Moran Towing Corporation

Marine Board Fall Meeting

Paths Towards Zero Emissions Shipping Operations Focus Session

Tug Challenges to Path-to-Zero for Tug Operators in the United States

November 2018

MORAN TOWING CORPORATION

Company Profile

BUSINESS

- Founded 1860
- Privately owned
- Headquartered in New Canaan, Connecticut
- Provides Marine & Environmental Services to North America
- Seventeen Ports of Operations
- Maintains long term relationships with customers, employees, and vendors.
- Currently employs over 1,000 employees
- Consumes over 18m gallons of main engine diesel fuel per year

SERVICES

- Ship Assist & Towing Services
- LNG Terminal Assist Services
- Ocean Transportation (Petroleum, Chemical, Dry Bulk Products) Services
- Environmental & Emergency Response Services
- Other Projects & Services (3rd Party Vessel Management, Ship Chandlery, Line Handling, etc.)

SAFETY & ENVIRONMENT

- International Safety Management (ISM) certified in all marine operations
- Comprehensive Marine Personnel Training Program
  - Leadership Training
  - Behavior Based Safety (BBS)
  - Skills Assessments, etc.
- Cultural Surveys
- Low employee turnover
- Compliant with IMO 2020

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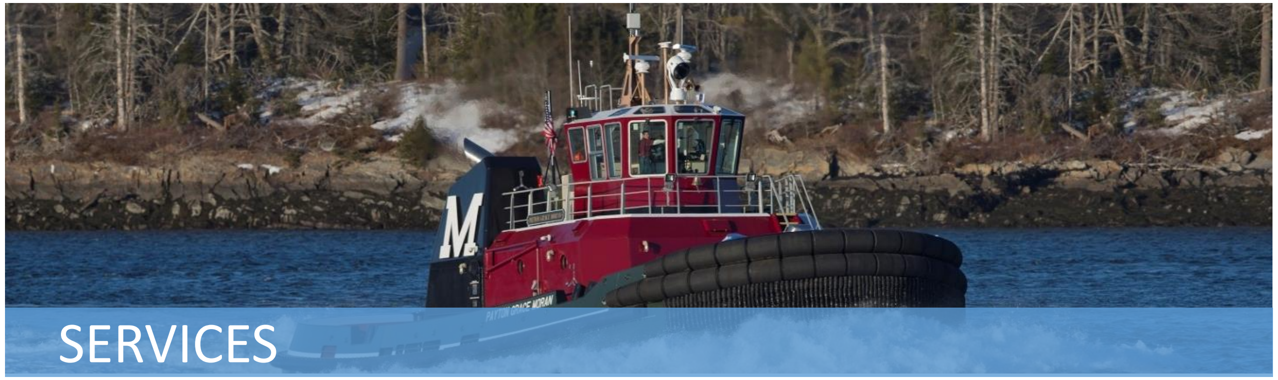
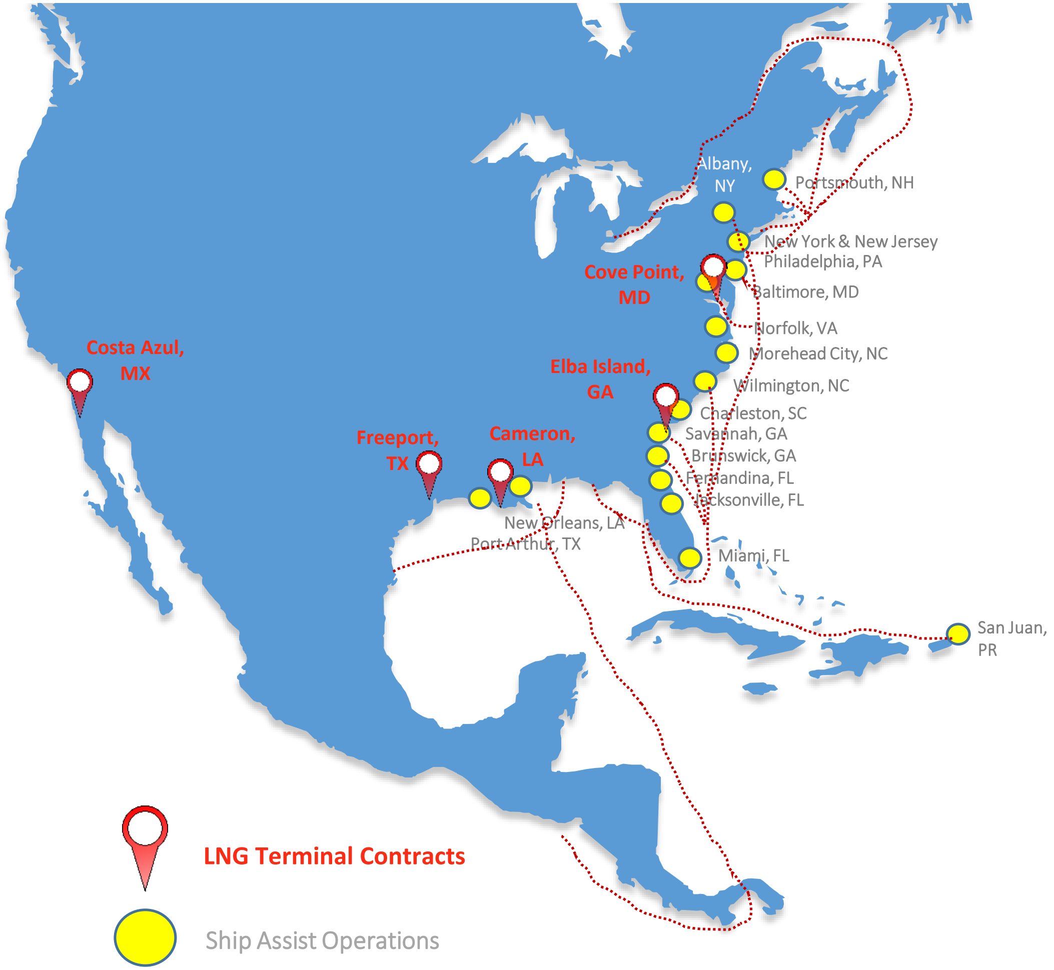
Operations



- Ship Assist & Escort: Fleet of 87 tugs servicing 17 different harbors
- LNG Terminal Services: Service the majority of LNG Terminals in North America (5)
- Transportation: Operate 10 ATB units along the U.S. East & Gulf Coasts, Caribbean Basin, and Canada. Nine (9) of the ATB units are in the petroleum products trade.



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Tug and ATB LNG Adoption Challenges in the United States-Path to Zero

- Logistical & Operational issues
  - Infrastructure: Can we get LNG where we need it? (Harbor & ATB Operations)
  - Frequency of fueling due to small tanks
  - Physical placement of LNG tanks and vent mast
  - Engine suppliers and serviceability
  - Engine response speed
- Capital issues
  - Harbor tugs generally do not burn enough fuel to justify capital expenditure
  - What will LNG cost?
  - The tugs will like cost 30% more
- Moran is currently IMO 2020 compliant
  - As more companies utilize low sulfur fuels as a solution, supply and price could impact domestic operations
  - Recently enacted environmental laws have already impacted our economics with little opportunities to recapture the increased costs
- Challenges for U.S. regulators
  - Balancing IGF (International Code for Safety for vessels using gases or other low-flashpoint fuels), Federal, State, and port regulations concerning LNG use
  - Working with class societies
  - New construction regulations (development, consistency with International regulations)
  - Certifications and training for operators and service contractors
- Path forward
  - LNG is the bridge fuel alternative for next decades
  - Development of safe, efficient battery technology may be the long term future
  - Autonomous tugs may be helpful with new energy technologies

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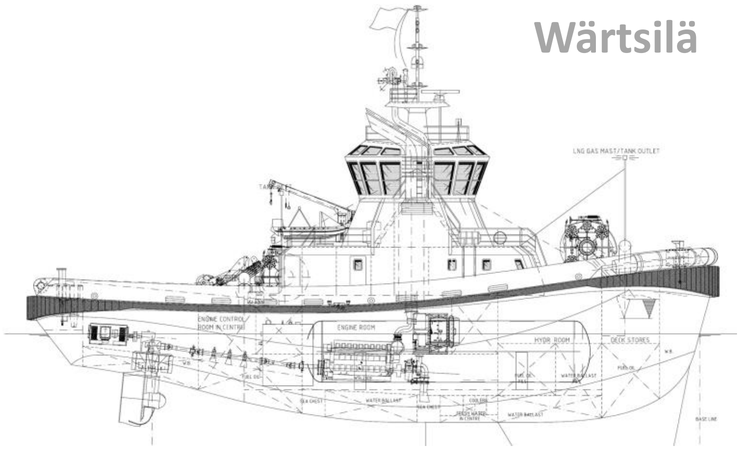
Harbor Tug Design Challenges

- Storage
  - — 4:1 Rule of Thumb
    - LNG requires 4x times the volume to store the equivalent amount of energy when compared to diesel fuel
- Total construction costs expected to be > 30% when compared to a traditional diesel powered harbor tug
- Design needs to be compact to easily operate in and around ships



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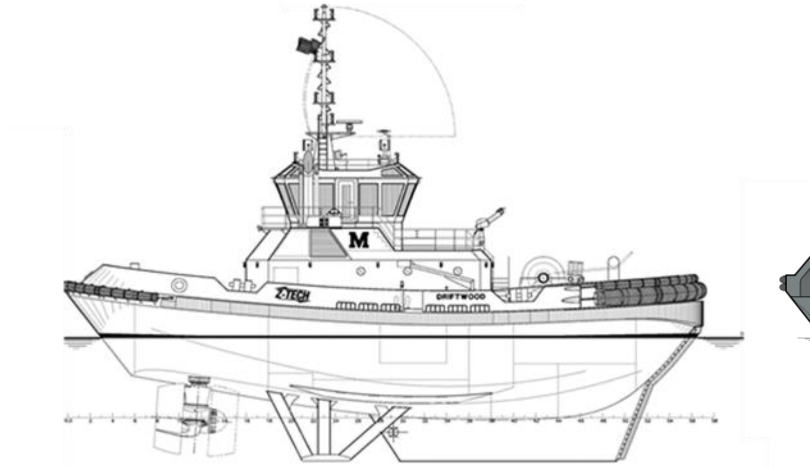
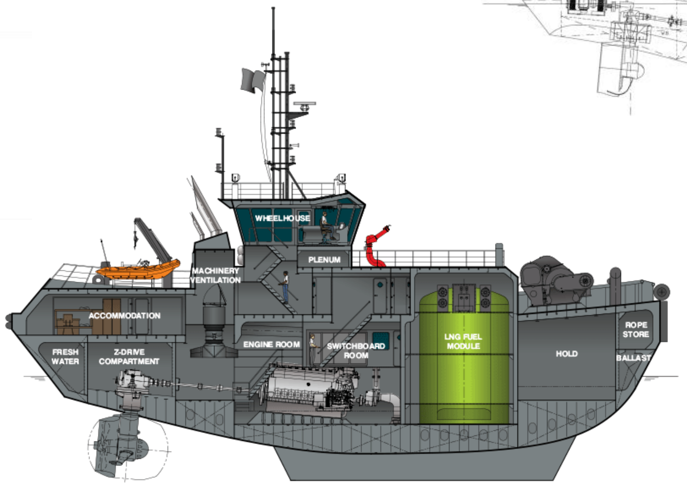


Robert Allan Z-Tech® 30-80



Robert Allan RANGLer 3600

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Harbor Tug Design Challenges

- Hazardous zones and venting consideration