Arctic Preservation: Exploring the Benefits of Alternative Fuel to Mitigate Environmental Impact Risks

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Overview

- Not Mandatory
- Unique Position
- Stringent Requirements
- Sustainable Shipping
- Introduce Threat
Benefits of Alternative Fuel to Mitigate Environmental Impact Risks

- Polar Region
- Effects of Oil on Ice
- Regulatory Status
- Viable Alternatives
- Other Considerations

Benefits of Alternative Fuel to Mitigate Environmental Impact Risks

- Polar Region
  - Remote Region
  - Business Decision
  - Global Awareness
- Effects of Oil on Ice
- Regulatory Status
- Viable Alternatives
- Other Considerations
Pristine Environment
Deepwater Ports in Bering Sea
Business Decision

- Panama Canal ~ 7,000 miles
- Incentive – Cost (Time, Crew, Fuel & More Cargo Carriage)
- Arctic Routes Infancy:
  - 30 cargo vessels traversed the Northern Sea Route
  - 21 vessels in the North West Passage

- 15 years ~ 500 annual transits (DNV 2020)
Harsh Environment
Hidden Dangers - Icebergs
Public Interest
EXXON VALDEZ – $3.8 billion clean-up (1989)
Deep Water Horizon - $12 billion
COSCO BUSAN - $44 million (2007) 1,200 bbls
Temp. Accommodations
Global Awareness

- Comprised of eight member countries:
  - Canada
  - Denmark
  - Finland
  - Iceland
  - Norway
  - Russia
  - Sweden
  - United States
Strategies/Partnerships

- **Cooperation on Marine Oil Pollution Preparedness & Response in the Arctic (May 2013)**
  - Agreement for Notifications, Assistance, Command & Control, Joint Training & Exercises, etc.

- **International Arctic Research Center (IARC)**

- **International Arctic Systems for Observing the Atmosphere (IASOA)**

- **Arctic Council**
  - Participants
    - Arctic Athabaskan Council (AAC)
    - Aleut International Association (AIA)
    - Gwich'in Council International (GCI)
    - Inuit Circumpolar Council (ICC)
    - Russian Association of Indigenous Peoples of the North (RAIPON)
  - Working Groups
    - Arctic Contaminants Action Program (ACAP)
    - Arctic Monitoring and Assessment Programme (AMAP)
    - Conservation of Arctic Flora and Fauna (CAFF)
    - Emergency Prevention, Preparedness and Response (EPPR)
    - **Protection of the Arctic Marine Environment (PAME)**
    - Sustainable Development Working Group (SDWG)
Benefits of Alternative Fuel to Mitigate Environmental Impact Risks

- Polar Region
- Effects of Oil on Ice
  - Capability
  - Reliability
    - Response Personnel Safety
- Regulatory Status
- Viable Alternatives
- Other Considerations
November 23, 2007

- Antarctic Peninsula
- 190 cubic meters of Marine Gas Oil (MGO)
- ~150 persons onboard (all survived)
- Collided with Ice and WTD did not close properly
- Oil remained for many days
Oil Spilled in Ice
Spreading/Weathering of oil in ice & cold temperatures of the sea and air is reduced, creating a larger ‘window-of-opportunity’.

- Significant Challenges
  - Inadequate equipment,
  - limited response inventories
  - lack of funding.
Significant Challenges
Dispersant use in Ice

- Oil
  - Blanketing Effect
- Dispersant
  - Wave Action

UNLIKELY TECHNIQUE
Insitu Burning (ISB) in Ice

- Need Ideal Conditions
- Low Heat Reaction Results in Poor Combustion
- Soot Particles Settle on Ice
Resource Availability

- Low Population
- Limited Ports or Storage Depots
- No Economic Interest to Stage Resources
- Limited Ice breaking capability
  - USCG has only two which are over 40 years old
- Jurisdiction/Sovereignty
  - Want the land, but not the problem
Equipment Failures in Harsh Condition

Safety of Personnel
- Potentially 24-hour Darkness
- Especially for a prolonged evolution

Svalbard Spill Experiment, Norway 2006
- 3,400 liters of crude under ice:
  - 24 Days passed before oil migrate to the surface
Personal Protective Equipment
Many experiments in recent years
Equipment Innovations
Inventory Build up
Training Personnel

U.S. only dedicates $8 mil in research funding annually. Much of the same strategies are used since Exxon Valdez.
Benefits of Alternative Fuel to Mitigate Environmental Impact Risks

- Polar Region
- Effects of Oil on Ice
- Regulatory Status
  - MARPOL Amendment
  - Polar Code
  - IGF Code
  - ECCs
- Viable Alternatives
- Other Considerations
Aug 2011, MARPOL Annex I Chapter 9
- Carriage of heavy grade oils in bulk, as cargo or fuel, are prohibited in the sea area beyond 60° S latitude.


Jun 2015, IMO member states adopted the Code of Safety for Ships Using Gases or Other Low-Flashpoint Fuels (IGF Code).

Both the Polar Code and IGF Code come into force January 2017. Coincidence?
PART II-A - POLLUTION PREVENTION MEASURES
CHAPTER 1 – PREVENTION OF POLLUTION BY OIL
1.2 – Structural Requirements

- Independent fuel tanks
- Independent storage tanks: Sludge/Bilge
- All Oil Tankers – Double Hull/Bottom
  - Now Includes <5,000 dwt
- Tanks with a capacity <30m³ are excluded
Emission Control Areas

Subject to 2018 review

Sulphur %

ECA  Global
Benefits of Alternative Fuel to Mitigate Environmental Impact Risks

- Polar Region
- Effects of Oil on Ice
- Regulatory Status
- Viable Alternatives
  - Liquefied Natural Gas
    - Properties & Effects
    - Clean Emissions
  - Other Fuels
- Other Considerations
Liquefied Natural Gas

- Cryogenic Storage -162 degrees Celsius
- Rapid Boil when exposed to atmosphere
  - Gaseous state is lighter than air
- Small flammability range 5-15%
  - Slow burn rate if ignited
- Non-Toxic & Non-Corrosive
- High Vaporization Rate
LNG Emissions

- LNG is scientifically proven to reduce emissions released into the atmosphere:
  - Reduces Green House Gases by 20%
  - Removes Sulfur Oxides totally

- Still cheaper than fossil fuels, even with the current market.
M/V Kvitbjorn – Short-Sea Cargo Ship
Methanol - Stena Germanica
Benefits of Alternative Fuel to Mitigate Environmental Impact Risks

- Polar Region
- Effects of Oil on Ice
- Regulatory Status
- Viable Alternatives
- Other Considerations
  - Bunkers
  - Oil Drilling
  - Insurance / Tug Assist
Oil and LNG are not readily available in the Arctic
  - Oil of course has longer range capability

Vancouver, Canada to Pori, Finland: 8,500 nm
  - Both ports intend to have infrastructure by 2017.
  - M/V Kvitbjorn, a pure LNG short-sea cargo ship with 740m$^3$ fuel capacity, has a documented range of 3,200 nm without refueling.
  - Tote recently converted a container vessel to dual fuel and is fitted with 2200m$^3$ LNG fuel capacity. Simple math would give 9,500 nm range.

With the increase of emissions driven mandates, there will likely be a plethora of alternative bunkering solutions to accommodate all navigable regions.
Tote – *Isla Bella* Deliver April 2015
Exception:

- Oil tankers may receive oil cargo from drill rigs provided that the vessel immediately and directly departs the region without delay.
- Additional oil pollution response contingencies must be made active & ready during the laden outbound voyage with appropriate reporting mechanisms.
Existing ships;

- Ensure full reimbursement for response costs, including damages as based on the maximum oil carriage capacity.
  - Similar to OPA 90 - Certificate of Financial Responsibility

- Conditional transit approval;
  - All ships carrying oil in bulk must have a tug escort with sufficient capacity to perform adequate assist duties during transit.
Thank You!

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International Conference on Safe and Sustainable Shipping in the Challenging Arctic Environment 2015

WMU World Maritime University

ShipArc


Sørstrøm, S. E., Brandvik, P. J., Buist, I., Daling, P., Dickins, D., Faksness, L. G., ... & Singsaas, I. (2010). Joint industry program on oil spill contingency for Arctic and ice-covered waters: Summary report. SINTEF.


