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IMPACTS OF U.S. ENVIRONMENTAL CONTROLS UPON OCEAN TANKERS

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We live in a world that continues to be increasingly dependent upon petroleum. There are long distances between major petroleum sources and petroleum markets and large ocean-going vessels, known as tankers, carry this petroleum and its products. Tankers have increased in size and some are huge. Very Large Crude Carriers (VLCCs) weigh between 200,000 and 300,000 deadweight tons (dwt); ultra-large crude carriers (ULCCs) can reach 500,000 dwt. (ULCCs are about 50 times as large as World War II-era "T-2" tankers.) Mostert said that tankers: "Are the biggest ships that have ever been, their dimensions being one of the technological audacities of the century. . . . They were the harbingers of that new manifestation of global strategy and national self-interest, the energy crisis. . . ."[1] Petroleum tankers provide about one half of the carrying capacity of the world's merchant fleet.[2]

The phrase "economies of scale" certainly applies to large tankers. However, from an environmental protection standpoint, another applicable phrase is "carrying all of one's eggs in a single basket." If and when there is a spill incident involving a large tanker, the quantity of oil spilled is so great that it overwhelms whatever man-made or natural defenses there may be to protect the environment from damage.

In the United States, the public called for action following the grounding and spill of the Exxon Valdez in Alaska's Prince William Sound. Congress responded by passing the Oil Pollution Act of 1990 (OPA90).

Here is a summary of OPA90 as applied to the maritime industry. The law (1) required tankers in U.S. waters to have a Certificate of Financial Responsibility (COFR) with essentially unlimited liability; (2) required all new tankers be built with double-hulls, accompanied by a size and age phase-out of existing tankers beginning in 1995 and ending in 2010; (3) mandated that the Coast Guard tie into the National Driver Register to detect drunk driving convictions; (4) increased Coast Guard authority to deny or revoke licenses and merchant mariners' documents; (5) authorized the removal of incompetent masters; (6) increased the Coast Guard's authority to deny entry to the United States of those foreign vessels with deficient manning standards; (7) limited work hours on tankers to 15 hours per day, but no more than 36 in any 72 hour period; and, (8) required the Coast Guard to designate areas where two licensed personnel are required to navigate a vessel, as well as where tug escorts are necessary.[3]

The two requirements upon which this paper shall focus are the Certificates of Financial Responsibility, and double-hulls for tankers.

CERTIFICATES OF FINANCIAL RESPONSIBILITY (COFR)

The COFR requirement for unlimited liability caused great concern within the tanker insurance industry, which consists of Protection and Indemnity (P&I) Clubs. These P&I Clubs were very reluctant to issue policy coverage when unlimited liability in involved. Previously, the responsible party was the ship owner and/or the cargo owner; the P&I Club protected them. OPA90 allows litigants to directly pursue the insurance company making all its assets vulnerable. Those traditional P&I Clubs initially refused to write coverage since it would expose them to direct lawsuits for unlimited liability.

The consensus was that only large companies like the major oil corporations will have adequate financial resources to comfortably acquire COFRs; "Few small tanker owners have been able to obtain their certificates of financial responsibility, but large tanker owners with substantial financial resources continue to find ways to certify their fleets."[4] Recently, a handful of new companies have come into being hoping to make policies available that will meet the COFR requirements. INTERTANKO (the International Association of Independent Tanker Owners) feels that: "No satisfactory solution to the question of Certificates of Financial Responsibility is available for the majority of tanker owners wanting to trade to the United States."[5] The deadline for COFR coverage was December 28, 1994. In 1996 it was reported that all tankers operating in U.S. waters had met the COFR requirement, with 62 percent relying on insurance companies, 37 percent self-insuring or having bank guarantees, and one percent buying surety bonds.[6]

Ship brokers predicted that tankers backed by a COFR soon will command a premium in the charter markets. The COFR requirement has already impacted the U.S. oil trade with several small tanker firms withdrawing from the U.S. market. Bishop thinks that COFRs will add an additional 2-5 cents/barrel to the cost of tankering and he added that U.S. refineries will continue to have trouble with increased air quality regulations which will foster even more changes in tanker market logistics.[7]

Another concern to tanker owners, recently come to the fore, is the proposed regulations for Natural Resources Damage Assessment (NRDA) as provided for under oil pollution laws passed in 1990. In their present form, the proposed regulations can add up to almost unlimited liability for tanker operators based on theoretical models. Because of the speculative nature of these projections, some protection and indemnity clubs may deny coverage for NRDA-related claims. Should that happen, tanker owners would be faced with a dilemma that could interrupt the flow of oil to the U. S. Computer models for assessing damage have been criticized. "In one case, a spill of 10 gallons of heavy crude oil led to a computer-generated assessment of $1.28 million, or $128,000 . . . per gallon spilled. The result assumed a mortality of 400,000 birds per barrel spilled. . . . In fact, the Exxon Valdez caused a mortality of approximately two birds per barrel."[8]

The International Association of Classification Societies (IACS) and its Enhanced Survey Program (ESP) is attempting to root out sub-standard tonnage in the tanker industry. This program comes largely as a result of an increase in tanker losses at the turn of the decade and the negative publicity directed against the IACS and its members as a result. The societies have been criticized for not being tough enough on ship owners and allowing a large number of unsafe vessels to continue in operation. Some companies are utilizing in-house vetting programs to assure quality tonnage for their business. Recently, the three largest IACS members published their own ideas for marine safety. Without consulting other members, the American Bureau of Shipping, Det Norske Veritas, and Lloyd's Register launched a plan "to strengthen their transfer rules so that no ship can switch from one

to another until all outstanding repair requirements have been completed."[9]

Flag State Control, where the vessel's country of registry acts as enforcing agent, has been the method for safety and environmental control to date. Enforcement, however, has been less that aggressive in many cases.

"Port State Control" is the new buzzword whereby the regulatory agency of the vessel's current port acts to enforce flag state regulations and, as a minimum, the regulations of the port state. "Members of the Paris Memorandum of Understanding on Port State Control (MOU), which have a voluntary agreement to check the condition of a quarter of foreign-flag ships calling at their national ports each year, currently focus their inspections toward passenger ships, bulk carriers, and vessels registered in countries with a poor maritime safety record."[10] This method has proven to be much more pro-active.

The U.S. is not signatory to the Paris MOU but the U.S. Coast Guard has been asked to implement a Port State Control system for the U.S. This system was initiated in 1994 and the Coast Guard is acting to implement and improve the system. The initial system had concentrated on vessel owners, operators, and flag states. Under the newer system, the Coast Guard's data base will include the performance of vessel classification societies, since these societies presumably both review plans for vessel design and rebuilding, and inspect vessels to ensure compliance with safety standards. The Coast Guard utilizes United Nations International Maritime Organization (IMO) guidelines to evaluate the work of classification societies, and the quality of work of the different classification societies varies. This information, along with records concerning the vessel's owner, vessel history, cargo carried, and vessel age are entered into a matrix where scores are assigned. The scores determine a "Boarding Priority," meaning which vessels will be selected for inspection, should they enter U.S. waters.

DOUBLE-HULL TANKER CONSTRUCTION

Double-hull construction is when a second layer of metal separates the cargo tanks from the ocean; the space between the two layers being occupied by air when the cargo tanks are carrying oil, or water when in ballast (while cargo tanks are empty). As might be expected, double-hull construction takes more capital than single-hull due to increased design, material and labor requirements. Estimates for the increase in construction costs vary and can run as high as 20 percent over a single-hulled vessel.[11] In addition to construction costs, operating costs for double-hulls are also higher. Tank inspection and maintenance will just about double and the increased effort resulting from double-hull construction has been estimated as high as 25 percent. For a small tanker spending 2 million dollars a year for inspection and maintenance, an additional $500,000 is necessary.

No new U.S.-flag double-hull vessels have been delivered since OPA90 although some are under construction and some existed previously; as examples, Marine Transport Lines operates the double-hulled Chemical Pioneer and Chevron Shipping operates a five-vessel class with double-hulls. On May 17, 1996, Avondale Shipyards in New Orleans launched the first of four double-hulled tankers that were designed and constructed to comply with the double-hull requirements of OPA90.

The spill prevention theory behind double-hull construction is that upon grounding or collision, there is a void space to absorb the impact without allowing oil to escape. Any ruptured tanks are flooded with sea water and the ship rides deeper in the water. The risks associated with double-hull construction are centered around major hull breaches and explosions.

The very spill which fomented OPA90, the Exxon Valdez, is believed to have been less due to single-hull construction. If the vessel had been double-hulled, the majority of the ballast tanks would have been flooded and the increased weight would likely have exceeded

the vessel's inherent strength; the ship would have broken up and instead of 260,000 bbls, the spill could have been the entire cargo of approximately 1,000,000 bbls. The primary concern within the industry with a major casualty is that many ballast tanks will be ruptured and the vessel will break apart, and one study "concluded that double bottom design is a detriment to a grounded vessel salvageability and therefore increases the chances of a major spill. Double bottoms may prevent minor pollution in vessel groundings, but probably increase the risk of major pollution in large vessel incidents."[12]

Another risk is the control of ballast tank atmosphere. Cargo tank vapor space (the space between the surface of the liquid and the top of the tank) is filled with inert gas to prevent any possibility of explosion. Ballast tanks are not inerted because they normally carry only water. The risk is when cargo enters the ballast tank and the vapor mixes with the air and forms an explosive mixture. The cargo may gain entry due to corrosion or cracks and if not detected, will endanger personnel attempting entry. Crew members may be overcome by the vapor or suffocate due to lack of oxygen, or an explosion may occur. Inerting ballast tanks adds significantly to construction costs. A final consideration relative to double-hull construction is the use of high tensile steel. This material allows the designer to meet the necessary construction and safety requirements with less metal. High tensile steel, however, corrodes at the same rate as "normal" steel and fatigue life is diminished. Using high tensile steel, as is becoming the norm, will require exceptional vigilance insofar as inspection and testing for rust, corrosion, and inherent material strength.

A separate issue with ballast is ballast water pollution. Ships use ballast water to maintain their sea-worthiness; the various "bending" or "shear" forces felt by the vessel's hull are brought to within design and safety limits by adding ballast weight at desired points within the hull. In the case of tankers, this weight is added for the empty leg of the voyage. Nearly all ocean-going vessels are built with the capability for carrying ballast water, and this is taken on from the water wherever the vessel is floating, whether inside a harbor or at sea. When no longer needed, the water is pumped overboard, again wherever the vessel happens to be.

By using tanks designated for ballast water only, oil pollution is avoided. However, a new environmental problem arises and that is the transfer of marine life to an area where it may not be desired. There is some awareness of this issue. Chevron double-hull tankers, going from San Francisco Bay to the Gaviota Terminal near Santa Barbara, take on ballast in San Francisco Bay. Shortly after leaving the Bay, they discharge this ballast water and take on ocean water. This step minimizes the possible bad effects the San Francisco Bay water might cause.

Alternative designs, potentially equivalent to double-hull, have not yet been acted on by the Coast Guard. Among these are the mid-deck tanker design (and two variations: the Coloumbi egg design, the POLMIS design) and the American Underpressure System. (The mid-deck tanker design has an additional deck installed approximately half way between the keel and the main deck, and below the loaded water line. Should a grounding or collision occur causing damage to the lower tanks, higher water pressure from outside the vessel will keep the oil in the tank. The American Underpressure System acts to create a partial vacuum in the vapor space above the cargo. By establishing and maintaining this vacuum after an incident, cargo is held inside the ship.) The Coast Guard is studying these designs.

The major advantage to double-hull construction is that the ballast tanks act to absorb the impact without allowing oil to escape. Almost everyone, industry and environmental alike, agree that this design will reduce the amount of oil spilled in minor situations involving limited hull breech. All of these scenarios have occurred and double-hull construction has prevented a spill.

Current thinking is that the double-hull requirement will not spread to other countries. Vessels delivering oil from other countries to the U.S. will bring it to within about 100 miles of the U.S. shore in single-hull tankers. At that point out at sea it will be lightered (transferred at sea) to double-hull tankers that will deliver it to U.S. ports. In mid-1995, the U.S. Coast Guard was establishing areas for lightering in the Gulf of Mexico, "The Coast Guard said the zones are necessary because the tanker industry is not building double-hulled tankers fast enough . . . ."[13]

U.S.-FLAG TANKERS

The Jones Act requires that cargo going from one U.S. port to another be carried on a U.S.-flag vessel. Under this act, many U.S.-flag tankers carry clean products (jet fuel, gasoline, diesel fuel, etc.) since crude oil is brought in on less expensive foreign flag vessels. (Currently, all Alaskan North Slope Crude Oil is brought to the U.S. on U.S.-flag tankers.) As more and more of the U.S.-flag tanker fleet is phased out under OPA90, freight rates for the remaining few will increase. Shipping companies will be reluctant to build new ships or convert old ones due to higher operating and construction costs for U.S. ships.

"It's also thought that U.S. environmental regulations may force the Maritime Administration to grant exemptions to the Jones Act, giving business to foreign tanker owners."[14] Representing the current change in the U.S. tanker market, this quote shows growing fear that while the fleet of tankers worldwide will continue to grow, the U.S.-flag tanker fleet will be reduced. A National Maritime Administration study indicated that sufficient Jones Act vessels would be available for 1995, but "shortages of product tankers and tank barges could develop in 1996."[15]

There will be increased controversy over subsidies to U.S.-flag ship owners. An example: "A $139 million federal loan guarantee to a U.S.-flag tanker company modernizing four aging vessels in a Louisiana shipyard is angering competitors and has reopened a debate over the Maritime Administration's program of extending financial support for the shipbuilding industry."[16]

There will also be continuing controversy over the amount of regulation being imposed on the shipping industry. Individual coastal states are also getting into the act by enacting their own specific regulations since the Exxon Valdez incident. The U.S. Coast Guard had to inform Washington State that some of that state's proposed regulations were in topical areas where the Coast Guard claimed jurisdiction. California's Office of Oil Spill Prevention and Response is requiring "escort" tugs to accompany single-hull oil tankers in San Francisco Bay. Each escorting tug costs an estimated $5,000. In June, 1995, Massachusetts environmental officials delayed implementation of a "clean air" rule requiring vapor recovery equipment on tankers. The rule would have applied to the Chelsea River, where Coast Guard requirements meant that tankers that had just discharged their cargo would have to take on ballast before moving down river. The taking on of ballast would have released vapors.[18] These are only examples of state actions, but they show that tanker operators have many new rules to read and to follow.

WORLDWIDE CONCERNS

After having looked at two specific new U.S. requirements, we can step back and try to see a bigger picture of where they fit in a global setting of what is truly a global industry. Worldwide demand for energy continues to grow. The world's energy demand increased 6.7 percent between 1987 and 1992—a little over one percent per year). Growth rates are expected to return to about 1.5 percent to 1.7 percent per year for the rest of the decade due to the ending of the world-wide recession, the end of the demand slump in the former USSR countries, and continued rapid growth of emerging nations in South East Asia, Latin America and the People's Republic of China. Oil is about 40 percent of energy demand (natural gas is about 23 percent). "The world's major industrial consumers of energy are still structurally bound to depend primarily on oil and oil products as fuel

sources, and the transfer to gas-fired boilers or 'clean' sources of electricity will necessarily occur only gradually."[17]

Worldwide, the major sources of petroleum are the Middle East and North Sea. They supply oil to the U.S., as does Venezuela. Another source of U.S. oil is the Alaskan North Slope, with oil moving from Valdez by tanker to U.S. ports on the either West Coast or East Coast (via a pipeline parallel to the Panama Canal).

Air pollution controls have impacted upon the refining industry. Historically crude has been transported to the end user markets due to refinery location, and refineries were built near major population centers to take advantage of skilled labor and technology. This scenario has been changing with producing countries building complete refineries near active fields. Burrill feels that the recent increase in regulation regarding air and water quality in the developed nations will tend to drive refineries to other countries. Major oil companies will build elsewhere and will essentially be "exporting air pollution"[18] in order to remain competitive. A second reason for this is that the oil-exporting nations wanted to create more jobs in their own economies. "Turn key" contracts have resulted in operating refineries in the Middle East and West Africa allowing these countries to pursue the export of refined products and to take advantage of the higher profit margin. Tankers that carry petroleum products are smaller than those that carry crude oil. Product buyers do not buy such large product cargoes and most ports do not have the capacity to handle large ships discharging products, or to store the refined material. The ramifications of environmental protection regulations can be complex since refined products are considered more hazardous than crude. For example, reformulated gasoline, blended with regular gasoline to reduce carbon monoxide produced by autos, is much more dangerous for tankers to carry. The reason is that some of its contents render ineffective the foam traditionally used to combat tanker shipboard fires.

Future oil production acts as a guideline for changes in tanker demand. The consensus appears to be that tanker tonnage will rise from approximately 207 million deadweight tons (dwt) to around 240 million dwt by 2000 (a 16 percent increase). Most of the increase will be for long haul transits in 90,000 dwt vessels and up. Between 1996 and 2000, a 24 percent increase in crude tankering is expected, mainly in the long haul routes.[19]

Drewry Shipping Consultants forecast an average annual growth of two percent in tanker demand for the period 1994 to 2000.[20] Long haul crude transport is expected to grow, with the emphasis on VLCCs. The growing South East Asia market, however, will demand larger amounts of product as economic development progresses.

Worldwide controls on the tanker industry come from the International Maritime Organization (IMO), which is an agency of the United Nations. Their initial thrust was safety at sea, but they now are concerned with pollution prevention as well. They also direct programs of international cooperation to deal with oil spills, wherever they occur. IMO cites figures that major oil spills have declined since 1980 and, in addition, less oil enters the water because of stricter maritime operational practices (such as tank cleaning) and equipment (segregated ballast tanks).[21] Tanker firms and other members of the petroleum industry also support and participate in "response teams" that will go anywhere in the world to help combat an oil spill and reduce its damage. Firms operating in the U.S. must also have government-approved "spill-response" plans that include contractual commitments stating what equipment and personnel they can make available to combat a spill. The result has been that competitors agree to help each other in case of a spill by providing personnel and equipment, such as "skimmers," to be shared.[22] Ship salvagers at the site of tanker accidents now have special training and equipment to reduce the leakage of oil from damaged hulls.

INDUSTRY RESPONSE

In light of the Exxon Valdez 1989 grounding in Prince William Sound, U.S. regulations regarding crew size, crew rest, ship construction, oil spills, and spill response have grown. The new U.S. and state restrictions are sufficiently severe that some companies (Shell and BP) are not allowing their vessels to trade in U.S. waters. Others are considering similar action and some are distancing themselves from tankers altogether. Exxon has renamed its shipping company "SeaRiver" apparently in an attempt to remove the Exxon name from tankers; a far cry from the days when oil companies painted their name in large block letters along the mid-section of the hull. Major oil corporations will look to reducing liability by avoiding in-house shipping operations; they will be outsourcing their transportation business. Those remaining companies are increasing their efforts to assure quality ships are being used. Chevron, Exxon and others have a "vetting" process whereby each vessel to be used for their cargo or at their terminals is approved as being suitable. Vetting includes vessel trading history, comparing vessel size and mooring equipment to berth size and configuration, water depth limits versus vessel draft, safety equipment and general vessel condition. This emphasis on quality should result in an increasing premium being paid for modern tanker tonnage.

However, Clarkson Research Studies Limited feels "the oil industry will continue to rely on using low grade tankers for the foreseeable future."[23] Also, "Some of the world's most safety-conscious oil companies with comprehensive ship-vetting procedures regularly charter elderly tankers."[24] Clarkson envisions the continuation of a two tier system, at least in the VLCC market segment. "The trading pattern of high productivity vessels was skewed toward the OECD countries. In particular the quality of ships visiting North America was above average, suggesting that OPA90 is having the desired effect. Low productivity vessels are more prominent in the non-OECD countries."[25]

Captain Dennis Bryant, deputy director of the Coast Guard's staff that is writing pollution act rules has said "Our analysis indicates there will be a tanker shortage . . . . We don't see construction rates (of double-hull tankers) as adequate to meet the coming shortage."[26]

CONCLUSIONS

At the beginning of this paper was discussion of two specific new U.S. controls on the tanker industry mandated by OPA90: the double-hull tankers, and for almost unlimited liability protection. These are just two requirements from a long list.

There is disagreement as to the effectiveness of a tanker's double-hull. Unfortunately, we may have to wait for an incident to determine how well they work. Possibly the next wreck will indicate some of the currently-mandated design's shortcomings, and advisory circulars will be issued by a federal agency indicating what additional safeguards must be either retrofitted to existing vessels or included in new ones.

The insurance requirement may be of some help, although at a cost. Older vessels will avoid U.S. ports, and this in itself may help protect the nation's shores, since older vessels are sometimes fatigued.

These requirements can be viewed in a worldwide perspective of the petroleum industry, and in a growing demand for environmental protection. One can ponder the extent to which national regulations reduce pollution or merely shift its incidence.

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