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
Polar Regions
Remote Region
Deepwater Ports in Bering Sea
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)
Hidden Dangers - Icebergs
Public Interest
Costly Clean-up

- EXXON VALDEZ – $3.8 billion clean-up (1989)
- Deep Water Horizon - $12 billion
- COSCO BUSAN - $44 million (2007) 1,200bbls
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
Mechanical Efforts

- 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
Reliability

- 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
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.
Finnish LNG Patrol Vessel - TURVA
Viking Grace – LNG Ferry
M/V Kvitbjorn – Short-Sea Cargo Ship
Nuclear - NS Yamal
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.
Insurance / Tug Assist

- **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.
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Thank You!
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