported safe. The ship is owned and operated by Lower Lakes Towing, the Canadian subsidiary of Rand Logistics. *Cuyahoga* previously suffered an engine room fire in May of 2023 while underway on Lake Erie (read *Freighters #69 - May-June 2023* for more details on the engine room fire). ☐

## 2024 SHIPPING SEASON UNDERWAY

MARCH 22, 2024

The 2024 Shipping season officially got underway on March 22, 2024, with the opening of the Soo Locks and Welland Canal. The *Joseph L. Block* was the first ship to lock through at the Soo Locks for 2024. The Welland Canal was opened by the downbound *Algoma Conveyor* and the upbound *Algoma Sault*. Ships are beginning to set sail from winter layup as the new season gets moving. ☐

## *AMERICAN MARINER* RUNS AGROUND IN ST. MARYS RIVER, HALTS TRAFFIC

MARCH 22, 2024

The *American Mariner* struck the Mud Lake Junction Light while upbound in Munuscong Lake in the morning of March 28, 2024. Following the collision, she ran aground, blocking part of the shipping channel. Authorities arrived on the scene soon after and later assisted out of the channel and to a new anchorage in Raber Bay, downriver. The cause of the incident is unknown at this time. The river was re-opened to vessel traffic on the afternoon of Friday, March 29, 2024. As of March 31, inspections onboard had concluded and *American Mariner* was underway for Ashtabula, OH, where owner Rand Logistics operates a ship repair yard. ☐

## 2023 SEASON STATS

STATISTICS AND FIGURES FROM LAST SEASON

**51 ACTIVE US-FLAGGED SHIPS**
**66 ACTIVE CANADIAN-FLAGGED SHIPS**
**9 INACTIVE SHIPS**
**2 SHIPS RETIRED**

Special Thanks to Know Your Ships and Lake Carriers Association for helping to provide this information.

**IN 2023, US SHIPS MOVED**

- **42,384,289 TONS OF IRON ORE**
- **8,400,833 TONS OF COAL**
- **24,631,568 TONS OF LIMESTONE**
- **3,732,534 TONS OF CEMENT**
- **1,158,665 TONS OF SALT**
- **734,591 TONS OF SAND**
- **314,513 TONS OF GRAIN**

# CANADIAN RANGER

## THE FIRST FORWARD BOOM BOAT

Written by Sam Hankinson


*Canadian Ranger* on the Welland Canal, 1988. Visible on the spar deck is the moveable unloading leg on the yellow hatch crane. Photo: MHSD Collection

Today, the hot trend on the lakes is building ships capable of servicing any dock with deep enough water. These ships are being built with aft accommodations and a forward-mounted unloading system. The Manitoulin entered service as a modern chop-job in 2016, and the Algoma Innovator came a year later, followed by the Algoma Intrepid. Mark W. Barker continued this trend on the US side in 2022. The forward-mounted boom with aft accommodations is not a trend specific to the Great Lakes. Algoma and Canada Steamship Lines have assets like this in their saltwater fleets.

The first forward boom boat came long before these in the form of Upper Lakes convert Canadian Ranger. To understand the history of the Canadian Ranger, one must first learn about the package freighter Chimo and the bulk carrier Hilda Marjanne.

The Chimo was built in 1967 at Davie Shipbuilding in Lauzon, Quebec. It sailed in the package freight business for Canada Steamship Lines on the Great Lakes, Canadian East Coast, and Arctic. It was sold with fleetmate Cabot to Upper Lakes Shipping in January 1983 as package freight business declined.

The Hilda Marjanne was built as the T2-SE-A1 tanker Grande Ronde at the Kaiser Company's Swan Island Shipyard in Portland, Oregon in 1943.

She was built for the U. S. Maritime Commission and entered service under the management of Los Angeles Tanker Operators in December 1943. It was sold to Greek owners in 1947 and renamed Kate N. L. A subsidiary of Upper Lakes purchased the tanker in 1960 for conversion to a Great Lakes bulk carrier.

The project took place at Schlieker-Werft Shipyards in Hamburg, West Germany. The old forebody was scrapped and a new forebody was fitted to the ship's existing stern section. It arrived at Port Weller Dry Docks in August 1961 for inspection before entering service in November 1961. The Marjanne laid up at Hamilton in June 1983.

The Chimo was towed to Hamilton following its sale to Upper Lakes, and was towed to Port Weller Dry Docks in September 1983. The Marjanne had its forward pilothouse removed and stern cut off forward of the engine room in Hamilton before it was towed to PWDD in November 1983. A 25-foot-long hull transition section was fabricated to make up for the width difference between the two hulls. The converted vessel entered service on May 6, 1984 as the Canadian Ranger.




(Inset, upper): *Chimo* in her original package freighter form. Photo: Graham Grattan, MHSD Collection. (Inset, lower): *Hilda Marjanne*. Photo: MHSD Collection

In 1988, the ship was outfitted with a specialized self-unloading system at Hamilton. A moveable unloading elevator was mounted to the ship's hatch crane and transferred cargo to another unloading conveyor running the length of the spar deck. A bucket elevator system was installed up forward which fed a bow-mounted boom. This system was designed for handling grain or other light commodities. Hamilton Marine, a division of Canadian Shipbuilding and Engineering, installed the system. The system was later modified to follow more conventional setups and the moveable unloading leg removed in 2007.

The Canadian Ranger sailed her last in 2008, laying up in Toronto for the final time. She was towed to Aliaga, Turkey for scrapping in June 2011. Although she never won any beauty contests, the Canadian Ranger's unique self-unloading design served as a preview for the optimized lakers we see today.□

# STANDING TALL AGAINST THE SANDS OF TIME

## SAND PRODUCTS CORPORATION REACHES CENTENNIAL IN 2024 – PART I: HUMBLE BEGINNINGS


Early Sand Products-Wisconsin Michigan Steamship Co. steamer *Missouri* departing Muskegon, MI, 1930s. Photo: McKee Collection

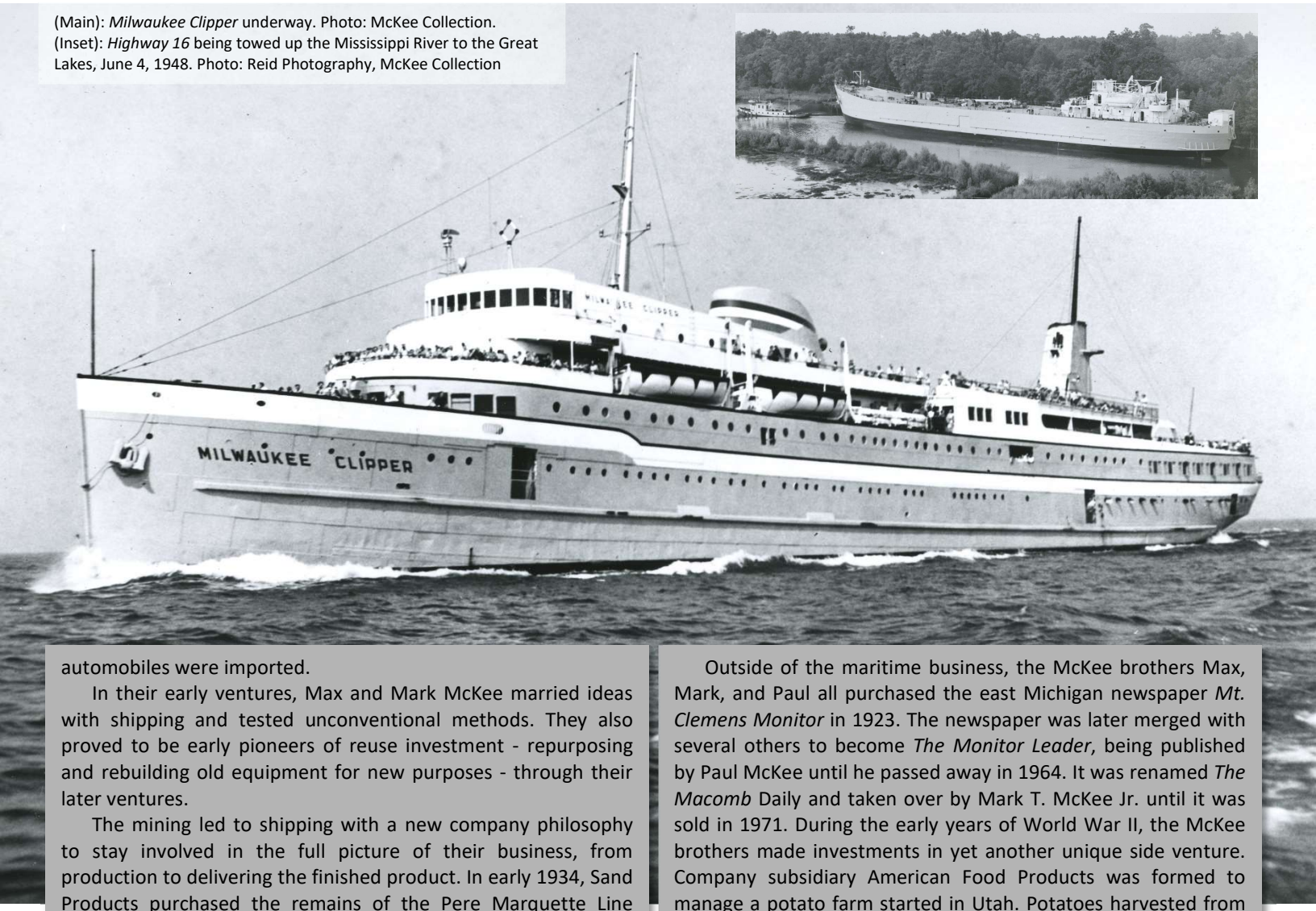
When Max and Mark McKee started the Port Crescent Sand & Fuel Co. in 1924, they would not have imagined what their small company would become in the next 100 years. January 14, 2024, marks the official centennial of Sand Products Corp., when the original bank account was opened at the Detroit National Bank. It was on that day in 1924 that Max McKee took a business loan, opening account number 003, to purchase a lumber plot on the shores of Lake Huron in Port Austin, MI. According to Michigan Manufacturer and Financial Record, Port Crescent Fuel & Sand Co. was officially incorporated on February 2, 1924, by Max McKee with partners from Muskogee, OK, and Mount Clemens, MI.

The McKee brothers grew up as farm boys in the Midwest, moving around frequently until eventually making their way back home to the Great Lakes. Max and Mark both sold insurance and later went on to become attorneys. Max graduated from high school as the class president in Lakeview, MI, and went right on to Law School, graduating in 1915. Both brothers worked in the insurance business up until their investment in the sand mining industry in Michigan's thumb region.

Following the purchase of the land in Port Austin, Port Crescent Sand & Fuel Co. began mining sand on the property and supplying foundry sand to feed the hungry industrial machine in Detroit. Prior to Port Crescent Sand's entry into the business, most foundry sand was shipped from West Michigan. In 1926 the Port Crescent facilities were further expanded with more conveying systems and a loading dock to load ships with sand. Over a mile of conveyors were designed and installed by Stephens-Adamson.

The Sand Products Corp. we know today was formed from the merger of Port Crescent Sand & Fuel, Hubbell Sand Co., Western Michigan Sand and Fuel Co., and Manistee Sand & Dock Co. in 1930. The merger included sand-rich property along the shores of the Manistee River that was developed in the late 1920s for mining and shipping sand. Sand was loaded into large self-unloading freighters along the north bank of the Manistee River for transport to foundries across the region. New terminals for the sand business were opened in Milwaukee, Cleveland, Buffalo, and Hamilton ON, as transshipment distribution centers. The last sand was shipped away from Port Crescent in 1938, but SPC had secured property on a strip of land between the west end of Muskegon Lake and Lake Michigan in the late 1920s. This facility, the Pigeon Hill property, was developed and exported its first load of sand on the *W.E. Fitzgerald* in 1936.

In 1931 the McKee brothers took up another venture: building the Mart Dock in Muskegon. Thus, two of the earliest divisions of the Sand Products Corp. – Muskegon Dock and Fuel Co. and West Michigan Dock & Market Co. – were born. The project was high risk, aiming at expanding agriculture and cold storage and providing a terminal from which a variety of cargoes could be handled all while in the depths of the Great Depression. The site of the former Blodgett and Byrne lumber mill and later used by Goodrich Transportation company as a passenger and freight terminal, the Mart Dock was located strategically near downtown Muskegon along the shores of Muskegon Lake. The multi-use vision of the Mart Dock was viewed as a huge success for the community. Farmers would store their fruit crops in cold storage to await transshipment overseas. Cargoes of coal and pig iron were brought in and stored at the dock to support local industries in West Michigan. New cars were shipped both in and out of the terminal. The Mart Dock was one of only three locations in the entirety of the United States that British MG




(Main): *Milwaukee Clipper* underway. Photo: McKee Collection.
(Inset): *Highway 16* being towed up the Mississippi River to the Great Lakes, June 4, 1948. Photo: Reid Photography, McKee Collection

automobiles were imported.

In their early ventures, Max and Mark McKee married ideas with shipping and tested unconventional methods. They also proved to be early pioneers of reuse investment - repurposing and rebuilding old equipment for new purposes - through their later ventures.

The mining led to shipping with a new company philosophy to stay involved in the full picture of their business, from production to delivering the finished product. In early 1934, Sand Products purchased the remains of the Pere Marquette Line Steamers and Wisconsin & Michigan Transportation Co., facilitating the merger of the fleets into the newly-created Wisconsin & Michigan Steamship Co. Through this merger the company's marine division was born, with the small package freighters *Missouri*, *Nevada*, and *Virginia*. One of the last vessels in the old Goodrich Fleet, the *Illinois*, was acquired in addition to the Montague, MI, fuel dock the same year. In the late 1930s the aging steamers *Illinois*, *Missouri*, and *Virginia* were laid up at the Mart Dock in Muskegon. Meanwhile, the *Nevada* became the subject of the McKee's first maritime experiments. In 1936 her stern was cut down to the main deck and she was converted into the world's first Roll-On/Roll-Off vessel, specially set up for the transport of new automobiles and truck trailers in the cross-Lake Michigan trade.

Five years after entering the marine shipping business, the McKees purchased the idle passenger vessels *Juniata* and *Octorara* in 1939 for reconstruction into modern passenger liners and automobile ferries. *Juniata* was rebuilt with a new fireproof superstructure in 1941 and returned to service as the *Milwaukee Clipper*. *Octorara* was to follow suit as a twin to the *Clipper*, but she as well as the *Nevada* were requisitioned by the U.S. Government for the war effort in 1942. *Octorara* was retired after the war, and efforts to retrieve her bell were unsuccessful. Interestingly enough, the bell found its way to the Dossin Great Lakes Museum in Detroit and eventually to the Mariner's Church where it stands today.

Outside of the maritime business, the McKee brothers Max, Mark, and Paul all purchased the east Michigan newspaper *Mt. Clemens Monitor* in 1923. The newspaper was later merged with several others to become *The Monitor Leader*, being published by Paul McKee until he passed away in 1964. It was renamed *The Macomb* Daily and taken over by Mark T. McKee Jr. until it was sold in 1971. During the early years of World War II, the McKee brothers made investments in yet another unique side venture. Company subsidiary American Food Products was formed to manage a potato farm started in Utah. Potatoes harvested from the farm were used to produce MREs – Meals Ready to Eat – for the US military to support troops in combat in World War II. Meanwhile Sand mining operations continued to grow, and Sand Products became one of the world's largest producers of industrial sands. Several hundred boat loads of sand were shipped out of Muskegon during the war period.

Growth of the marine division continued in the late 40s and early 50s. Following the end of World War II, many former Naval vessels were laid up in reserve fleets along the coastlines of the US. The era of suburbanization and increased consumerism meant more demand for products like new automobiles, and the heads of Sand Products saw opportunity in this market. In 1948 the company purchased the former landing ship USS *LST-393* from the U.S. Navy and converted it to an automobile ferry. USS *LST-393* had a storied war career following her commissioning in 1942, participating in the occupation of Sicily in July 1943, the Salerno Landings in September 1943, and the Normandy Landings in June 1944. Renamed *Highway 16*, she hauled new cars from the factories in Detroit, Flint, and Lansing to Milwaukee, WI, and brought new cars back over while fleetmate *Milwaukee Clipper* focused on the passenger trade.

The onset of the Korean War created yet more demand for raw materials for the steel and manufacturing caused a panic among Great Lakes shipping operators. Orders flooded into Great Lakes shipyards as operators rushed to upgrade their aging fleets with more modern and efficient vessels. Order books filled


(Main): *McKee Sons* underway on the Detroit River, July 30, 1960. Photo: Elmer Treloar, McKee Collection
(Inset): *Aquarama* underway on the Detroit River, September 1962. Photo: MHSD Collection

quickly and Great Lakes yards were not able to keep up with the demand. The McKees rallied alongside other Great Lakes operators to encourage Congress to amend the Merchant Shipping Act of 1936. This Act – The Great Lakes Vessel Sales Act of 1950 – was passed by Congress on September 28, 1950, and allowed Great Lakes shipping operators to purchase up to ten surplus wartime hulls from the U.S. Maritime Commission by December 31, 1950, for a reduced cost with an allowance for conversion for Great Lakes service. The bill was pushed by two Wisconsin congressmen and Rep. Albert Engel of MI with the support of Troy H. Browning and Nicholson-Universal interests as well as Miles and Mark McKee, who both testified before Congress in the bill's favor. Wisconsin & Michigan Steamship applied to purchase several C-3 ships through the Merchant Vessels Sales Act of 1946, but Great Lakes operators were denied the opportunity to purchase at that time.

The Great Lakes Vessel Sales Act opened the door for Sand Products to make new investments in Great Lakes shipping at a time of rapid fleet renewal. The company entered negotiations in December 1950 for three C-4 ships *Marine Angel*, *Marine Robin*, and *Marine Star* from the Maritime Commission in 1950. To help finance these capital-intensive projects, Sand Products partnered up with two other companies to convert two of the vessels. In October 1951, Sand Products and Hanna Mining formed Hansand Steamship Corp. to convert the *Marine Robin* into a gearless bulk carrier. She was rebuilt with a new forebody and brought up the Mississippi River to the Great Lakes. She entered service on November 4, 1952, under the name *Joseph H. Thompson*, then the largest cargo ship in the world at 714'03'' long. Next up was the *Marine Angel*, which was purchased by the partnership company Amersand – a joint operation with American Steamship Co. and Boland & Cornelius. She was given a new forebody, brought to the Great Lakes, and fitted with self-unloading equipment. She entered service as the McKee Sons on October 28, 1953. The last of the triplets was transferred to a new company subsidiary Michigan-Ohio Navigation Co. The upper superstructure of the vessel was removed prior to her trip up the Mississippi to Muskegon where she was reconstructed into a passenger and auto liner at the Mart Dock to plans drawn by George Sharpe. The $7.5 Million renovation took over two years, and the Marine Star entered service in 1955 as the *Aquarama*.

Of the trio of troopship converts, *Aquarama* faced the most trouble. Her original run between Detroit and Cleveland proved not profitable and plans to shift her to the Muskegon-Milwaukee run fell through. Disagreements with the Port of Milwaukee over dredging for the *Aquarama's* deep draft barred her from entering the port. She was laid up in 1962 at the Mart Dock, never to sail again.

Investing in the C4 triplets allowed Sand Products to support the transportation of their raw materials and other cargoes. "The company was there to step in to innovate and provide capital, but didn't always need to be the one out front," remarked Chuck Canestraight, President of present-day Sand Products subsidiary Port City Marine Services. The company departed from commercial cargoes and ship management in the 1950s and 60s besides their passenger and automobile ferry services. For their other shipping interests, they hired other managers or chartered the vessels to other operators.

With the opening of the Seaway in 1959, business boomed at the Mart Dock. Foreign ships flocked to the Seaway and visited the facility in Muskegon in droves. More than 100 vessels were expected to call on the Mart Dock in the 1962 season alone. Products such as olives, wines, cars, and even clay were being offloaded at the Mart Dock while fruit and other Michigan products were exported across the world. The peak hit in 1965, and soon fell as containerized cargoes came on the rise. Containerized shipments made it much easier to ship products directly to the major American coastlines for transshipment

*Diamond Alkali* loads sand at the Pigeon Hill Dock at Muskegon, MI, 1963. Photo: MHSD Collection

across the globe onboard giant container ships. While the increase of containerized cargoes made it easier to ship goods across the world, it hurt Great Lakes ports like Muskegon as they could be easily bypassed for shipping directly to the main coastlines.

The new automobile ferry business gained new competition in 1962 when Grand Trunk Railroad, then with a major ferry hub in Muskegon, modified their carferry *Madison* to accommodate taller "piggyback" cars to transport automobiles cross-lake. The Grand Trunk operation began transporting 300-400 cars per week, and did not require transloading the new vehicles from railroad cars to the ship.

In the late 1950s Sand Products Corp. began investment in a new sand mining facility. The original Port Crescent property was swapped with the State of Michigan in exchange for a plot near Brevort, MI, along the shores of northern Lake Michigan in 1959. The Port Crescent property was later opened to the public as Port Crescent State Park. The remaining portions of land for the future Brevort mine were purchased from the Prentiss M. Brown family. Construction of the new facility started with the building of a road off US Highway 2 down to the shoreline where the loading terminal would later take shape. A dolostone quarry was developed about 10 miles north in the town of Rexton to provide rip-rap stone for the shipping harbor breakwall. The stone was blasted, excavated, loaded, and trucked down to the Brevort site to extend the pier 4000' into Lake Michigan. The blasting, quarrying, road construction, and filling of the peninsula for the terminal was performed over a 10-year period by only a few men. About 20 years after the land was acquired, the harbor, loading facility, and sand mine were completed and the first cargo of sand was loaded out of Brevort on September 25, 1985, onboard the *Myron C. Taylor*.

The Mart Dock in Muskegon, late 1960s. Photo: McKee Collection

Meanwhile, mining was concluded in Muskegon in 1967 and Manistee in 1973. In 1975 a new operation was opened in Harte, MI. Sand was mined there for two decades, and was trucked up to Ludington where it was loaded aboard freighters on the shores of Pere Marquette Lake.

Demand for the auto and passenger ferries dwindled in the late 1960s and early '70s. The aging *Milwaukee Clipper* joined the *Aquarama* in layup at the Mart Dock in 1970. *Highway 16* joined the pair on July 30, 1973, her job taken over by more efficient rail transportation around the lake. The *Clipper* was the first of the laid-up vessels to depart, being sold in 1978 for repurposing in Chicago. After two decades of serving various roles, *Milwaukee Clipper* returned to Muskegon in 1997 to serve a new role as a museum ship. *Aquarama* departed in 1989, only to eventually meet her end at a Turkish scrapyard in 2007. *Highway 16* still is owned by Sand Products, and is on lease to the USS *LST-393* Veterans Museum organization that operates her as a Naval Museum and memorial at the Mart Dock.

Due to the combination of their high operating costs and the economic downturn at the end of the 1970s and early '80s, both the *Joseph H. Thompson* and *McKee Sons* were idled. Clyde VanEnkevort and Upper Lakes Towing interests purchased the Thompson in 1984 from Hansand for conversion to a self-unloading barge. Over the next six years, the vessel was converted from a gearless bulk carrier into a self-unloading Articulated Tug-Barge unit. Following completion of the *Thompson* project, Clyde VanEnkevort approached the company about converting the *McKee Sons* into a barge as well. At this point ownership of the McKee Sons was transferred to a new Sand Products subsidiary Lake Service Shipping. A charter agreement was made and the *McKee Sons* moved to Menominee to have her stern reconstructed with a notch for a pushing tugboat. She returned to service in 1992 with the tug *Olive L. Moore*.

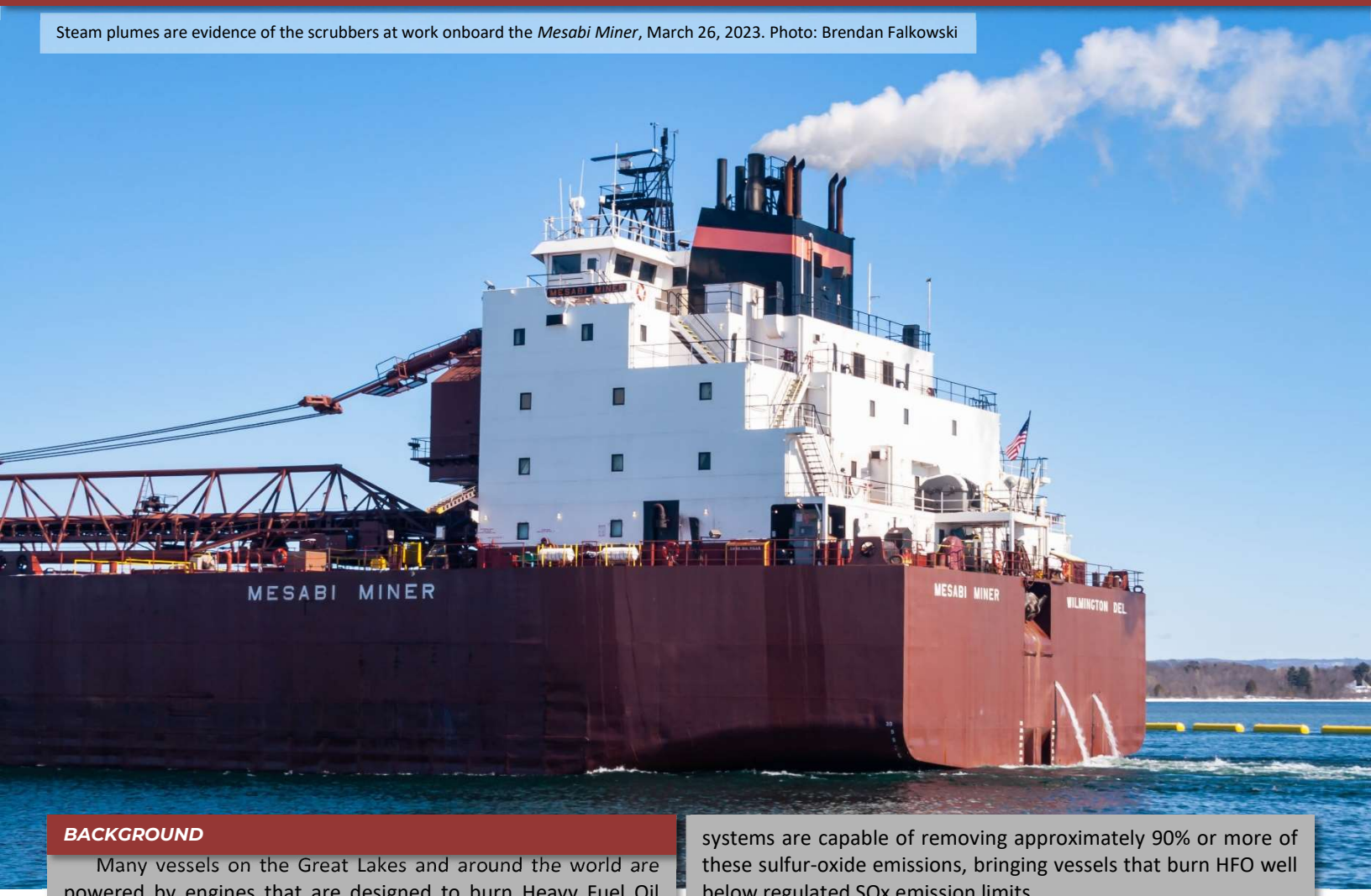
The late 1990s marked a transition period for Sand Products with more aggressive approaches in their return to the maritime business. With new blood in the team the company began a remarkable period of growth, diversification, and finding their new place in the maritime industry. *Continued in the next issue*□

Special thanks to Chuck Canestraight, Max McKee, and Patrick McKee for their time and assistance in preparing this article.

*IN THE DESIGN – NAVAL ARCHITECTURE & MARINE ENGINEERING DEPARTMENT*

# DIESEL EXHAUST SCRUBBERS

AN EXPLORATION OF DIESEL EXHAUST SCRUBBERS AND HOW THEY WORK




Steam plumes are evidence of the scrubbers at work onboard the *Mesabi Miner*, March 26, 2023. Photo: Brendan Falkowski

## BACKGROUND

Many vessels on the Great Lakes and around the world are powered by engines that are designed to burn Heavy Fuel Oil (HFO), which falls outside of SOx emissions limits and require the use of Exhaust Gas Scrubber systems to bring them into compliance.

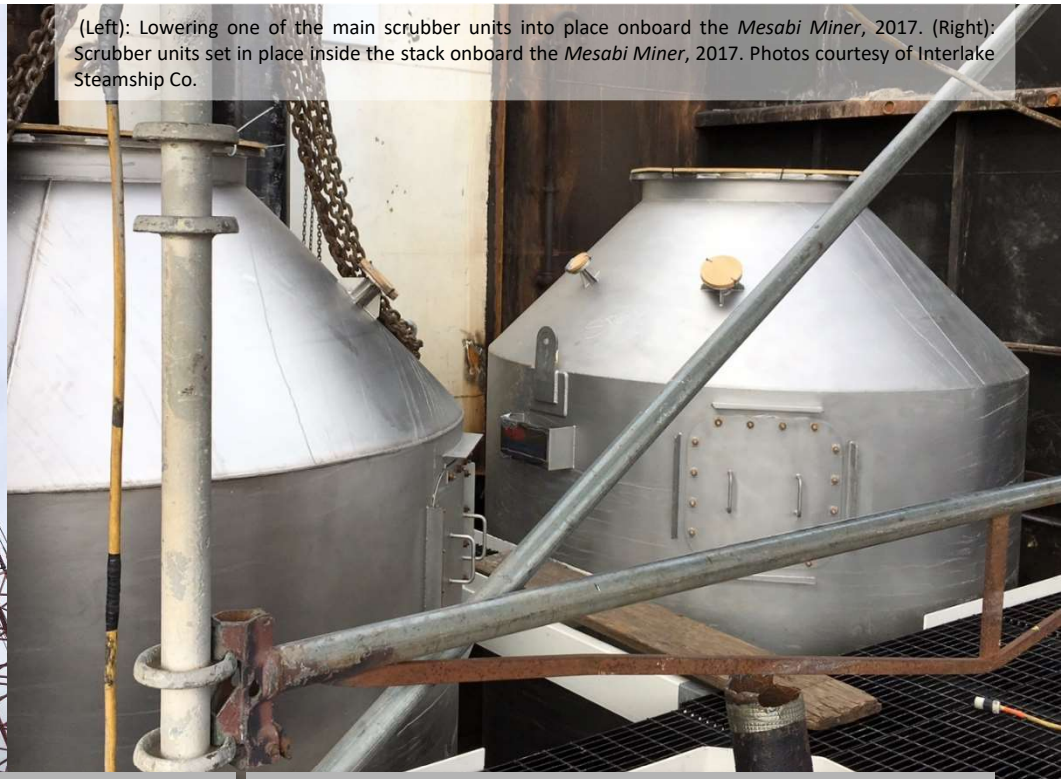
Some companies have chosen to invest in Exhaust Gas Scrubber systems – or scrubbers – to clean vessel exhaust in order to be more environmentally-friendly. These systems remove harmful sulfur-oxides from engine exhaust. The US Environmental Protection Agency (EPA) regulates exhaust emissions for US flagged ships while Transport Canada regulates Canadian ships. These organizations look to ensure emissions of Carbon-Oxides (COx), Nitrous-Oxides (NOx), Sulfur-Oxides (SOx), and Particulate Matter remain within reasonable levels from ships sailing the waters of the Great Lakes. Emissions can largely be controlled by the fuel being burned in the engine with additional control from how the engine is designed and additional exhaust treatment systems. Emissions levels are extremely low on modern Tier-IV diesel engines which burn ultra-low sulfur marine diesel fuel.

## HOW SCRUBBER SYSTEMS WORK

Exhaust Gas Scrubbers (EGS) are primarily intended to remove SOx emissions though some systems are in development to remove COx and potentially NOx emissions as well. Most EGS systems are capable of removing approximately 90% or more of these sulfur-oxide emissions, bringing vessels that burn HFO well below regulated SOx emission limits.

There are several types and variations of EGS systems, the primary being ‘wet’ and ‘dry’ scrubbers. There are two subtypes of ‘wet’ scrubbers – open and closed loop. Open-loop ‘wet’ scrubbers take in seawater to use in the treatment system and discharge the residuals overboard, while closed-loop ‘wet’ scrubbers filter and recirculate their treatment water and store waste residuals in a tank onboard. ‘Dry’ scrubbers utilize limestone granules to filter and collect the sulfur-oxides, which are unloaded onshore. ‘Dry’ scrubbers are very large and take up a lot of space while ‘wet’ scrubbers can be designed in a much more compact manner.

Great Lakes ships utilize closed-loop ‘wet’ scrubbers for environmental and onboard space considerations. The EGS system consists of several components, the main scrubbing unit, a processing and filtration system, waste and process tanks, and the associated pumps and piping to connect the system. Inside the main scrubbing unit a mixture of water and caustic soda (NaOH) is injected into the exhaust through a system of small nozzles to create a fine mist. The particles of water and caustic soda attach themselves to the sulfur oxides to create a new compound – sodium sulfate (Na2SO4) – and are collected in the bottom of the unit with remaining water. From there the sodium sulfate and water mixture is taken to the processing and



(Left): Lowering one of the main scrubber units into place onboard the *Mesabi Miner*, 2017. (Right): Scrubber units set in place inside the stack onboard the *Mesabi Miner*, 2017. Photos courtesy of Interlake Steamship Co.

filtration system which sends the sodium sulfate concentrate to an effluent tank and the clean water back into the system to be recirculated. The effluent tank is pumped to shore when in port and the sodium sulfate solution disposed of or reused in other industries. What exits the stack is a large cloud of steam from the water reaction inside the scrubber unit, with nearly all of the SOx emissions removed.

Caustic Soda – otherwise known as Sodium Hydroxide – is the primary treatment agent used in wet scrubbers. Caustic Soda must be handled with care as it can be a very corrosive chemical and is also quite dangerous to humans. It is very viscous and must be heated to be moved and stored onboard. Tanks for storing Caustic Soda are treated with a special coating to protect against corrosion and piping systems are carefully set up for maximum safety. In addition, eyewash and shower stations are often set up nearby to transfer stations for crew safety.

EGS systems are monitored by a Continuous Emissions Monitoring System (CEMS) or similar system. These systems monitor exhaust compliance and ensure proper operations. The scrubbers are operated in tandem with the engines and are set up with a metering system to accurately dose Caustic Soda for exhaust treatment based on the vessel's engine loads. Higher engine loads will require a higher dosing of Caustic Soda to effectively treat the exhaust.

## SCRUBBER RETROFITS

Many older vessels are powered by engines designed to burn HFO, meaning they need an EGS system to remain compliant. Often the addition of the scrubber system works out to be a better alternative than repowering the vessel with newer engines. Design work for retrofits is tricky as the main scrubber units are quite large – those installed on some ships on the Great Lakes can be approximately 8' to 9' in diameter and nearly 20' tall. Finding space for tanks and storage can also be quite challenging.

During the retrofit the stack and exhaust system are completely gutted to make room for the scrubber unit system. A larger stack casing is usually required to house the units. Tanks and storage spaces are set up in void spaces or are set aside from other existing tanks. Piping is set up between storage tanks and the main scrubber units and ventilation to cool the associated pumps and machinery is arranged. Since scrubber units and the tanks are large they can play a large part in the weight balance of the ship and often will raise the vessel's vertical center of gravity (VCG). These components are kept as low as possible to minimize the effect on the ship's VCG. Special foundations for the scrubber units are also designed to account for the heat-related expansion and contraction of the units.

## SCRUBBERS ON NEWBUILDS

Newbuild vessels are required to meet the latest of EPA regulations, meaning engines installed onboard do not need the assistance of EGS systems to keep emissions within limits. On the other hand, larger Tier IV diesel engines are required to be paired with Selective Catalytic Reduction (SCR) systems to reduce NOx emissions which are the most harmful to the environment of the emissions from diesel engines. SCR systems use a special urea system – otherwise known as DEF – to react in a catalyst chamber and reduce NOx emissions to N2 and H2O – both harmless to the environment. The remainder of the reactants burn off in the exhaust heat.

## FUTURE

Exhaust Gas Scrubbers are another method for making ships a more environmentally-friendly mode of transportation. While these systems add more equipment and processes to be handled onboard the ship, when handled correctly they work extremely effectively. EGS systems will likely be seen installed on more and more ships in the near future as a stepping stone while other alternative fuel options are being developed for the future. ☐

Special thanks to the naval architects who provided their time and resources to assist in the writing of this article. Thank you to Ryan Dow from Bay Engineering.

*VESSEL FEATURE*

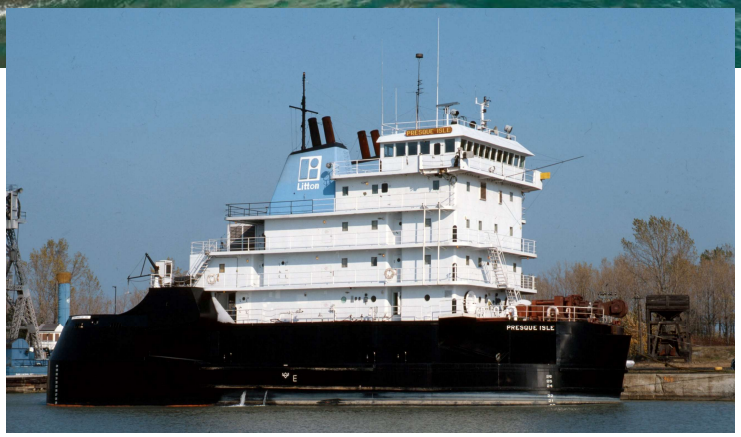
# PRESQUE ISLE


*Presque Isle* upbound on the Detroit River, September 20, 2023. Photo: Sam Hankinson

In the early 1960s, a defense contractor turned conglomerate began exploring opportunities in Great Lakes shipbuilding. The construction of the new Poe Lock in Sault Ste. Marie, MI created an opportunity for 1000-foot vessels to sail the Great Lakes, but investment in shipyards was necessary to bring these vessels to life. Litton Industries built a new shipyard in Erie, PA, constructing a 1200' long by 120' wide drydock with a semi-automated manufacturing facility for constructing repetitive hull sections for super ships. In 1967 Litton purchased the Wilson Marine Transit fleet with the intention to operate a fleet of 1,000-Footers of their own design. Litton constructed the first 1,000-Footer *Stewart J. Cort* for Bethlehem Steel. While the *Cort* was under construction Litton began making plans for their own vessel, hiring Marine Consultants & Designers to assist with the design of a new 1,000' long Integrated Tug-Barge (ITB).

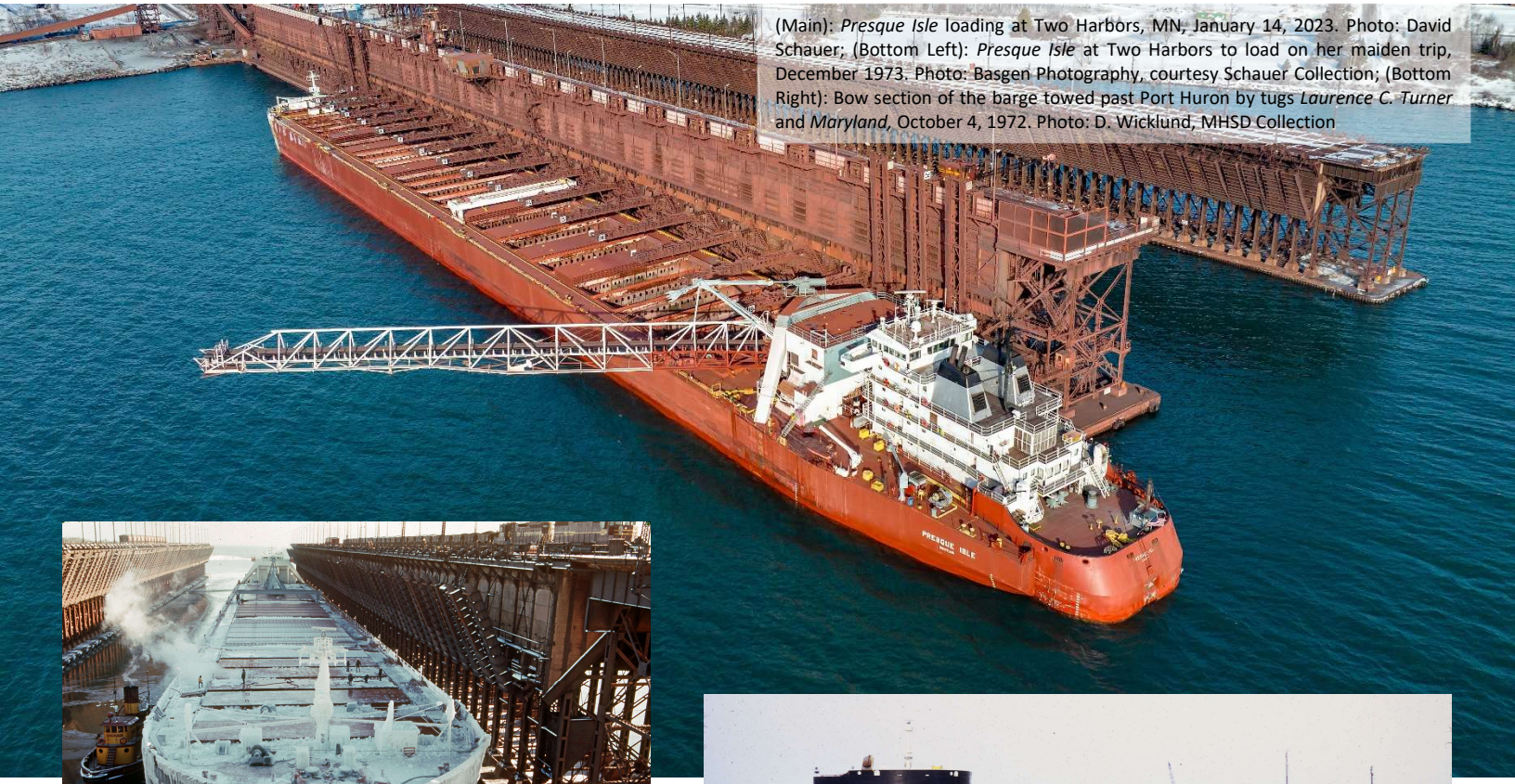
The ITB concept was chosen to try and take advantage of smaller US Coast Guard manning requirements for tugboats paired with unmanned barges. The tug did not meet requirements to navigate on its own in open waters, and the ITB unit was classified with the same manning requirements as a standard 1,000' ship and thus failed to achieve the goal of the ITB concept.

The tug was built in New Orleans, LA, by Halter Marine, and launched on December 15, 1972. She was named *Presque Isle*, and departed for the Erie Marine shipyard on the Great Lakes on October 29, 1973. The tug was designed as a deep-hull tug with a hull form specially designed to integrate into the notch of the barge. She is 153'03'' long, 54' wide, with a depth of 31'03''. Presque Isle is powered by a pair of Mirrlees Blackstone KVMR-16 diesel engines with 14,840 BHP. The propulsion system turns a pair of 17'06'' diameter controllable-pitch propellers.




Tug *Presque Isle*, on the Welland Canal. Photo courtesy MHSD Collection

The barge was built as part of the efforts of two other shipyards. The 68' bow section was constructed by DeFoe Shipbuilding at Bay City, MI, and launched on July 27, 1972. It was towed to Erie Marine by the tugboats *Laurence C. Turner* and *Maryland* in October. Meanwhile the remaining cargo section and barge notch were constructed at the Erie Marine shipyard using the automated shipbuilding technology at the yard. The bow section was mated to the barge hull in early 1973, bringing the barge to an overall length of 974'06'' long with a width of 104'07'' and depth of 46'06''. When combined with the tug, the pair was designed to have an overall length of 1000' with a capacity of 57,500 tons at a draft of 28'07''. The barge was designed with a short enough depth to be able to load under existing gravity-fed ore docks in addition to shiploaders. The unloading system onboard the barge was designed by Hewitt-



(Main): *Presque Isle* loading at Two Harbors, MN, January 14, 2023. Photo: David Schauer; (Bottom Left): *Presque Isle* at Two Harbors to load on her maiden trip, December 1973. Photo: Basgen Photography, courtesy Schauer Collection; (Bottom Right): Bow section of the barge towed past Port Huron by tugs *Laurence C. Turner* and *Maryland*, October 4, 1972. Photo: D. Wicklund, MHSD Collection

Robins, another division of Litton Industries. The goal was to design a system to steadily discharge at 10,000 long tons per hour. The cargo hold was set up with two unloading belts that moved cargo aft to a rotary elevator. Unlike the earlier *Stewart J. Cort*, the barge was fitted with a transversely-arranged rotary elevator consisting of two circular girders forming a 67'06'' centerless wheel. Cargo is dumped onto the wheel by the cargo hold belts and held in place in pockets on the wheel as it is rotated. The wheel then dumps the cargo onto a short transfer belt at the top that feeds the 250' deck-mounted boom. The barge was completed in late 1973 and named *Presque Isle* to match the tug. The pair were built for a total cost of approximately $35 Million and were financed under Title XI of the Merchant Marine Act of 1970 which allowed operators to invest in their fleets with government-guaranteed financing and tax benefits.

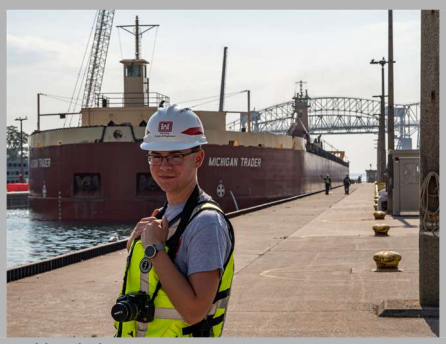
The ITB *Presque Isle* - referred from this point forward collectively as *Presque Isle* - entered service on December 16, 1973 under the banner of Litton Great Lakes Corporation, as Litton sold off the remainder of the aging Wilson Marine fleet in 1972. The pair sailed to Two Harbors, MN, to load iron ore for the U.S. Steel Gary Works in Gary, IN, laying up for the winter after this maiden trip.

The *Presque Isle* experiment turned out to be a failure on the goals of Litton as they were unable to achieve the smaller crewing status with the ITB system. She was one of very few ITB's ever built; the concept never gained the traction that the Articulated Tug-Barge (ATB) variants did. Signs of hope did come, in 1975 U.S. Steel signed a 25-year lease on *Presque Isle* as they were experiencing major shipyard delays with the construction of their own 1,000-Footers. The situation was a win-win, U.S. Steel needed a 1,000-Footer, and Litton needed to find a home for theirs. *Presque Isle* fit well within the U.S. Steel routes, typically moving iron ore from the upper Great Lakes to Gary, but was also efficient in the coal and stone trades with her large cubic capacity. She also participated in U.S. Steel's winter navigation experiment.

*Presque Isle* has had a relatively uneventful career, her only major accident having rammed an approach wall to the Poe Lock on April 12, 1990. On July 25, 1995, *Presque Isle* became the first vessel to utilize the unloading hopper at the DM&IR dock in Duluth, MN. The hopper was installed to begin receiving limestone shipments for use in making taconite pellets.

U.S. Steel's fleet went through several management changes over the years that the *Presque Isle* was under charter. In 1981 management of the fleet was shifted to USS Great Lakes Fleet, a separate entity under U.S. Steel ownership. In 1988 Blackstone Capital purchased a majority stake in the fleet, changing the name to USX Great Lakes Fleet. USX Great Lakes Fleet acquired the remaining stock of Litton Great Lakes Corp. on November 1, 1997, taking full ownership of *Presque Isle* in early 1998. The fleet was sold again to Canadian National Railway in 2004. The fleet remained under U.S. ownership of Great Lakes Fleet Inc., managed by Key Lakes Inc. Presque Isle finally received her black and grey stripes on her bow in the early 2010s.

*Presque Isle* spent most of the 2022 season laid up at Superior, WI, awaiting parts to repair a reduction gear. While considered a failure of an experiment, the ITB *Presque Isle* has found her place serving her owners in the ore, coal, and stone trades. ◻



*Scott Bjorklund photo*

***BRENDAN FALKOWSKI*** is a Great Lakes ship enthusiast who shares his passion for the freighters through his newsletter, research, and photography. Hailing from Bath, MI, he is a student at University of Michigan studying Naval Architecture & Marine Engineering. He is an avid musician and is a member of the Michigan Marching Band. Brendan is also a competitive sailor, and is an assistant coach and photographer for the Bath High School Sailing Team. He enjoys sailing, chasing boats, and spending time with his friends and family. ☐

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Cover Photo: *McKee Sons* sailing beneath the Ambassador Bridge, Detroit River, October 5, 1958. Photo: Elmer Treloar, McKee Collection