

## **Are Moratoriums Necessary: Investigating Methods to Mitigate Risk Associated with the Marine Transportation of Oil**

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**Abstract.** *The issue of marine transportation of oil and the risks it poses is an important and ongoing topic in today's societal discussions as there will always be valid concerns with regard to the environmental damage which could occur in the event of a spill. Environmental concerns have driven Canada to formalize a moratorium banning oil tanker traffic off the northern coast of British Columbia [1] even though statistics indicate that despite an enormous increase in global tanker traffic, there has been a massive decline in the frequency and severity of oil spills [2]. This paper reviews the factors that have contributed to this escalation in safety, and considers some innovative systems that could be implemented in sensitive areas to further enhance oil tanker safety. In addition, human error was found to be a major contributing factor in most maritime accidents; therefore, to have a noticeable impact, rigorous procedures during the marine transport of oil must be in place. The regulations and restrictions reviewed in this paper would unite to mitigate the risk of an accident. Several countries have recognized this need for improved safety and they are emerging as leaders in the marine transportation of oil. As a result, this paper suggests various actions to help mitigate risk in the marine transportation of oil so that moratoriums on tanker traffic may not be necessary measures as we move forward in the 21<sup>st</sup> century.*

**Keywords:** *Moratoriums; Tanker Safety; Oil Spills; Modern Technology; Human Error.*

## 1. Introduction

The issue of marine transportation of oil and the risks it poses has become one of the most important topics in today's environmental and transportation discussions. This issue does require scrutiny, as there is an increase in tanker traffic due to the global need for crude oil and petroleum products [3].

Although transporting oil by tankers is considered a safe method of transportation compared to other modes, accidents can still happen. Marine transportation is considered to be the most cost-effective way to move goods and raw materials globally, and with 90% of the world's trade being carried by sea, marine transport is vital to global economies [4]. According to the United Nations Conference on Trade and Development (UNCTAD), the world's fleet of tankers transporting crude oil and petroleum has increased by 73% since 2000 and accounts for a third of global maritime trade [5].

Environmental concerns have motivated the Canadian Government to impose an oil tanker moratorium on British Columbia's (B.C.) north coast, from the Alaska/B.C. border to the northern tip of Vancouver Island [6]. While many of British Columbia's Coastal First Nations have been advocating for the formalisation of this moratorium since 2011 [7], there are others who plan to challenge the moratorium. The Eagle Spirit chief's council are backing a \$14 billion pipeline between Fort McMurray, Alberta and Prince Rupert, B.C., as they feel the pipeline will benefit the Canadian economy [8].

Therefore, as the world becomes increasingly more reliant on the marine transportation of oil, we need to ensure that our marine ecosystems remain pristine. The objective of this paper is to acknowledge that oil tankers are currently operating in a very safe manner while also recognizing that there is room for improvement. By reviewing existing safety regulations and investigating additional methods to mitigate the risks associated with the marine transportation of oil, the findings of this paper aim to provide some additional options.

## 2. Tanker safety

Global statistics indicate that oil spills are declining while tanker traffic is increasing [2]. This significant decline in oil spills (refer to Figure) can be attributed to more stringent regulations such as double hulls, new construction materials and enhanced operational practices. [9]. In 1993, the International Maritime Organization (IMO), in a commitment to prevent marine pollution implemented a phase-out policy for single hull tankers and imposed a policy stating that all tankers operating worldwide would have double hulls by 2015 [10]. In 2013, Transport Canada amended the Canada Shipping Act to create a “World-Class Tanker Safety System”. Amendments included proposals to increase tanker inspections, upgrade navigation systems onboard tankers, develop an efficient response to oil spills, and add hazard warnings to navigation routes [11].

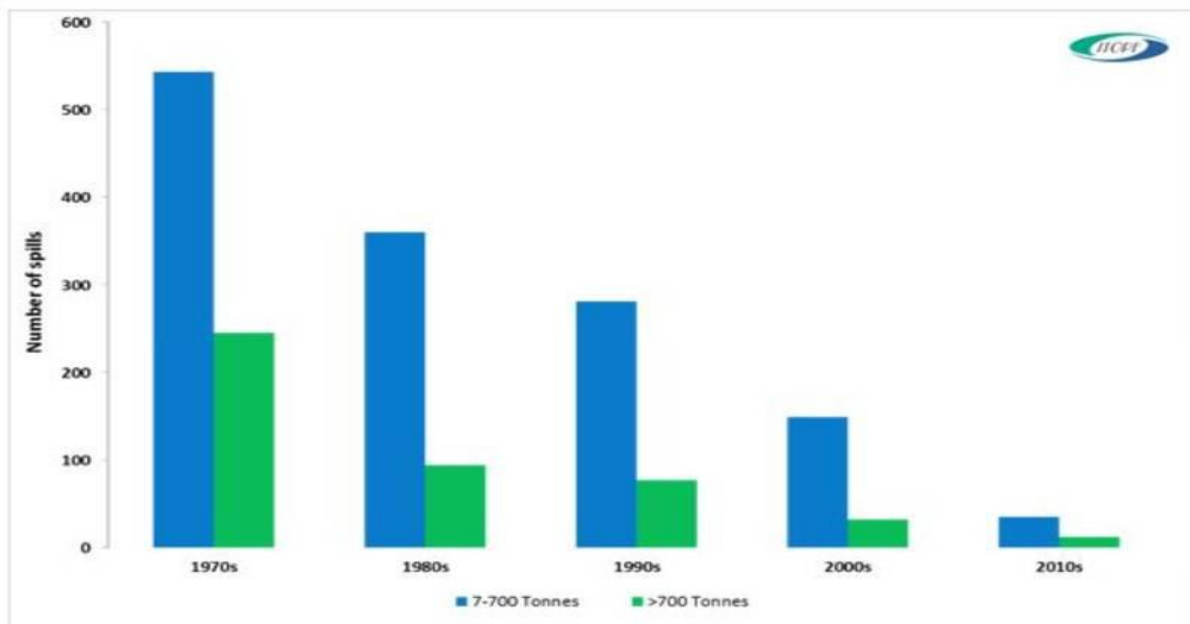


Figure: Number of large (>700 tonnes) and medium (7-700 tonnes) spills per decade from 1970 to 2016. Retrieved from ITOPF website: <http://www.itopf.com/knowledge-resources/data-statistics/statistics/>

Many other countries are also taking positive measures to improve oil tanker safety in accordance with IMO regulations, and the International Safety Management (ISM) code [12]. In addition, best-practices to further enhance safety during the arrival and departure of oil tankers are imposed at the discretion of each terminal as per the Oil Companies International Marine Forum’s (OCIMF) Tanker Management and Self Assessment (TMSA) programme. Procedures include the exchange of information between the terminal and vessel, environmental limits for

safe transit, speed and angle of approach, as well as the use of tugs and pilots [13]. The OCIMF's Ship Inspection Report Programme (SIRE) is another example of a very positive initiative, where up-to-date information on tankers and barges is shared through a very large database [14]. Actions currently in place within areas of Canada, the United States, the Gulf of Finland and northern Norway include imposed speed restrictions, designated shipping lanes, compulsory pilotage, operation during daylight hours only, areas to be avoided, and mandatory tug escorts. Up-to-date navigation equipment and shore-based Vessel Traffic Services (VTS) are additional safety measures to consider implementing [15]. Industry standards must continue to evolve with more ports and terminals going beyond the basic safety measures as demonstrated in Placentia Bay, Newfoundland as well as in Washington State. Placentia Bay has a voluntary Line of Control for tankers entering the bay to ensure that incoming tankers remain in uncongested waters that are free of navigational hazards until a pilot is available to board the vessel [16]. Washington State's remarkably low spill rate compared to the rest of the United States is attributed to the owners and operators of vessels working under mandated and voluntary best-practice procedures for vessel inspections, vessel response and spill preparedness plans, as well as to having pre booming regulations for the transfer of oil [17].

### **3. Innovative technology**

Technology is progressing rapidly in the 21<sup>st</sup> century. Consequently, there are many technological innovations in navigational safety. These developments include two revolutionary systems that appear to have the potential to mitigate the risk of an accident for an oil tanker: Enhanced Navigation Support Information (ENSI) and ShipArrestor.

ENSI is a two-way navigation service created in 2013 to reduce the chance of an oil spill in the Gulf of Finland. ENSI works in real time in conjunction with VTS services relaying data on route traffic, route danger areas, weather conditions, etc. A VTS control centre receives the ECDIS route information sent from a computer on the bridge of the ship, and the system interprets that information both visually and automatically, providing an extra cross check of the route plan as well as advanced onshore monitoring. All information is reviewed and then route-specific information and feedback is sent to the ship [18].

Another revolutionary new technology is ShipArrestor, developed to help protect the Norwegian coastline by slowing a ship's rate of drift after it has experienced a blackout, giving more time for a rescue tug to reach the ship. It can be used to turn a ship into the wind when Not Under Command and is in danger of grounding or breaking up due to the stresses of lying side-on to the waves. ShipArrestor is a sea anchor system deployed from a helicopter which lowers the chain loop of ShipArrestor around the winches and bollards on the foredeck of a drifting ship. The helicopter subsequently drops a parachute shaped ShipArrestor and its attached towline into the sea, upwind of the ship, which provides the resistance needed to turn the ship's bow into the wind. A 100,000 ton tanker can quickly be turned into the wind, reducing its drift speed by 50%, allowing time for a tug to reach the drifting ship [19].

#### **4. Human error**

As per a 2004 report titled *Maritime Accidents and Human Performance: The Statistical Trail*, most maritime accidents can be attributed to human error. This report examined accidents occurring in Canada, the United States, Australia and the United Kingdom between 1991 and 2001. Human error was found to be a factor in 80 – 85% of the accidents and concluded that continued attention to the human element as a means to improve maritime safety is appropriate and that initiatives to enhance situation assessment, reduce risk tolerance and risk taking behaviour, improve awareness, and perform consistent incident investigations would be highly beneficial to the industry. During their research for this report, Baker and Seah discovered that 50% of all maritime accidents originated as a direct result of human error while a further 30% of accidents happened because the humans failed to take action to avoid the accident.

There must be attention focusing on reducing human error within the marine industry. Therefore, a requirement for stringent and enhanced training for all navigation officers working on oil tankers would help reduce accidents in addition to intensified mandatory voyage and contingency planning on every trip [20]. Although maritime safety is rapidly increasing due to the innovations in technology, experts predict that commercial pressures combined with increases in vessel size mean that human error will continue to be a factor in marine accidents.

Therefore, it is vital that the standards for hiring crew are rigorous and that training procedures are constantly updated [21].

Navigation officers must create and implement voyage and contingency plans when operating in or near sensitive ecological areas. If these schemes were in place and continuously monitored, research has found that accidents could be significantly reduced [22]. Risk management mitigates risk, thus preventing accidents. Therefore, it is essential that the navigation team work together to predict all possible risk to ensure a safe passage [23].

## **5. Conclusion**

Neither mariners nor environmentalists want an accident in any marine ecosystem. As per the ITOPF data, oil spill size and frequency have been declining since the 1970s due to improved government, port, and terminal regulations. This paper has revealed that safety measures set out by Transport Canada and the IMO such as double hull requirements and tanker inspections, are vital to reducing the risk of an oil spill if a collision or grounding were to occur. Therefore, the findings of this paper indicate that revisions and updates to government regulations are essential to continue to improve tanker safety. However, adoption of other industry initiatives, such as the OCIMF's TMSA as demonstrated in Placentia Bay and Washington State, should be encouraged by the broader shipping community. Furthermore, several innovative technologies could be implemented to increase marine safety, such as ENSI and ShipArrestor. The rigorous safety measures that have been implemented in the ports and terminals of Canada, the United States, Norway, and Finland to protect the sensitive coastal areas; such as imposed speed limits, weather and visibility restrictions, the employment of tugs and the requirement of pilots onboard each vessel are very positive actions. The findings of this paper suggest that moratoriums are not necessary measures in the 21<sup>st</sup> century as long as the issue of maritime safety remains a priority for government agencies, ports and marine terminals. Industry standards must continue to evolve and continuously strive to go above and beyond the minimum safety requirements. Rigorous training procedures must be required for navigation officers, up-to-date navigation equipment must be employed and innovative technologies need to continue to be implemented as they become available.

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