Tanker Transportation ©

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Copyrighted Chapter from Encyclopedia of Energy, Cutler, C. (Ed.), Academic Press/Elsevier Inc., (to be published in March, 2004).

GLOSSARY

Charterer An individual or an entity such as an oil company that contracts the services of a ship under different chartering arrangements

Charterparty The chartering contract between a ship-owner and the charterer

Deadweight (DWT) A rough measure of the cargo carrying capacity of an oil tanker

Panamax The largest size ship that can safely transit the Panama Canal given the limitations of the Panama Canal locks

Spot Charter A ship contracted for a specific voyage by a charterer

Suezmax A fully loaded tanker that can transit the Suez Canal

Supertankers Refers to all large and ultra large tankers

Time Charter The leasing of a ship for a given period of time by a charterer

I. TANKER TRANSPORTATION DEFINED

Tanker transportation serves as a vital link in facilitating the movement of oil and petroleum products from their limited sources of origin to their innumerable destinations the world over. This particular segment of the ocean shipping industry constitutes the largest component of sea-borne cargo movements today with tanker cargoes accounting for approximately one-third of all cargoes shipped by sea. Although oil is also transported through pipelines as well as by tanker trucks and tanker railcars, these movements are relatively minor and often confined to national or in some limited cases, intra-regional trades. Accordingly, this is a crucial transportation segment for the global community of oil consumers as well as for the oil suppliers and traders and also the owners of these ships. Aside from its vast commercial implications, tanker transportation is also becoming an epicenter of global attention for reasons ranging from environmental sensitivity to geopolitical apprehension as evidenced through the actions and reactions resulting from a November 2002 catastrophe involving a laden tanker off the Brittany coast of Spain or the involvement of Venezuelan oil tankers in that nation's ongoing economic paralysis as this is being written. Though not widely recognized outside the industry, tanker transportation has always had inextricable links with oil trading and its geopolitics from its very formative years as discussed next.

II. BRIEF HISTORY OF OIL TRADING AND TANKER TRANSPORTATION

II A. The early years

Oil trading began in late 19th century with the United States being the leading source and the U.S.-based Standard Oil, the most dominant player, exporting refined oil to Europe, using its fleet of purpose-built small ships. The Nobel brothers, sons of Alfred Nobel the

inventor of dynamite, built up a competing European fleet in the mid 1880s to trade oil from Russia that flourished until the Bolshevik revolution. Crude oil trading was not considered a feasible option during those years because of the relatively low value of the commodity. In the post-WWI era, short-haul crude oil trade originated with most movements being to the United States from the nearby Latin American sources of Mexico and Venezuela. As the crude oil trade increased gradually, so did the need for new refining capacity in major consumption markets. The Middle East and its vast oil resources came under Allied control during WWII and helped meet the war-time logistical needs of the Allied Forces. Another major development during the WWII years was the rapid construction of a large number of T-2 tankers by U.S. shipyards to supply fuel to the Allied fleet. On completion of the war, the surplus T-2 tankers were sold off at low prices which laid the foundation for the shipping fortunes of many entrepreneurial tanker owners in subsequent years.

In the post-WWII era, the Middle East emerged as the focal point of the oil industry, which by this time had supplanted coal as the most dominant source of primary energy for a world economy recuperating from the ravages of two closely fought world wars. Thus, although the Gluckauf, a prototype of the modern oil tanker was launched in 1886, the highly specialized tanker transportation sector of the current vintage originated only during the 1940s and 1950s. The increased demand for crude oil came not only from the U.S. and Western Europe but also from a rapidly recovering Japan, a nation devoid of indigenous oil resources. The distances between such major consumption and production centers of crude and refined oils contributed toward increased demand for the transportation of those commodities, crude oil in particular. Accordingly, the demand for

oil tankers rose and hence, the meteoric growth of that specialized market in a very short span of time. As viewed by maritime economists, tanker transportation is a derived demand industry, for fluctuations in the oil volumes traded usually leads to a very perceptible impact on the trading conditions within the tanker market.

Until 1952, tankers were operated primarily by the big oil companies with independent ship-owners playing a fringe role. It was typical to find a Marine Transportation Division within the corporate hierarchy of the vertically integrated multi-national oil majors. Traditional ship-owners entered the market for a brief span in 1953 to be followed later by government-owned shipping companies. By early 1960s, the oil majors' investment in direct ownership of oil tankers had dropped to about one-third of the global fleet. However, they still maintained direct control of 90 percent of their transportation requirements, supplementing their owned fleet with ships on long-term time charter from independent ship-owners. It was important for the oil companies to maintain such control as ocean transportation component was a factor input in the landed price of their commodity. If this were to vary depending on daily market swings, it would impact the price of crude oil from different suppliers despite its being a homogenous commodity. Accordingly, the oil majors procured barely a tenth of their transportation requirements of those years from the open market through spot charter agreements. Although they had the wherewithal to provide all their tanker needs in-house, such an attempt would only help their competitors, especially the smaller oil companies as postulated by Zannetos and hence, not attempted.

II B. The golden years

The 1960s was a period of spectacular growth in the oil industry in general and the tanker market in particular because of its derived nature. The rapidly growing U.S., Western European and Japanese economies consumed large quantities of crude and refined oils and the U.S., an oil exporter in earlier years, became dependent on foreign oil by the mid 1960s. Correspondingly, oil tankers began to increase in number as well as size. The ship size limitation of 65,000 DWT imposed by the dimensions of the Suez Canal was no longer relevant with the bigger vessel sizes benefiting from their economies of size and contributing toward lower unit cost of oil transportation. The construction of Universe Apollo of 100,000 DWT in 1959 was a major landmark as was the construction of the first ultra large crude carrier, Universe Iran ten years later in 1969. A study by Tusiani documents that while the first 200,000 DWT tanker was delivered only in 1966, by 1973 there were a total of 366 such very large or ultra large crude carriers in trade with another 525 being under construction or on order, ample testimony to the sanguinity of the period. Thus, with the increase in demand for crude and refined oils apparently showing no end in sight, new tankers of increasing sizes, financed by overly optimistic shipping financiers, were being ordered at unprecedented levels, characterizing the 1960s and early 1970s as golden years of the tanker transportation sector.

From the oil majors' perspective, their domination of the retail market was challenged by the evolution of the oil spot market in Rotterdam in the late 1960s that allowed the entry of non-traditional retailers in the market. The role of politics in oil trading and tanker transportation had also become clearly obvious by this time starting with a brief closure of the Suez Canal in the wake of its nationalization by Egypt in 1956 which led to an immediate increase in freight rates for a brief span. A more lasting closure of the Suez

Canal that began in 1967 as war broke out between Egypt and Israel remained in effect until 1975. This increased the sailing time to destinations in Europe and North America thereby increasing the demand for tankers and further consolidating the good fortune of some tanker owners. The OPEC cartel, formed in 1960, remained relatively benign during the decade and did not flex its political muscle until 1973. Thus, as discussed next, an era of turbulence and uncertainty quickly permeated the oil trade and tanker transportation market in stark contrast to the opulent 1960s and early 1970s.

II C. The uncertain years

The *Yom Kippur* War of 1973 put a dramatic end to the phenomenal growth that oil and tanker markets experienced during the previous two decades. This along with the Arab embargo of oil shipments to the U.S. and the Netherlands, and the increasing dependency of the U.S. on oil imports led to the first oil price shock during which the OPEC nations raised the price of a barrel of oil five-fold on an average to $10/barrel. Furthermore, the Arab nations expropriated American and European oil investments in their countries. However, all these were merely temporary setbacks and the global demand for oil increased again once the embargoes were lifted. The Middle East consolidated its position as the world's largest exporter of oil by late 1970s, supplying close to three out of every five barrels of oil exported in the world. The increasing oil prices however made oil exploration economically feasible in politically safer locations such as Alaska and the North Sea. The apparent re-emergence of stability in oil market was once again disturbed by political events in Iran and hence, the second oil supply shock in 1979-80 that quadrupled oil prices. The subsequent introduction of oil conservation initiatives in major consuming nations as well as the sudden growth of non-OPEC sources of oil made

significant inroads in the market share of the Middle East crude oil in particular. The collective effects of these developments were so remarkable that the level of global oil consumption reached in 1979 was not surpassed until 1990 and was only 13 percent higher even 21 years later in 2000.

The events of this period were particularly troubling for tanker owners who were left with surplus shipping capacity (built under speculative contracts signed during the waning golden years discussed in the previous section) and huge mortgage payments. Thus, the golden era of the tanker transportation sector came to an abrupt end and was replaced by a period of gloom and doom which only worsened in the 1980s as they began to bear the full brunt of the conservation measures enacted after the second oil supply shock. As the oil prices began to stabilize, the cohesion of the OPEC cartel itself came under threat with member nations undercutting each other, and crude oil price dropping to as low as $10/barrel. The price eventually stabilized around $15-18 per barrel by late 1980s and trade volumes resumed their increasing trend. Once again, the demand for oil tankers began to rise and so did the profitability of tanker owners until that trend was altered by a new set of problems triggered by the grounding of the Exxon Valdez, discussed under the regulatory environment in section VI. The next section discusses current trends in oil movements, an understanding of which is essential to comprehend the dynamics of contemporary tanker transportation market.

III. CURRENT OIL MOVEMENTS AND TANKER DEMAND TRENDS

The International Energy Agency statistics shows that total primary energy supply through crude oil increased from 2,880 million tons of energy in 1973 to 3,700 million tons of energy in 2000. Table 1 shows the major producers of crude oil and petroleum

products in 2001 and Table 2, the major exporters and importers for the year 2000. A 2002 study by Glen and Martin estimated that 59% of world oil produced in 2000 was traded by sea, a significant increase from the prior levels of 48% in 1990 and 56% in 1995. However, estimating demand for tanker transportation purely based on the volumes traded would be inaccurate unless the distances involved are also included. As an example, the disruption in oil movements caused by the Iraqi invasion of Kuwait made nations such as the U.S. to partially substitute its dependence on Middle East oil with oil from closer, politically safer locations such as the North Sea, West Africa, Venezuela, Mexico, and Colombia. In such cases, even if the volumes imported were to stay the same, the demand in ton miles would drop. A study by Kumar in 1995 reported that a 10 million barrels per day shift in sourcing the U.S. crude oil imports from the Middle East to North Sea would reduce tanker demand in ton miles, making 32 medium size very large crude carriers redundant. Likewise, a shift in the sourcing of crude oil in Western Europe from the Middle East to closer sources such as the Russian or North Sea oil would have a similar detrimental effect on tanker demand. In situations like this, unless tanker demand in other optimum long distance routes pick up, the very large tankers will migrate into sub-optimal routes that are usually served more efficiently by smaller vessels, and lower the freight rate for all players in the market.

It is worth noting that the ton-mile demand for oil tankers reached its highest value in 1977 whereas the crude oil volume traded continued its upward trend until 1979. The ton-mile peak reached for crude oil movements remains unsurpassed even today. Currently, although the U.S. alone is responsible for a quarter of the world crude oil consumption, much of its imports come from closer locations that include Canada, Mexico, Venezuela,

West Africa and Colombia. The Former Soviet Union is now a prominent supplier of oil to Europe. Although about one-half of all present world crude oil exports originate from the Middle East, its major export markets are currently in the Asia Pacific region to countries such as Japan and South Korea. As the Middle East-Asia Pacific trade is a relatively long distance trade optimal for the large tankers and also because the overall crude oil volumes transported by sea are on a rising trend, the redundancies made by the crude oil sourcing shifts in Western Europe and U.S.A. have not had a sustained direct impact on the market for very large tankers. As indicated in Table 3, the estimated productivity of tanker fleet in terms of cargo loaded per deadweight ton as well as the ton-mile demand is on a steady upward trend after their precipitous drop during the 1980s and early 1990s. However, as noted by Glen and Martin, the average tanker haul recorded in 2000 was 4.917 miles while that in 1977 was 6,651 miles. The 26% drop in ton-mile demand is too severe a shock for a forlorn tanker owner reminiscing the golden years. The major export areas in oil trade in descending order for the year 2000 include the Arabian Gulf, West Africa, Venezuela, Mexico, North Africa, Black Sea, Sidi Kerir, Indonesia/E. Malaysia, China, East Mediterranean, Baltic and the Red Sea. The major import areas for 2000, also in descending order, include Western Europe, U.S.A., Japan, S. Korea, Canada East Coast, Taiwan and Hong Kong.

IV. TANKER NOMENCLATURE AND FLEET STATISTICS

Oil tankers can be classified into two broad categories, crude oil tankers and product tankers. Crude oil tankers are typically large dedicated ships that carry solely crude oil. As an example, the Jahre Viking, a crude oil tanker built in 1977 is the largest floating object ever built and would require 16,500 road tanker trucks to empty its full-load of

cargo. Although it is theoretically possible for a crude carrier to carry petroleum products, the time and monetary costs associated with tank cleaning for such a switch would be prohibitively high that it is rarely done these days in tanker operations. The crude carriers are classified based on their carrying capacity and suitability for a particular trade as depicted in Figure 1. However, there is considerable variation in the DWT figures for a particular class such as for example a deepening of the Suez Canal would propel an upward adjustment of the capacity of a Suezmax tanker. The VLCCS and ULCCs are usually used on the long distance hauls whereas the medium size vessels, Suezmax and Aframax are used in the medium distance ranges such as from West Africa to the U.S. Gulf crude oil trade. The Panamax vessels are the largest tanker sizes that can transit the Panama Canal.

The product carriers are smaller vessels compared to the crude carriers and transport both the clean and dirty products of the petroleum refining process. However, because of the level of tank cleaning required, they do not usually switch from carrying clean products to dirty products. Contrary to the crude carriers, product carriers are built to facilitate the carriage of multiple products simultaneously. They are kept well segregated throughout the loading, loaded passage and unloading operations using a complex and sophisticated network of pipelines and valves on board the ship. Furthermore, whereas the crude oil movements are typically one-way trades that consist of a loaded transit between one among the few export locations in the world and a major refining center followed by a ballast voyage back to the load port, product carrier movements are more dynamic and provide better vessel utilization. It is not unusual to find a product carrier bringing certain

products to a particular site followed by loading a different group of distillates from a refinery in that discharge port or its vicinity for discharging elsewhere.

Figure 1 also includes a third category that consists of tank barges and other ships linked to the transportation of oil and its by-products. Tank barges usually operate in coastal trade. Combination carriers, specially constructed ships that can switch from trading bulk crude oil trade to that of dry bulk commodities, are relatively small players in today's tanker market. The parcel tanker sector consists of highly specialized chemical tankers, liquefied petroleum gas (LPG) carriers and liquefied natural gas (LNG) carriers. These vessels also operate outside the tanker market and are not typically included in a discussion on tanker transportation. Figure 2 shows a summary of the tanker fleet developments during the past decade. It shows the total tanker (gross) and net tanker fleet for each of the years, the difference being the idle capacity. The total active fleet for each year is obtained when the combined carrier tonnage is added to the net operating fleet for each chosen year. As shown, the global tanker fleet is on a rising trend once again and the idle capacity is on the decline showing a tightening market in general.

V. THE ECONOMICS OF TANKER MARKETS

Zannetos' extensive analysis of the tanker market in 1959 found it to be rather concentrated with 1.5% of the owners owning 35% of the fleet and the remaining 65% dispersed among the rest of the owners, none amongst which had a capacity share that exceeded 7% of the global fleet. Paradoxically, despite the seemingly concentrated nature of tanker ownership, he found that the market for oil tankers behaved as if it were perfectly competitive. Although a study by Kumar in 1995 based on the tanker market conditions of the post-Exxon Valdez years highlighted the elevation of entry barriers in

tanker markets and the potential for oligopolistic behavior by incumbents, it is fair to surmise that the market has remained highly competitive throughout its life span. A discussion of the ownership trends, market dynamics, cost categories and tanker freight rates follows next.

V A. Tanker ownership and market mechanics

Although the market has maintained its competitive features, the ownership structure in the market has undergone radical changes. The oil majors in particular have shifted away from a policy of direct control of bulk of their tanker transportation needs to one of greater dependence on the spot market for chartering ships on an *as needed* basis. The study by Glen and Martin provides three reasons for the ongoing structural change in the composition of ownership of oil tankers. They include the evolution and growth of the spot market for oil and oil products, a change in the logistics strategy of oil companies and lastly, the increasing environmental awareness of the public at large that has led to the imposition of new environmental regulations that directly affect tanker operations. Their study also found that the tanker fleet owned by the top ten independent owners was 162% larger than the fleet size owned by the top ten major oil companies. However, if one were to eliminate the fleet owned by government-owned oil companies from the above statistics, the tonnage owned by the remaining oil majors would be close to 10% of the fleet owned by the top ten independents. Using capacity shares as a proxy for market competitiveness, the tanker market maintains a highly competitive stance. It also meets the basic behavioral assumptions of the perfect competition model within limits.

The demand for oil tankers can be satisfied either through their direct ownership or through the well established tanker charter market that exists in commercial centers like

London or New York. The charter market brings together cargo-brokers and ship-brokers acting as agents of the cargo-owners and the ship-owners respectively. With the help of their specialized knowledge, tankers are fixed either on long term charters or as is the case increasingly, spot or voyage charters. Whereas the time charter agreement gives the exclusive use of the ship and its crew for an extended period of time such as one year, the spot or voyage charter agreement covers one specific voyage. It is also possible to acquire tankers on bareboat charter, an arrangement under which *bare* ships are handed over to the chartering interest, typically for long periods of time such as five years. The charter agreement in all cases is generally referred to as a charterparty. There are a number of standardized time and voyage charterparty clauses in existence today that are widely understood by all parties involved and constitute the boilerplate clauses of all charterparties.

V B. Tanker costs and operations management

There are three categories of costs involved in tanker operations and management. These are capital cost, running cost and voyage cost. Capital cost is the cost of acquiring the tanker and represents a fixed cost. Running cost is a semi-variable cost and includes crew salaries and subsistence cost, maintenance and dry-docking costs, stores and lubricant costs, and administrative expenses. Voyage costs are costs that vary with individual voyages depending on the distance and the route involved. Examples of this category include fuel costs, tug and pilot charges, port and harbor dues and cost of transiting canal/s if applicable. The above costs are borne by either the charterer or the ship-owner under different charter agreements. With a voyage charter, the ship-owner bears all three costs and any surplus from the charterhire would be the owner's profit. With time charter

agreements, the ship-owner bears capital cost as well as running costs whereas with bareboat charters, the ship-owner bears only the capital cost, all other costs being borne by the charterer.

Unlike capital costs and voyage costs, running costs can be trimmed through various strategies. Accordingly, ship-owners might pursue entrepreneurial options such as flagging their vessel in a country outside their own where there is a more benevolent attitude towards shipping through liberal regulatory and taxation policies. These convenient open flags of registry also offer liberal crewing options, particularly attractive to ship-owners from nations such as the U.S. where the labor costs are approximately five times more expensive than the going international market rates. As shown in Figure 3, the tanker tonnage of developed market economy nations has halved in the past 30 years whereas the tonnage of the open registry fleet has doubled and that of the developing countries quadrupled. As Kumar and Hoffman discusses in their 2002 study, such trends have led to the globalization of the shipping industry in general. Indeed the tanker market exhibits very high levels of globalization with the nations of Panama and Liberia being the largest registries of such vessels although the beneficial ownership of those vessels still remains in traditional ship-owning nations such as Greece, the U.S., Japan and others. Unfortunately, such practices may also be used by unscrupulous ship-owners to overcome the mandated minimum standards of safe ship operation which has resulted in tarnishing the image of such liberalism in shipping.

Another strategy to bring down the operating cost of tankers, used independently or in combination with the flagging out strategy is through outsourcing the technical management of ships to a third party that specializes in ship management. This has

become particularly useful in the contemporary era as it helps the ship-owners focus more on the strategic aspects of ownership while delegating the mundane technical aspects to a specialist who has the expertise as well as the economies associated with managing the operations of a larger fleet of ships. Furthermore, with the entry of unconventional ship-owners such as pension funds and banks, there is no option but to use such dedicated ship managers who possess the technical know-how and expertise. The market for ship managers is also highly competitive with relatively no entry barriers and there is considerable swapping of ships from one manager to the other as warranted by circumstances.

V C. Freight rates

It is to be noted that transportation cost is a very small component in the retail price of oil. As an example, the study by Glen and Martin quotes that in the U.K., the transportation cost component amounts to less than 1.3% of the landed cost of petrol. The relatively minor incidence of the freight component in the landed cost makes it highly inelastic in nature as predicted by economic theory and also as documented by various studies. However, as was made painfully clear especially after the second oil price shock, the demand for tanker transportation is directly related to economic activity in general and is hence, elastic. Thus, it would be typical to find a global recession during which manufacturing activity is considerably reduced negatively affecting the demand for oil tankers and the resulting excess supply of shipping capacity suppressing the freight rates. The industry is very cyclical in nature with no reliable forecasting mechanism to predict its vacillations. A period of high freight rates, whether caused by external stimuli such as a war or a political boycott or random events like an unusually strong winter in the

northern latitudes, usually leads to high exuberance in the market. It is immediately reflected through increased new orders for ships, rising price of second hand ships and reduced scrapping of older tonnage. The ship-owners often find the circumstances changing precipitously in the other direction, more often for reasons beyond their control although their own actions during the years of opulence may have contributed indirectly to the volatility and made the transition even more painful.

There are different ways of expressing tanker freight rates. The term used to quote freight rates in the spot market is in WorldScale (WS) where WS100 is a nominal index number. The WorldScale Association publishes an annual listing of WS100 rates (in $/metric ton) for all potential trade routes for a standard 75,000 DWT tanker operating under assumed conditions and earning a notional daily hire of $12,000. The principle behind the WS system is that regardless of the voyage undertaken, identical tankers will earn the same gross revenue per day. The WS nominal rate serves as a starting point for spot charter negotiations and as the total earnings are proportional to the quantity of cargo carried, vessels with lower carrying capacity would typically bargain for a higher WS rating than a larger vessel assuming both were trading on an identical trade. Any spot market fixture in which freight rates are expressed in $/ton can be converted into WS figures that facilitate easier comparison of market conditions. By converting the WS figures into time charter equivalent (TCE), a comparison can be made to the current rates in the time charter market. Likewise, a fixture in the time charter market can be converted into a World Scale Equivalent (WSE) for comparison with rates in the spot market. From a ship-owner's perspective, it would be preferable to have the ships on long term time charter when the spot rates headed down whereas in a rising market, spot fixtures would

be more attractive. However, tanker chartering still remains more of an art than a science given the inability to foresee the market changes with any level of comfort.

Ship-owners have the option of laying up their ships when the market conditions are poor. Although this would eliminate their voyage costs and reduce the running costs, there will be no respite from making capital cost payments. As the market recovers, idle capacity re-enters the trade. However, as noted by R.S. Platou, a leading ship-broker, as long as the capacity utilization remains below 80 percent, freight rates remain relatively stable. Glen and Martine refer to this being the elastic segment of the short-run supply curve of tankers. The slope of the curve increases beyond the 80% range and becomes fully vertical (completely inelastic) when all existing ships are utilized. Under such circumstances, any increase in the derived demand would cause dramatic fluctuations in the freight rate and hence, the profitability of tanker-owners. In the long run, the introduction of newer and more efficient ships would bring down the marginal cost of transporting the oil, culminating in the low incidence of ocean freight in the landed cost of oil discussed earlier. Furthermore, recent studies by Kavussanos and also by Glen and Martin have shown that different sizes of tankers operate in distinct markets with varying levels of risk and returns although all the sub-markets remain interdependent in the long run. One commonality that affects all segments of the market and is becoming increasingly significant is the regulatory environment in which all tankers operate and is discussed next.

VI. THE REGULATORY ENVIRONMENT

The operations on board an oil tanker are radically different from other types of ships primarily because of the physical properties of the cargo. The entire cargo operations are

highly automated and proceed with no one on board the ship or shore seeing the cargo physically. Even minor misunderstanding of an order or a miscalculation can cause a major spill in pristine locations. By the same token, a tanker crewed by properly trained seafarers under good management could very well be the safest ship afloat. Although most tanker voyages today are completed safely and go unreported, even a minor tanker pollution accident often gets widespread attention from the media, and the image of a polluted beach laden with dead flora and fauna is a sad and telling picture. Given the increasing environmental awareness of society at large, a tightening of the regulatory environment of oil tankers was only to be expected. Furthermore, investigation of many maritime casualties has shown repeatedly that most accidents were attributable to the human factor.

The International Maritime Organization (IMO), a multilateral governmental entity established under the auspices of the United Nations to promote safer shipping and cleaner seas, has been a key player in this field. The 1973/78 MARPOL Convention imposed on tanker transportation greatly ameliorated the operational pollution of the seas, hitherto the predominant cause of oily efflux from tankers. The ISM (International Safety Management) Code Amendment to the Safety of Life at Sea Convention and the Amendments to the STCW (Standardization of Training, Certification and Watchkeeping) Convention are two recent multilateral regulatory developments of particular significance. The ISM Code for the Safe Operation of Ships and Pollution Prevention applies a very tough set of standards to all aspects of shipboard operations and management. Furthermore, the shore office and the management of the firm also come under scrutiny, thus expanding the scope of the regulatory reach to areas that were

traditionally excluded. The Amendments to the STCW Convention has attempted to raise the threshold of seafarer education and training in general by mandating the minimum acceptable levels. The establishment of such a floor in maritime education was long overdue given the wide disparity in the knowledge, skill and ability of seafarers and the propensity of unscrupulous ship-owners toward staffing their vessels with the cheapest crew available.

The most drastic regulatory impact on tanker transportation came from a unilateral regulation enacted by the U.S. in response to the grounding of the Exxon Valdez off Alaskan waters. The U.S. Oil Pollution Act (OPA) of 1990 is a comprehensive plan to prevent and clean up oil spills, impose greater liability on those responsible for it, and compensate those who suffer resulting economic damage. Its provisions include liability, compensation, prevention and removal aspects of a pollution incident. It mandated the need for double-hull tankers and established a phase out period for the existing single-hull tankers. Above all, the law also eliminated the limitation of liability of ship owners involved in a pollution incident to which many tanker owners immediately responded by staying away from the U.S. market at least temporarily. The IMO enacted new tanker design rules in the wake of the U.S. initiative, giving the ship-owners the option of building ships with double hull or equivalent level of protection. However, given the U.S. mandate, the industry has gravitated toward the double-hull as the requisite standard-bearer.

Given the diversity in ship ownership and operation, the existence of multilateral and/or unilateral regulations alone does not necessarily make the industry any safer. Investigation of past casualties has often shown some flag states to be negligent in

enforcing the statutes. As a result, many nations have enacted a procedure whereby ships that visit their ports are inspected by local authorities for compliance with international standards. Such Port State Control inspections are now very common in most trading areas and results in the rogue ships being arrested and their names publicized through the media. Despite all the new regulations, tanker accidents still do happen as was illustrated in the case of the ship Erika, a 1970s Japanese-built, Maltese-flagged and Italian-owned tanker. The ship laden with 30,000 tons of viscous fuel oil on a voyage from Dunkirk to Leghorn, under charter to TotalFinaElf, the French oil major, encountered stormy seas and sank off coast of France in December 1999, spilling 12,000 tons of its cargo and causing severe environmental and economic damage. The IMO, under pressure from the European Union, amended the MARPOL convention in April 2001 to speed up the phasing-out of single-hull tankers and also empowered member States to ban the entry of such tankers over 25 years old. One direct consequence of the changing regulatory ambience has been the trend towards divestment of tankers by oil majors such as Exxon-Mobil. Presently, the oil majors' tanker fleet is the smallest that they have ever had in the modern tanker era. Other drastic recent developments are discussed next.

VII. RECENT DEVELOPMENTS AND OUTLOOK FOR THE FUTURE

Developments during the first three years of the new millennium serve as an excellent synopsis of the unpredictability of the tanker transportation sector. Commercially, the year 2000 was an exceptional bull market year with a tightening supply of ships and increasing demand. However, there was a precipitous downward dip in 2001 depicted in Figure 4 because of a global recession that led to lower demand for oil along with the rising security concerns resulting from the World Trade Center attacks. The relatively

weak winter season in North America and the re-emergence of Russia as a major player in the oil export sector did not help the tanker market either. However, the market dynamics changed dramatically in mid October 2002 once again driven by geopolitical developments. As the possibility of a U.S. attack on Iraq became evident in October 2002, charterers began stockpiling inventory prior to the outbreak of hostilities and increasing the demand for modern larger tankers which eventually filtered down to the smaller classes of ships. Furthermore, the ongoing political crisis in Venezuela has halted oil exports from that nation. This affected the tanker market directly with the involvement of striking government-owned Venezuelan tankers and also because of the urgency to find alternate oil supply for the U.S., a nation that depended on Venezuela for 13% of its oil imports until the political crisis began. As the new supplies will have to come from farther sources, this would also add to the demand in ton-miles of oil movements in 2003. The OPEC cartel, faced with the high oil prices affecting their potential market share is on a move to increase production and attempt lowering the crude oil price to the $25-28 range, optimal for their own sustained competitiveness. The increased loading from OPEC nations will also need larger tanker tonnage and hence, increase their demand. The trade journals are already reporting a tripling of the daily charterhire for modern VLCCs to $74,000 per day in early January 2003 from their 2002 average level of $23,300.

The spectacular progress made in the safety of the sea and reduction of environmental pollution from tanker operations was documented in the recent study on Oil in the Sea by the U.S. National Research Council. According to that study, 62% of the petroleum hydrocarbon inputs into North American marine waters during the 1990s came from natural seeps and 32% from the consumption of oil whereas only 3.5% came from the

transportation of petroleum of which none was caused through routine operations like tank cleaning. The corresponding worldwide figures were 46%, 37% and 11.5%. The Kumar and Hoffman study also documents the decreasing loss of ships and lives at sea. However, there was yet another tanker laden with heavy fuel oil that broke and sank off the coast of Spain in November 2002, a stark reminder of the Erika tragedy. The Prestige, the ship in question, was a 26-year old Japanese-built, Bahamas-flagged single hull tanker, operated by a Greek firm, certified by a U.S. based classification society and on charter to a Switzerland-based Russian trading company and carrying heavy fuel oil from Latvia to Singapore. This has reenergized the opposition to single hull tankers in the EU as well as in the U.S. The EU is currently pushing for a ban on all single hull tankers by 2010 as well as any tanker over 23 years of age, five years ahead of the current mandate. They have also banned such tankers carrying the heavy fuel oil-type cargo from calling at European ports. This will affect the market significantly as 53% of the world tanker fleet is of single-hull design and 80% of those ships are 15 or more years old.

While the above analysis appears to imply that owners of good modern tankers stand to gain from the ongoing market volatility, there are notable troubling developments as well. Piracy attacks against merchant ships are on the ascent once again and presently cost the global economy $25 billion per year according to the International Maritime Bureau. The consequences of a piracy attack on a laden oil tanker in a sensitive region could be truly catastrophic and the economic damages phenomenal. Furthermore, the attack on a French tanker off the coast of Yemen in October 2002 is a sad reminder that tanker transportation could easily become a defenseless and innocent victim of terrorism. The

recent Al Qaeda warning to slash the economic life-line of the world's industrialized societies sounds ominously true given the inherent vulnerability of tanker transportation.

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Table 1. Major Producers of Crude Oil and Petroleum Products, 2001

Crude Oil, 2001			Petroleum Products, 2001		
Producer	**Million Tons**	**% World Total**	**Producer**	**Million Tons**	**% World Total**
Saudi Arabia	421	11.8	U.S.A.	823	23.7
U.S.A.	354	9.9	Japan	207	6.0
Russia	347	9.7	PRC	196	5.6
Iran	186	5.2	Russia	174	5.0
Mexico	179	5.0	Korea	122	3.5
Venezuela	173	4.8	Germany	116	3.3
PRC	166	4.6	India	101	2.9
Norway	162	4.5	Italy	95	2.7
Canada	125	3.5	Canada	94	2.7
U.K.	118	3.3	France	89	2.6
Rest of the World	1,343	3.7	Rest of the World	1,458	42.0
World Total	**3,574**	**100**		**3,475**	**100**

Source: International Energy Agency, 2002

Table 2. Major Exporters and Importers of Crude Oil and Petroleum Products in 2000

Crude Oil				Petroleum Products			
Exporters	**M Tons**	**Importers**	**M Tons**	**Exporters**	**M Tons**	**Importers**	**M Tons**
S. Arabia	320	U.S.A.	511	Netherlands	63	U.S.A.	74
Norway	146	Japan	214	Russia	54	Japan	51
Russia	144	Korea	123	S. Arabia	53	Netherlands	45
Iran	116	Germany	104	U.S.A.	49	Germany	42
Venezuela	115	Italy	90	Singapore	41	Singapore	39
Nigeria	107	France	86	Korea	40	France	27
Iraq	102	PRC	70	Venezuela	37	PRC	24
U.K.	93	India	67	Kuwait	26	Korea	23
Mexico	92	Netherlands	61	Algeria	21	Italy	20
U.A.E.	84	Spain	59	U.K.	21	Spain	20
Rest of the World	656	Rest of the World	642	Rest of the World	352	Rest of the World	319
World Total	**1,975**		**2,027**		**757**		**684**

Source: International Energy Agency, 2002

Table 3. Estimated Productivity of Oil Tankers for Selected Years

Year	Oil Cargo Carried in Million Tons by Tankers>50,000 DWT	Tons per DWT of Tankers	Demand in Billion Ton-Miles	Ton-Miles per DWT
1970	1,182	8.58	6,039	43.82
1980	1,564	4.79	9,007	27.56
1990	1,427	5.96	7,376	30.81
1998	1,985	7.10	9,465	33.86
1999	1,988	7.04	9,586	33.94
2000	2,070	7.25	10,107	35.41

Source: UNCTAD Review of Maritime Transport 2001

Figure 1. Tanker Classification

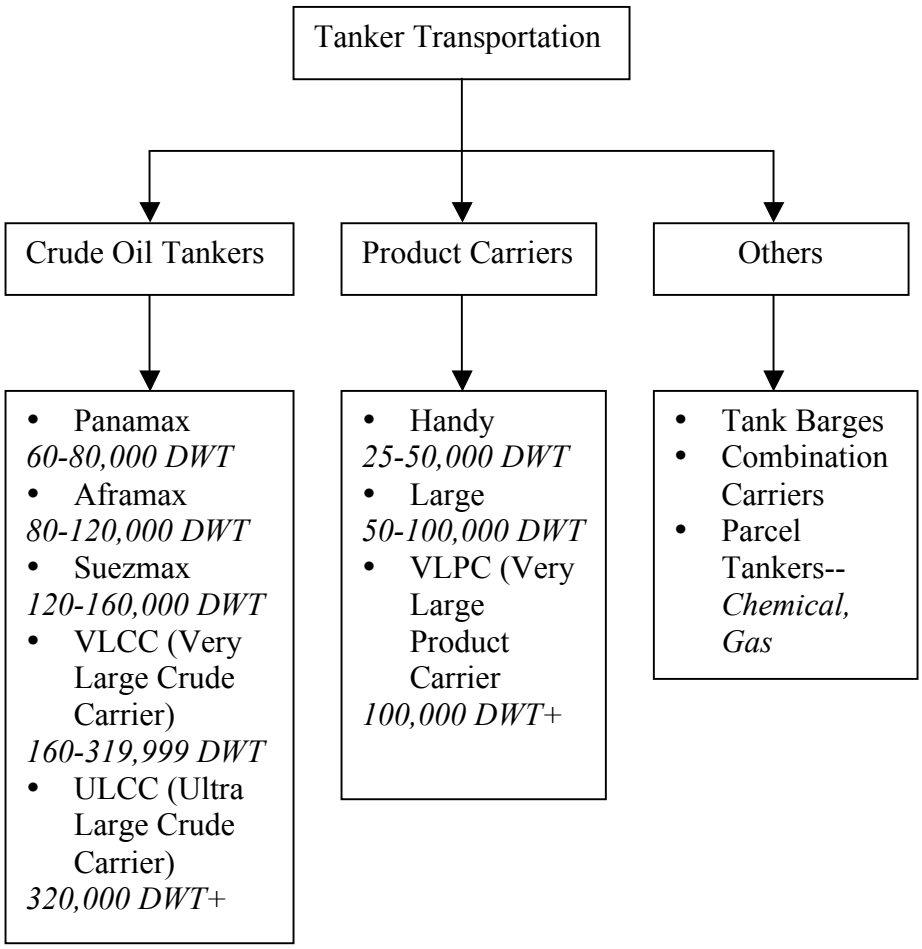
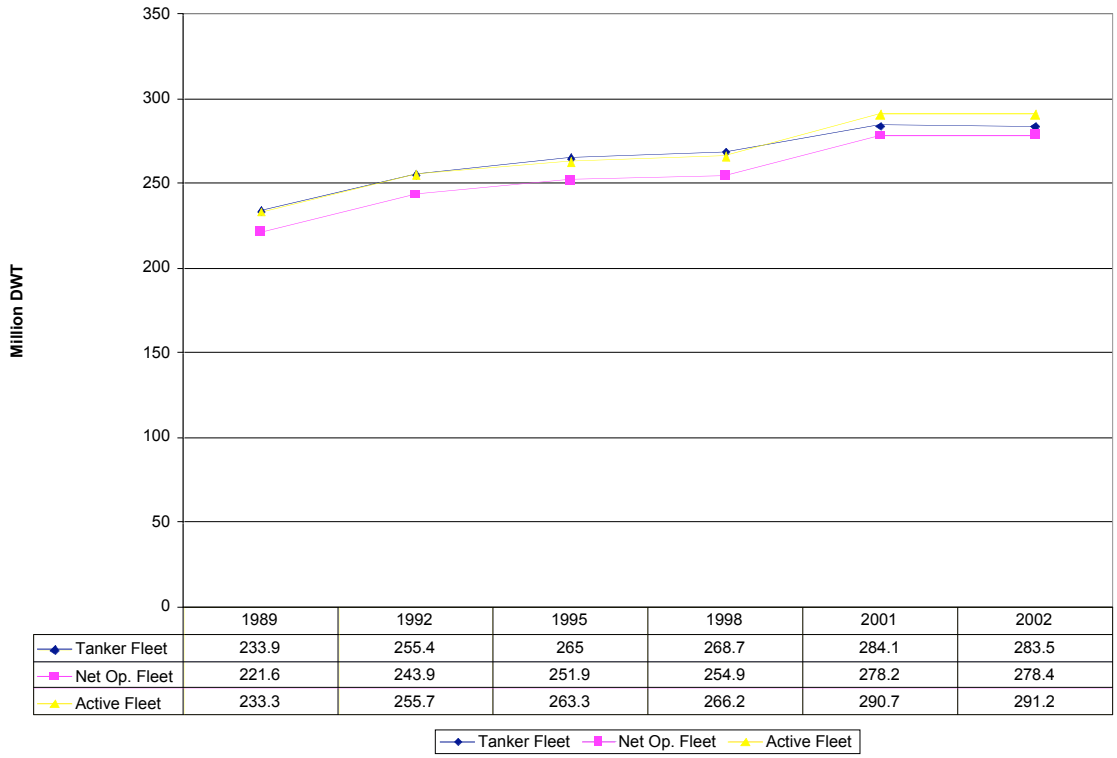


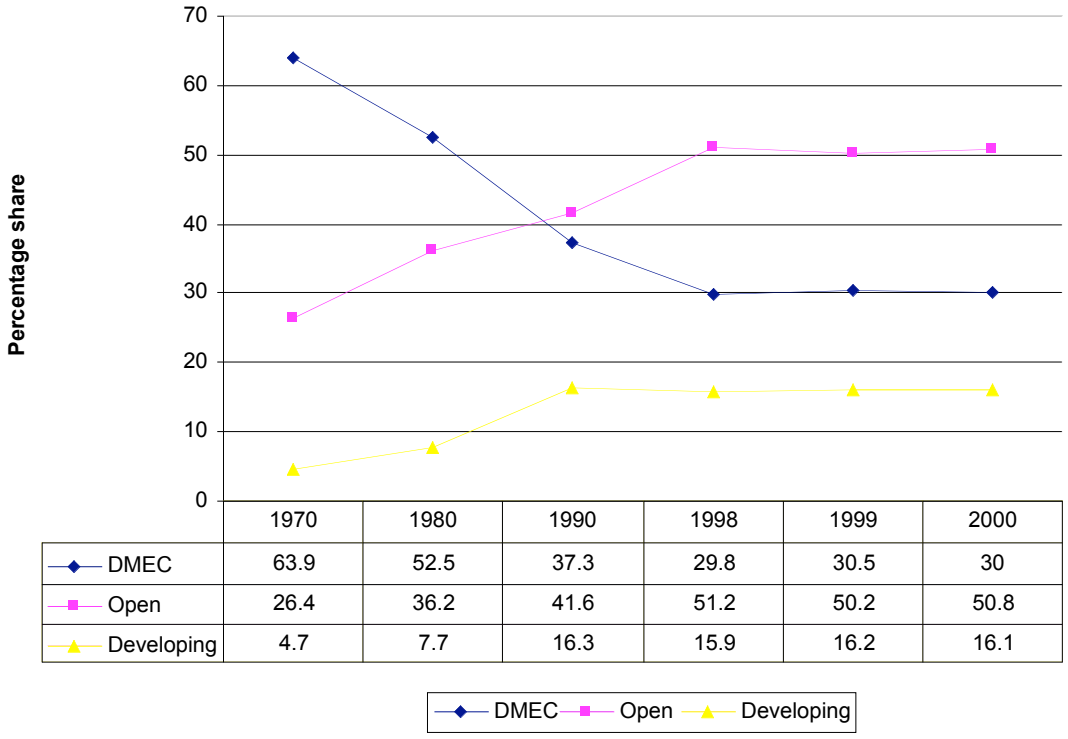
Figure 2. Tanker Fleet Statistics



	1989	1992	1995	1998	2001	2002
Tanker Fleet	233.9	255.4	265	268.7	284.1	283.5
Net Op. Fleet	221.6	243.9	251.9	254.9	278.2	278.4
Active Fleet	233.3	255.7	263.3	266.2	290.7	291.2

Source: R.S. Platou 2002

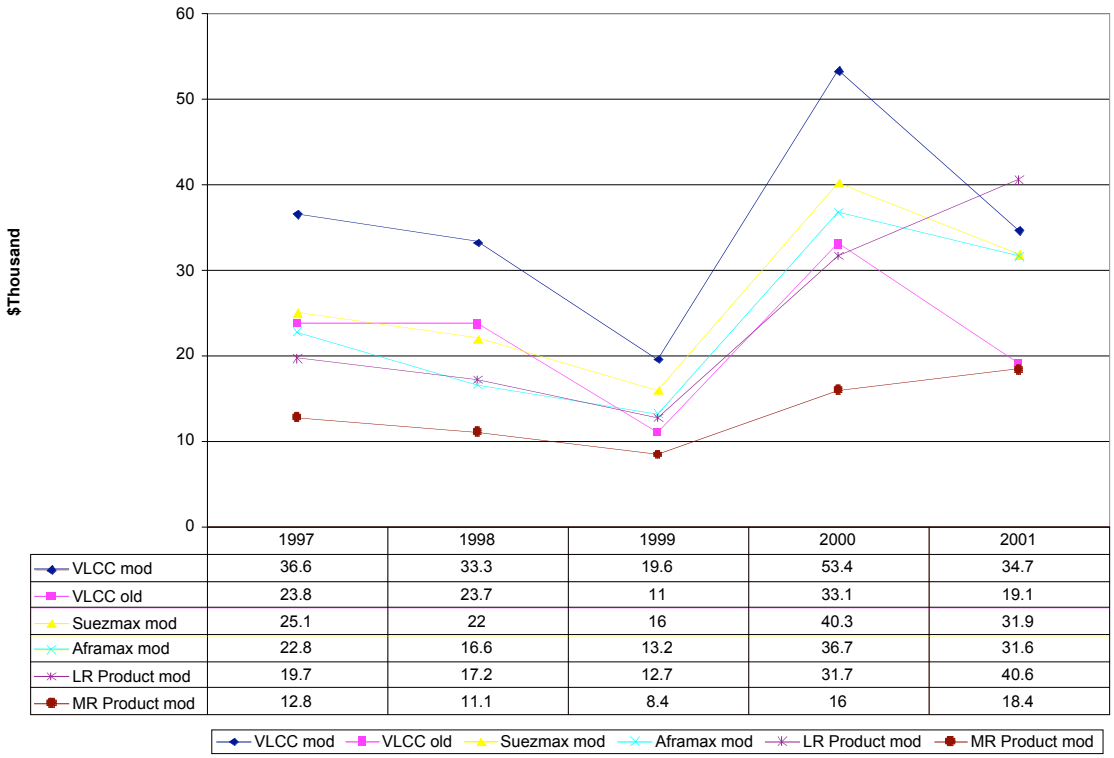
Figure 3. Tanker Ownership by Country Groups



	1970	1980	1990	1998	1999	2000
DMEC	63.9	52.5	37.3	29.8	30.5	30
Open	26.4	36.2	41.6	51.2	50.2	50.8
Developing	4.7	7.7	16.3	15.9	16.2	16.1

Source: UNCTAD Review of Maritime Transport, 2001

Figure 4. Average Single Voyage Freight Rates (in thousand dollars)



	1997	1998	1999	2000	2001
VLCC mod	36.6	33.3	19.6	53.4	34.7
VLCC old	23.8	23.7	11	33.1	19.1
Suezmax mod	25.1	22	16	40.3	31.9
Aframax mod	22.8	16.6	13.2	36.7	31.6
LR Product mod	19.7	17.2	12.7	31.7	40.6
MR Product mod	12.8	11.1	8.4	16	18.4

Source: R. S. Platou (2002)