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MARPOL 73/78 and Vessel Pollution: A Glass Half Full or Half Empty?

ANDREW GRIFFIN

As global commerce has grown over the past several decades, so too has the world's hunger for oil. The amount of oil it takes to satisfy this demand on just a daily basis is staggering. Every day, an estimated 100,000,000 tons of oil are ferried between the ports of shippers and consuming nations. Given the volume of oil shipped over the oceans, as well as the scale of the supertankers involved, it is not surprising that some oil makes its way into the oceans. Vessels annually release some one to two million tons of oil into the marine environment. Sometimes the release is related to ship operations; other times it is due to accidental spills. In both cases, the oceans are degraded.

Disasters such as the Exxon Valdez grounding provide gripping illustrations of the problem of vessel pollution. Since these large coastal spills are both newsworthy and accessible, television regularly treats viewers to up to the minute pictures of the ensuing ecological harm. As a result, the public, galvanized by graphic images of blackened beaches and oil

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2. In 1960, more than half the ships in the world fleet were under 50,000 deadweight tons (dwt). There were only a few "supertankers" of over 100,000 dwt. By 1970, 45% of the world tanker fleet were ships of more than 105,000 dwt. By 1980, more than half of the fleet consisted of tankers of more than 200,000 dwt, with several ships breaking the 500,000 dwt barrier. The Fight Against Marine Pollution, 3 IMO NEWS 8 (1982).
4. Oil pollution contains a host of toxic chemicals. There are, for example, 100-200 known carcinogens in every 10,000 pounds of oil released into the oceans. While spills have the immediate effect of killing waterfowl and mammals, the more insidious harm is the disruption of the food chain caused by these carcinogens. First, oil pollution kills the coastal phytoplankton which feed commercial fish, thereby causing a reduction in harvests. Second, the feed organisms which survive introduce the oil toxins into the food chain as they are consumed. Dempsey, supra note 1, at 467-68.
5. The spill was the biggest human-caused disaster in U.S. history. More than 36,000 waterfowl died, along with more than 1,000 sea otters and 144 bald eagles. Exxon spent over $2 billion in clean-up costs, and agreed to pay over $1 billion to avoid facing criminal charges. Settlement Reached On Exxon Oil Spill, CHRISTIAN SCI. MONITOR, Mar. 15, 1992, at 4.
soaked birds, puts pressure on national governments to take stronger measures to prevent future spills.

However, these tanker accidents, while damaging, are not the only threat. An additional source of vessel pollution comes from operational discharges on the high seas. Away from the watchful eyes of television, many vessels discharge water contaminated as a result of normal ship operations. Of the oil released by vessels, seventy-five percent is reported to have come from operational discharges and twenty-five percent from accidental spills.6 If there is a need to prevent ship spills, then there must also be an equal or greater need to prevent operational discharges.

In 1983, the International Convention for the Prevention of Pollution from Ships 19737 and its 1978 Protocol8 (MARPOL 73/78) came into force.9 This treaty is the international community’s answer to the problem of vessel pollution. Since international commerce is vitally dependent upon sea transport, MARPOL 73/78 attempts to strike a balance between the need to protect and preserve the marine environment and the desire not to impose laws which make shipping prohibitively expensive. Additionally, MARPOL 73/78 had to create an environmental enforcement regime which balanced conflicting jurisdictional claims made by flag states and coastal states. Whereas flag states historically had, and wanted to preserve, exclusive jurisdiction over their vessels, coastal states wanted to be given authority to enforce MARPOL 73/78 against the ships of other nations.

In 1992, major amendments to MARPOL 73/78 were adopted concerning the design and construction of both new and existing tankers.10 These amendments came into force in July 1993.11 Directed toward reducing the environmental damage caused by spills, these amendments require that tankers be outfitted with either a double-hull or an equally

7. This treaty’s full title is even more cumbersome: International Conference on Marine Pollution: Convention for the Prevention of Pollution from Ships, Nov. 2, 1973, 12 I.L.M. 1319 [hereinafter MARPOL 73].
effective alternative. These changes were controversial because of the great costs they placed upon shipowners, who questioned the effectiveness of the double-hull design, and who argued that there were other less costly design solutions which should have been considered. As with past debates over MARPOL 73/78, the final amendments reflected a compromise between divergent interests.

This Comment seeks to evaluate whether MARPOL 73/78’s compromises were effective ones. Part I considers operational discharges. Part II discusses the history leading up to MARPOL 73/78. Part III explores the mechanics of MARPOL 73/78’s regulations and enforcement regime. Part IV critiques the treaty. Part V describes the double-hull amendment to MARPOL 73/78. Part VI concludes that MARPOL 73/78 is an effective treaty, not because it rigorously regulates operational discharges, but because it imposes structural and equipment standards upon ships which eliminate or reduce the sources of dirty discharges. Recent amendments, requiring that tankers be additionally outfitted with double-hulls, are a natural extension and refinement of this “structural” emphasis. This Comment also concludes that while the compromises found within MARPOL 73/78 did favor shipping interests and flag states in the short run, these compromises were necessary to ratify the Convention, and their impact has diminished over time. This comment argues that it was this pragmatic approach—making concessions to industry in the short term in return for greater environmental protection in the long term—which enabled the new and controversial double-hull amendments to come into force.

I. OPERATIONAL DISCHARGES

There are two ship operations which pollute the oceans: ballasting and cargo tank washings. Ballasting occurs after a tanker has discharged its load. A crew fills up to one-third of the cargo tanks with sea water to compensate for weight lost from the delivered payload. With this replacement water as ballast, the ship displaces sufficient water to be maneuverable during its trip back to the loading port. If a ship encounters particularly rough weather during its return and needs more ballast to stabilize the ship, it can fill its cargo tanks up to half capacity.12

The pollution problems associated with ballast come from the water being stored in the "empty" tanks used for transporting oil. When water is placed in cargo tanks, it mixes with oil remnants on the walls and settled residue on the floors. This contaminated ballast is discharged before arriving in port. Since 0.35 percent of a ship's original cargo is left behind after a shipment, the oil content of a ballast discharge for a 200,000 ton ship could amount to about 700 tons.

Tank washings are the other source of operational pollution. At the same time a ship stores water in one-third of its tanks for ballast, water is also used to clean an additional one-third of the tanks. This washing prepares the hold for new and perhaps different types of cargo to be stored and prevents the buildup of sludge. The resulting dirty washings, like the ballast, are then discharged back into the ocean before returning to port.

While ballasting and tank washings are necessary vessel operations, their discharges can be cleaned. There are several efficacious methods for reducing or eliminating the pollution associated with operational discharges. MARPOL 73/78 requires ships to utilize some or all of the following methods: load on top, crude oil washings, and segregated ballast tanks.

A. Load on Top (LOT)

This is a procedure in which operational waters are allowed to settle during the voyage back to the loading port. Given time, oil and water mixtures left standing will separate: oil will gradually rise to the surface, and the heavier clean water will sink. With LOT, the clean water is drawn off the bottom, leaving behind concentrated oily residue which is then transferred to a slop tank. Once in port, new cargo is either "loaded on top" of the oily slop, or the slop is transferred to reception facilities. The difficulty with LOT is that in order to be effective it requires a skilled and conscientious crew to follow the correct procedures. Also, since the separation process takes considerable time, LOT does not work well for short coastal voyages.
B. Crude Oil Washings (COWs)

This technique uses oil in place of water to clean off the walls of cargo tanks. Because of the dissolving action of crude oil, COWs are the superior method for reducing residues and sludge. COWs minimize operational pollution caused by tank washing by reducing or eliminating the use of water.\(^{18}\)

C. Segregated Ballast Tanks (SBTs)

SBTs are tanks which are designed for carrying only ballast. SBTs virtually eliminate the problems of oily ballast discharges because the holds for ballast and oil are distinct.\(^{19}\) With SBTs, the only possibility for ballast contamination occurs when the ship needs to take on ballast beyond the capacity of its ballast tanks. Where the weather would be particularly treacherous, ballast would also be stored in the cargo tanks.\(^{20}\) A cheaper substitute for SBTs is Dedicated Clean Ballast Tanks (CBTs). With CBTs, cargo tanks are set aside only for carrying ballast water.\(^{21}\) While in principle CBTs can be as effective as SBTs, this is only true so long as the tanks are kept clean of oil. The fact that CBTs share the same pumping and piping arrangements as the regular cargo tanks raises the specter of opportunistic crews filling them up without setting aside tanks for ballast.

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\(^{18}\) The Fight Against Marine Pollution, supra note 2, at 10.

\(^{19}\) Illustrating the principle that for every action there is an opposite and equal reaction, it is worth noting that SBTs are not without their own problems. While SBTs were designed to eliminate one problem—oily discharges—they in turn create a new problem: travelling biomatter. Tankers travel the globe and typically take in ballast water in one corner of the world which is later discharged at a destination port thousands of miles away. This creates the potential for harmful organisms to enter and spread to a new region via the discharge of ballast water and sediment from shipping. In Australia, tankers are linked with the introduction of a type of algae known to cause paralytic shellfish poisoning in humans; in the United Kingdom, sargassum muticum, a seaweed from the Pacific, has made itself at home; and in the Great Lakes, it is estimated that it will cost $4-5 billion to control the prodigious and damaging zebra mussel, a European arrival. Working Group to Consider Pollution by Ballast Water, 2 IMO NEWS 4 (1990). Thus, while a peregrine organism might be harmless in its natural environment, it can become unpredictably virulent if placed in surroundings lacking its natural predators or other controlling factors.

\(^{20}\) COMMITTEE ON TANK VESSEL DESIGN, supra note 15, at 47.

\(^{21}\) MARPOL 78, supra note 8, Annex I, reg. 13A, at 558.
II. HISTORY LEADING TO MARPOL 73/78

For much of the twentieth century, vessel pollution has been recognized as an international problem. In 1954, the international community acted for the first time through the International Convention for the Prevention of Pollution of the Sea by Oil. The Convention’s scope, however, was limited to prohibiting discharges within fifty miles of land. Later, in 1962, the International Maritime Consultative Organization (IMCO) called a conference which amended the Convention so that it applied to smaller gross tonnage and extended the zones where dumping was prohibited.

The problem with OILPOL 54 and its 1962 amendments was that they did little more than move oil pollution outside coastal areas. They did nothing to reduce the amount of oil being introduced into the oceans. In 1969, OILPOL amendments adopted the LOT system. This system was promoted by the oil companies as a cost-effective solution to proposals calling for ships to be outfitted with expensive and unproven oil separating technology. In part, LOT was adopted because the oil companies had already installed the technology in the majority of their ships in an effort to head off competing ideas on how to strengthen environmental regulations.

22. In 1926, the United States, a coastal state, called an international shipping conference to prevent shippers from making operational discharges into the sea. In 1934, the United Kingdom asked the League of Nations to address the problem. In both cases, the international community’s response was tepid, although the United States was successful in getting seven major maritime nations to voluntarily accept a 50 mile coastal discharge prohibition zone. Curtis, supra note 17, at 685.


24. Shaw et al., supra note 3, at 164. The IMCO was an agency of the United Nations responsible for marine pollution matters. Its role was strictly to be a consultative and advisory body. The IMCO has since been succeeded by the International Maritime Organization (IMO), which continues to serve as an advisory body. Id.


27. M’GONIGLE & ZACHER, supra note 12, at 96. At the conference for the 1969 Amendments, the U.K. wanted a prohibition on all discharges from ships over 20,000 tons. As part of the restriction, ships would have very large oil separators which could purify discharges and store oil residues. This separation technology, however, was expensive for shipowners (as well as States, who would have to build reception facilities to take in the oily wastes) and unproven. In contrast, the LOT system could be immediately implemented with only minor adjustments to existing ships. Id. at 94.

28. Id. at 98. By 1965, oil companies had unilaterally installed LOT in 60% of their tanker tonnage and were considering it for another 18%. "Thus, their actions can almost be viewed as an
VESSEL POLLUTION

LOT, however, did not produce the environmental gains promised by its proponents. This was due, in part, to the difficulty in operating the system correctly, even by a trained crew. As a result, LOT often produced inadequate oil and water separation. But it was also due to unconscientious crews, who found it easy to circumvent LOT and to simply discharge untreated ballast waters. By the early 1970s, the problems with LOT were clear. In 1973, the United States threatened to take unilateral action in regulating tankers if an effective international solution was not reached. The United States wanted SBTs to be installed on all tankers and, as a result of the pressure exerted by the United States, the international community convened the conference which passed MARPOL 73.

MARPOL 73 represented a break from OILPOL 54 and its amendments. Although it included all of the old requirements and standards, prohibition zones and LOT, there was much that was new. For example, for the first time ships were required to have SBT and oil separating equipment. Also, the Convention applied not only to tankers, but to all ships operating on the oceans. These requirements were tightened further in the 1978 protocol, which was drafted in such a way that it absorbed the parent Convention. The combined instrument is usually known by the acronym MARPOL 73/78.

III. THE MECHANICS OF MARPOL 73/78

MARPOL 73/78 is a convention which seeks nothing less than “the complete elimination of intentional pollution of the marine environment by oil and other harmful substances and the minimization of accidental discharge of such substances.”32 To achieve this end, the Convention sets down very specific regulations for ships to observe. These regulations, which address all aspects of vessel-source pollution, are contained within five Annexes.33 These annexes address, respectively, oil, chemicals, tanks

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29. Id. at 108. In 1973, a consortium of oil companies undertook a secret survey of their ships at their oil-loading terminals in the Middle East. They learned that one-third of the tankers were using LOT well, one-third were using it poorly, and one-third did not use it at all. Id. at 110-11.

30. Id. at 107-14.

31. The Fight Against Marine Pollution, supra note 2, at 10.

32. MARPOL 73, supra note 7, preface, at 1319.

33. For the purposes of this Comment, only Annex I, governing oil pollution, is important.
and containers, sewage, and garbage. MARPOL 73/78 also creates a regime to enforce these regulations, although in comparison with the specific regulations, this regime is less comprehensive. Under the enforcement regime, flag states are primarily responsible for enforcing the Convention.

A. Annex I

Annex I contains all of the regulations pertaining to vessel oil pollution. MARPOL 73/78 approaches the issue of controlling ship pollution from two directions, one procedural and one technical. First, MARPOL 73/78 seeks to reduce vessel pollution by regulating the shipboard operations which generate pollution. Toward this end, it lays down procedures and restrictions which ships must observe when discharging ballast water or other wastes. MARPOL 73/78 also seeks to reduce vessel pollution by requiring that ships be specially designed or reconfigured so as to eliminate or reduce operational pollution. Unlike the first approach, which relies upon crews keeping the ships’ discharges as clean as possible and flag states to detect and punish those ships which violate operational regulations, this second approach relies upon structural solutions and technology to directly reduce and monitor vessel pollution.

1. Technical regulations

Annex I adopts a sliding scale approach to design standards for vessels. For new ships, the requirements are stiff: all must be equipped with SBTs. For older existing vessels, the requirements are less strict: COWs or CBTs may be substituted in place of SBTs. The exact requirements,

Annex I can be found in MARPOL 78, supra note 8, at 550-78.

34. Ships are “new” if they are built after certain dates:

<table>
<thead>
<tr>
<th></th>
<th>New Ships</th>
<th>New Tankers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(MARPOL 73)</td>
<td>(MARPOL 78)</td>
</tr>
<tr>
<td>Contract date after</td>
<td>Dec. 31, 1975</td>
<td>June 1, 1979</td>
</tr>
<tr>
<td>Keel laid after</td>
<td>June 30, 1976</td>
<td>Jan. 1, 1980</td>
</tr>
<tr>
<td>Delivered after</td>
<td>Dec. 31, 1979</td>
<td>June 1, 1982</td>
</tr>
</tbody>
</table>

All ships which are not “new” are classified as “existing.” (Note that MARPOL 73 refers to “new ships,” while MARPOL 78 uses the term “new tankers.”) MARPOL 73, supra note 7, reg. 1(6), at 1336; MARPOL 78, supra note 8, Annex I, reg. 13, at 551.

35. MARPOL 78, supra note 8, reg. 13B, at 559.
summarized below, depend upon the type of vessel, its age, and its dead weight tonnage.

**Summary of requirements of MARPOL 73/78 for COW, SBT and CBT**

<table>
<thead>
<tr>
<th>New tankers</th>
<th>At entry into force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Product 30,000 dwt+ SBT</td>
<td></td>
</tr>
<tr>
<td>Crude 20,000 dwt+ SBT, COW</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Existing tankers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude 40-70,000 dwt SBT or COW or CBT</td>
</tr>
<tr>
<td>Crude 70,000 dwt+ SBT or COW or CBT</td>
</tr>
<tr>
<td>Product 40,000 dwt+ SBT or CBT</td>
</tr>
<tr>
<td><strong>CBT option dropped after four years</strong></td>
</tr>
<tr>
<td><strong>CBT option dropped after two years</strong></td>
</tr>
</tbody>
</table>

Beyond the design requirement of SBTs, Annex I also requires that ships have the equipment necessary to operate the LOT system and to retain oily residues on board until they can be discharged into shore reception facilities. This equipment includes slop tanks, oily-water separating equipment or filtering systems, oil content meters, suitable pump and piping arrangements, and sludge tanks.

Finally, Annex I requires ships to be equipped with systems that can monitor and control oily discharges. Like a “black box,” this hardware is to continuously record either “the discharge in litres per nautical mile and total quantity discharged, or the oil content and rate of discharge.” All record entries must be made according to time and date and be kept for at

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36. See MARPOL 73/78, 4 IMO NEWS 12 (1982).
37. Because of the expense involved with converting to SBTs or COWs, existing tankers were given a grace period in which CBTs were allowed while the ships gradually came into compliance with the new standards. *Id.*
39. *Id.* reg. 15(3)(a), at 1354.
least three years.\textsuperscript{40} International Maritime Organization (IMO) Resolution A.496(XII),\textsuperscript{41} recognizes three categories of cargo monitoring systems: control units, computing units, and calculating units.\textsuperscript{42}

Like the SBTs, there is a sliding scale for cargo monitoring equipment. For new tankers this equipment was mandatory. Conversely, most existing tankers had until three years after the ratification of the Convention before installation was required. Because existing tankers comprise a great majority of global tonnage, the IMO\textsuperscript{43} concluded that incentives should be given to encourage equipment compliance before it became compulsory.\textsuperscript{44}

Obviously, the extent to which these [cargo monitoring] systems are reliable and tamper-proof varies significantly between the categories established. It was the concerted opinion of IMO, however, that the prompt installation of an inferior device was more consonant with the goals of MARPOL 73/78 than the delayed implementation of a more efficacious system.

\ldots [As an example of this rationale,] new tankers of over 4,000 deadweight tons installing cargo monitors since June 1, 1982 are required to use control units. If a vessel of this description opted to install a system prior to that date, a computing unit was sufficient. Computing units are also required for existing tankers of more than 20,000 deadweight tons, but if the vessel owner procrastinated later than October 2, 1984 in attaching the unit, a starting interlock was also necessary.\textsuperscript{45}

\textsuperscript{40} Id.
\textsuperscript{41} IMO Resolution A.496(XII), § 4, reprinted in 33 C.F.R. Part 157, Appendix F (1993).
\textsuperscript{42} Of the three, the control units system is the most sophisticated, automated, and tamper-proof. It comes with devices which prevent the discharge valve from being opened when the monitoring system is out of order (starting interlock) and which close the valve when the discharge rate exceeds a permissible rate (discharge valve control). The second best cargo monitoring device is the computing units system. Although it too is automated, it tracks less information, and it allows crews to manually insert data into the discharge record. Starting interlock and discharge valve control devices are not generally required for these systems. Finally, there is the minimal calculating system. With this system most of the data is manually entered. Starting interlock and discharge valve control are not required.
\textsuperscript{43} See supra note 24.
\textsuperscript{44} Collins, supra note 42, at 283.
\textsuperscript{45} Id. at 284–85.
Under Resolution A.496(XII), the earlier a ship is outfitted with cargo monitoring equipment, the more relaxed is the standard required.  

2. Operational Requirements

The underlying reason for the monitoring systems, described above, is to make sure that a ship’s operational discharges meet the precise standards of Annex I. For tankers, these standards are: 1) a ship may not leak more than 1/30,000th of its total carrying capacity into the ocean; 2) the rate at which oil may be discharged must not exceed sixty liters per mile traveled by the ship; and 3) no discharge of any oil whatsoever can be made within fifty miles of the nearest land or in certain special areas. For other vessels, the standards are a little more relaxed: 1) the oil content of effluents must be less than 100 parts per million; and 2) no discharge whatsoever can be made within twelve miles of the nearest land or in certain special areas.

Under Annex I, tankers and other ships are obligated to use the LOT system to extract oily residues from operational waters. These oily wastes must be retained on board in slop tanks for later transfer into shore reception facilities. Parties to the Convention are obligated to provide adequate facilities for reception of residues and oily mixtures at loading terminals, repair ports, and other ports frequented by ships which have oily residues to discharge. Furthermore, tankers and other ships must carry and maintain an oil record book in which all operations involving oil are to be recorded. Every movement of oil from loading to discharge, on a tank to tank basis, must be logged in the book. This book can be inspected by the authorities of any State which is a Party to the Convention.

46. IMO Resolution A.496(XII), supra note 41, § 3.3.
47. MARPOL 73, supra note 7, Annex I, reg. 9(1)(a), at 1343-44. The Convention recognizes that certain enclosed bodies of water are particularly vulnerable to vessel pollution. Accordingly, it prohibits all dumping in these "special areas": the Mediterranean, Baltic, Black, and Red Seas, and the Persian Gulf. Id. Annex I, reg. 10, at 1345-46.
48. Id. Annex I, reg. 9(1)(b), at 1344.
49. Id. Annex I, reg. 15-17, at 1353-58.
50. Id. Annex I, reg. 12, at 1350-56. Parties to the Convention are also obliged to provide reception facilities if their coastlines border on any of the environmentally sensitive areas. Id. Annex I, reg. 10, at 1347.
51. Id. Annex I, reg. 20, at 1359-61.
B. The Enforcement Regime

Parties to MARPOL 73/78 may enforce the Convention in three ways: through ship inspections to ensure vessels meet minimum technical standards, by monitoring ship compliance with discharge standards, and by punishing ships which violate the standards.

1. Inspection

MARPOL 73/78 requires that ships meet various technical standards. Responsibility for seeing that these standards are met lies with the various flag states. Under the enforcement framework, every State has a duty to make sure that ships which fly its flag or which are under its control comply with MARPOL 73/78. Although generally the flag states have great discretion over how best to carry out this duty, they are obligated to inspect tankers and large ships.

For tankers and large ships, flag states are periodically required to conduct thorough inspections of ships to guarantee that their “structure, equipment, fittings, arrangements and material fully comply with the applicable requirements [of Annex I].” The Convention requires flag states to conduct inspections, or “surveys,” before a ship is put into service or when issuing a five year International Oil Pollution Prevention Certificate (IOPP). After that, the timing of the surveys varies, but at minimum one must be conducted every five years. The force behind the survey is that a ship which fails to pass the quality test cannot sail until it has been brought up to MARPOL’s standards.

In addition to the flag states, port states also have some authority to survey ships and confine those which fall below MARPOL’s standards. This port state authority is contingent on whether a ship at a port or an off-shore terminal has an IOPP certificate. If a ship has no certificate, a port state may conduct a full survey. If, however, a ship is carrying a valid

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52. “The Administration [flag state] shall establish appropriate measures for ships . . . in order to ensure that the applicable provisions of this Annex are complied with.” Id. Annex I, reg. 4(2), at 1340.
53. MARPOL requires surveys for tankers of 150 gross tons and above and for other ships of 400 gross tons and above. Id. Annex I, reg. (4)(1), at 1340.
54. Id.
55. Id. Annex I, reg. 4, 5, at 1340-41.
certificate from a flag state, the port state is obligated to honor the document as if it were its own. The vessel must be accepted as passing MARPOL 73/78's standards. The only time a port state can go beyond the IOPP Certificate and conduct a complete survey is if there are "clear grounds for believing that the condition of the ship or its equipment does not correspond substantially with the particulars of that certificate." Intervention would be warranted, for example, if a crew had removed monitoring equipment which was originally listed on the ship's certificate.

### 2. Monitoring

A second component of the enforcement regime is state monitoring of vessel discharges. MARPOL 73/78 requires all parties to cooperate in detecting ship violations and to use "all appropriate and practicable measures of detection and environmental monitoring, adequate procedures for reporting and accumulation of evidence." If a State has evidence of a MARPOL 73/78 violation, it must forward this proof to the flag state responsible for the deviant vessel.

But, while MARPOL 73/78 charges States with the duty of policing the oceans, most violators are not caught on the high seas, for several reasons. First, States have neither the resources nor the interest to patrol the many millions of ocean miles. Second, once an oil slick is discovered, it is difficult to build up sufficient evidence to link it to a particular ship. Without pictures of a long slick of oil trailing behind a vessel, the usual method for detecting a MARPOL 73/78 violation is observing a discharge while a ship is docked.

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56. Id. art. V, at 1322-23.
57. Id. art. V(2), at 1323.
58. Id. art. VI(1), at 1323-24.
59. Id. art. VI(3), at 1324.
60. Curtis, supra note 17, at 707.
61. And even then a photograph might not be enough. In 1975, when OILPOL 54 was the controlling treaty, France photographed the West German vessel *Stadt Emden* with an oil trail 6 nautical miles long and 100 meters wide. Although this evidence was forwarded to German authorities, the courts dismissed the case for lack of evidence. In 1978, France used photographs to document 44 violations. Although this evidence was forwarded to the flag States involved, in not one case was a fine imposed. Dempsey, supra note 1, at 517-18.
shore terminal under their jurisdiction. In a discharge inspection, the port state would look mainly at a ship's oil record book in which the ship's operator records all movements of oil during a voyage. If a ship has oil discharge monitoring equipment installed, this too would be important evidence. Finally, if a ship does not have normal amounts of dirty ballast, or oily residues stored in its slop tank, this would be prima facie evidence of an improper operational discharge.

3. Punishment

The last component of the enforcement regime is the punishment of vessels which have illegally discharged oil. Once a flag state has received notice or evidence that one of its ships has violated MARPOL 73/78, it must investigate. If this obligatory investigation turns up sufficient evidence to bring an action against the vessel, then the flag state must initiate a legal proceeding to judge the matter. In the spirit of cooperation, it must then promptly inform the party which reported the violation of the action taken. When punishing a ship, the flag state must impose penalties that are "adequate in severity to discourage violations of the present Convention and shall be equally severe irrespective of where the violations occur."

IV. MARPOL 73/78 CRITIQUED

MARPOL 73/78 has been immensely successful in bringing the world's merchant fleet under its rules. Today, seventy countries, whose fleets comprise about ninety percent of global shipping tonnage, have ratified the Convention. As MARPOL's reach has expanded, pollution has declined.

62. MARPOL 73, supra note 7, art. VI(2), at 1324.
63. Curtis, supra note 17, at 706.
64. In 1980, the United Kingdom entered into MARPOL 73/78. Thereafter, authorities at a Scotland reception facility notified all oil tankers that they would be refused berths if they came into port with less dirty ballast water than normal, indicating an illegal dump at sea. Id. at 700-01.
65. MARPOL 73, supra note 7, art. VI(4), at 1324.
66. Id. art. IV(4), at 1322.
67. MARPOL 73/78 Amended for New and Existing Tankers, supra note 10, at 3. There are, however, significant exceptions: of the oil-exporting countries, only a few have signed the Convention and only 65 of the 125 nations with seacoasts that must assume responsibility for ships leaving their harbors have signed the Convention. Andrea Berghuizen, A Sea of Troubles, WORLD PRESS REV., June 1993, v.40, at 45, available in LEXIS, Nexis Library, Current File.
During the 1980s, marine oil pollution dropped by as much as sixty percent. Even more dramatic has been the fall in oil pollution from operational discharges. From 1973, when MARPOL 73/78 was first drafted, until 1990, tanker operational pollution dropped eighty-five percent. Despite this success, however, MARPOL 73/78 is not without its problems.

A. Annex I

1. Technical Regulations

The SBT requirement is a good idea which was only partially implemented. If all ships were required to be equipped with SBTs, the problem of oily ballast water would be eliminated. Annex I, however, stopped short of such a sweeping requirement. It made SBTs mandatory, but only for new vessels. Existing ships were exempt. This was a mistake because it slowed down the process of upgrading the environmental quality of the fleet as a whole. Faced with the prospect of purchasing expensive new vessels equipped with SBTs, many shipowners opted instead to hold onto their existing vessels for longer than usual. This has been the case with the world’s tanker fleet, fifty percent of which were built between fifteen and nineteen years ago. Had SBTs been required on existing vessels, many ships would have been retired earlier than usual since retrofitting would have not been cost efficient.

But while it might have been better if SBTs were universal, this approach was unpalatable to many of the States drafting MARPOL 73/78. The two-tiered approach was the result of a compromise. In MARPOL 73, as the result of U.S. pressure, SBTs were required for the first time, but only on new oil tankers of 70,000 dwt and above. All other ships were exempt.


69. The National Research Council estimated that tanker operational losses released 1.08 million tons of oil into the ocean in 1973. For 1985, the Council estimated these operational losses at 0.41 million tons. For 1990, the U.S. Coast Guard updated the Council estimates and found operational losses to be 0.16 million tons. COMMITTEE ON TANK VESSEL DESIGN, supra note 15, at 23.

70. Marine Environment and Development: the IMO Role, supra note 68, at 8.

71. Apart from the cost of SBTs, a second disincentive is the practice of some port States collecting charges and dues on the additional gross tonnage of the SBTs. Concern Over Segregated Ballast Tanker Port Dues Expressed by Intertanko, Lloyd's List, Aug. 31, 1992, available in LEXIS, Nexis Library, Reuters File.
U.S. demands for SBTs were born of its frustrations with LOT, which the United States did not believe was working. The United States saw SBTs as a way to bypass LOT. In negotiations leading up to MARPOL 73/78, the United States lobbied for the SBT requirement to be extended to all ships above 20,000 dwt. This proposal was vigorously opposed by major shipping states, who would have had to absorb the enormous cost of retrofitting the world fleet. In place of SBTs, shipping advocates argued for COWs, which they said would substantially reduce all tanker residues without the use of a salt water wash. COW advocates also distinguished COWs from LOT. They noted that unlike LOT, which takes place at sea away from supervision, crude oil cleaning takes place at the unloading port where a governing body is likely to conduct an adequate inspection. In the end, both sides compromised by requiring new tankers of 20,000 dwt and above to have SBTs, but allowing existing tankers to choose between the SBT, COW, or CBT systems.

A much more unsatisfactory and unnecessary compromise was made in regard to cargo hold monitors. The idea of a cargo monitoring system was first introduced into MARPOL 73 by the United States. Although technology for monitoring refined products (white oils) did not exist at the time, the United States believed that it would become commercially available if mandated. Other conferees were doubtful. Accordingly, they included an escape hatch which empowered the IMO to waive the requirement for carriers of white oil if it judged that reliable cargo monitors did not yet exist. Additionally, in recognition of the cost involved with retrofitting, existing tankers did not have to install monitors until three years after the Convention came into force.

The compromise was fair at the time. It made sense to have an escape hatch in case the technology never did materialize, as well as a three year grace period for the older ships to comply. However, when the technology did develop, the IMO conceded even more ground. When the technology

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72. See supra text accompanying notes 29-30.
73. Estimates of the cost of retrofitting the existing fleet with SBT varied widely. Supporters, like the United States, estimated the cost to be $2.93 billion. The Oil Companies International Marine Forum, however, set the conversion cost at $6 billion. M'Gonigle & Zacher, supra note 12, at 133.
74. See id. at 130-40.
75. Id. at 114.
76. MARPOL 73, supra note 7, Annex I, reg. 15(6), at 1355-56.
77. Id. Annex I, reg. 16(4), at 1357.
became available, the IMO was impatient to outfit as many existing ships as possible. It did not want to wait for the three year period to run. As a result, it passed IMO Resolution A.496(XII),\textsuperscript{78} which exempted vessels from more sophisticated monitoring systems later if they took on a less reliable system immediately.\textsuperscript{79} This was a short-sighted solution because three years was not a significant time to wait. Now, as with SBTs, the general quality of the world fleet’s monitoring systems will only be upgraded when existing ships are turned to scrap.

2. Operational Standards

Today’s shipowners find themselves in a curious Catch-22 situation with Annex I’s LOT requirement. Under Annex I, ships are obligated to run their operational waters through a LOT procedure, retaining the oily residues on board for later transfer to a reception facility. In turn, port states are obligated to provide these reception facilities. Unfortunately, many States have been reluctant to build these facilities because of the expense involved.\textsuperscript{80} The return on reception facility investments is seen as being too low. The dimensions of this problem are illustrated by the situation in the Mediterranean, where half of the littoral states have no reception facilities at all.\textsuperscript{81} For many tankers, the only option under these circumstances is to discharge their oily wastes into the ocean and risk the penalties.

The problem with inadequate reception facilities, however, is not the fault of MARPOL 73/78. The blame lies fairly with the Contracting Parties themselves. These Parties have ignored the fact that they have bound themselves to construct facilities. Their eyes are only on the bottom line of whether they can turn a profit with a reception facility. A possible solution to the problem might lie in article 10, which deals with the settlement of disputes. It provides that any disputes between Parties concerning the

\textsuperscript{78} IMO Resolution A.496(XII), supra note 41, § 3.3.
\textsuperscript{79} Collins, supra note 42, at 281-85.
\textsuperscript{80} International Chamber of Shipping Study (1990) reported that many contracting parties have failed to ensure that facilities are provided, and where facilities are available there are often considerable differences in charging for the reception of wastes. Marine Environment and Development: the IMO Role, supra note 68, at 8.
interpretation or application of MARPOL 73/78 shall be submitted to arbitration. This arbitration is binding. Presumably a State could force a port state to build a reception facility by taking the defaulting Party to arbitration.

B. The Enforcement Regime

The weak link in MARPOL 73/78 has been its reliance on flag states as the primary enforcement agents. Under the Convention, a flag state is vested with the exclusive right and duty to inspect and certify its vessels. A flag state is also exclusively responsible for investigating and punishing its ships when they violate MARPOL 73/78's operational standards. Coastal states and port states, on the other hand, generally have limited jurisdiction over the ships flagged by other countries. If a ship discharges within the territorial waters of a coastal state, then the ship would be subject to the coastal state's jurisdiction. Beyond these territorial waters, however, the role of nonflag states is restricted to monitoring and reporting ship violations.

A major problem with the flag state system has been the widespread use by shipowners of flags of convenience (FOC). FOC are flags of certain countries whose laws make it easy and attractive for ships owned by foreign nationals or companies to fly these flags. For the shipowners, the benefits of a convenience registry are many: easy registration of ships, lower taxes, reduced operating expenses, and greater freedom from control by the flag state. For the FOC state, the benefit is the income brought from

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83. MARPOL 73, supra note 7, art. V, at 1323.
84. Coastal states have historically claimed sovereignty over their coastal waters. These waters are known as the territorial waters. In the sixteenth and seventeenth centuries, the breadth of the territorial sea was set by criteria such as the limits of visibility. Later the rule developed that sovereignty extended to the furthest point which could be controlled by a shore-based cannon. Today, the international standard is 12 miles, as set by the Law of the Sea Convention. R.R. Churchill & A.V. Lowe, The Law of the Sea 65-67 (1988).
85. This vesting of exclusive authority within the flag states has deep roots in the law governing the seas. For centuries, maritime law has been guided by the principle of free navigation, be it for military or commercial interests. The corollary of this principle has been the flag state monopoly as it exists today. Under it, States are barred from interfering with the movement and trade of vessels flying the flag of another State. See G. Keeton & G. Schwarzenberger, The Law & Custom of the Sea 57-65 (1959).
the ship’s registry. Convenience registries have undermined MARPOL 73/78’s pollution control efforts. With the vast majority of FOC states classified as developing or Third World states, most of these States do not have the resources to properly regulate their huge fleets. Furthermore, because of their dependence upon registry income, these States do not have the inclination to rigorously prevent and punish pollution from their multinational clients.

Because convenience registry states do not have the economic or political incentive to protect the oceans, MARPOL 73/78 needs to be strengthened. One solution would be to break the flag state hegemony and give other States a stronger role in enforcement. Nonflag states should be given the authority to inspect other countries’ vessels, as well as to investigate and punish MARPOL 73/78 violations. Among the strongest advocates for expanding nonflag powers have been the coastal states. In the Convention which produced MARPOL 73, they argued that the traditional division between a narrow territorial sea and the high seas was an anachronism. Because vessel pollution most often occurs outside territorial waters and then moves into coastal waters, coastal states wanted their sphere of environmental jurisdiction expanded. Marine states, on the other hand, were worried about their vessels being subject to the jurisdiction of other countries. They feared that unscrupulous states might use environmental enforcement as a device to hassle and prosecute their ships for political reasons. The United States was one of those concerned—in particular, the Department of Defense.

Both sides agreed to a compromise. In the end, the coastal state reformers were left with only a promise that if international law changed, so too would their power:

Under article 4, the flag state was to prohibit violations “under the law of the Administration” of the ship, while the coastal state would also prohibit such violations “within the jurisdiction” of the state. Additionally, it was stipulated that the latter clause was, by article

87. Shaw et al., supra note 3, at 160-63.
88. Payne, supra note 86, at 72.
89. M’GONIGLE & ZACHER, supra note 12, at 207-08.
90. See id. at 208-09.
91. Id. at 209-10.
9(3), to “be constructed in the light of international law in force at the time of application or interpretation of the present Convention.” This latter formulation left to UNCLOS [United Nations Conference on the Law of the Sea] III the task of deciding the limits of particular coastal state jurisdictions which would then be applied retroactively to the 1973 Convention.92

In the meantime, the flag state monopoly was left in place.

Given that MARPOL 73/78 chose to retain the traditional flag state system, it should have at the very least established basic standards for flag state enforcement. As it is, the Convention allows each State to decide how best to satisfy the requirements of the Convention. For example, while States are obligated to inspect and certify tankers, what constitutes a passing grade varies from State to State. Similarly, while every State is required to investigate discharge violations and punish ships if there is sufficient evidence, what constitutes “sufficient evidence” depends upon each State.

V. DOUBLE-HULL AMENDMENTS

In 1993, major amendments to MARPOL 73/78 came into force requiring that all tankers be outfitted with double-hulls.93 These amendments were long awaited. The United States had unsuccessfully lobbied for a double-hull requirement to be included in MARPOL 73 and then again in MARPOL 78.94 In reviewing these latest changes to MARPOL, two conclusions can be drawn: they are a natural extension of MARPOL 73/78’s emphasis upon a “structural” solution to pollution, and like other key Convention requirements, such as the SBT requirements, these latest amendments make pragmatic concessions to industry interests in order to gain acceptance for a controversial environmental standard.

92. Id. at 208.
93. The concept of a double-hull is simply that the cargo tanks are separated from the outer hull by means of a space large enough to absorb low speed impacts. In the event of a grounding or an accidental collision, a double-hull provides a measure of protection against the outflow of oil. As with SBTs, the process of retrofitting a ship with a double-hull is complex, costly, and time consuming. Steering Committee Report Backs Double-hull and Mid-deck Tanker Designs, 1 IMO News 3 (1992).
The amendment modifications came in the form of two new regulations, which were added to Annex I of MARPOL 73/78. The first, regulation 13F, governs new tankers of 600 dwt or above. If the tanker is above 5,000 dwt, then 13F requires double bottoms and wing tanks extending the full depth of the ship's side. The second, regulation 13G, governs existing crude carriers of 30,000 dwt or above. For existing ships which comply with the standards laid down in MARPOL 73/78, 13G gives these ships no more than thirty years after the date of delivery to comply with the double-hull requirements of 13F. Ships which already had double-hulls were specially exempted from the thirty year refitting requirement. For existing ships built according pre-MARPOL standards, 13G gives no more than twenty-five years after the date of delivery for these ships to be fitted with side or bottom protection covering at least thirty percent of the cargo tank area.

The debate over these double-hull amendments was extensive. On one side, double-hull advocates argued that their design would guard against spills caused by groundings or collisions, would make ships easier to clean, faster to load and unload, and would increase each tanker's payload by replacing the SBTs, which on single-hulled ships are limited to holding ballast. Critics countered that double-hull ships would be more dangerous than conventional ships because explosive vapors might be trapped between hulls. Additionally, these critics questioned the stability of double-hull tankers after an accident by arguing that such ships would be more likely to capsize. But of all the arguments against the double-hull design, the strongest was the increased cost. In 1973, the United States made its proposal for double-hulls, submitting a supporting study which concluded the increased costs of double-hull ships to be nine percent. Today it is estimated that a double-hull tanker costs around $85 million, which is fifteen
to twenty percent more than it costs to build a standard single-hull tanker.  

In recent years, the balance in this debate has shifted in favor of the double-hull. After several spectacular accidents, such as the Exxon Valdez and the 1992 mishap off Scotland, political pressure built up worldwide to put an end to catastrophic oil spills. It was in response to these expectations that the double-hull amendments, proposed again by the United States in 1990, were accepted into MARPOL 73/78. In their final form, however, a concession was made to shipping interests. Rather than making double-hulls mandatory, the amendments made double-hulls the environmental standard against which ships would be judged. Specifically, regulation 13F allows mid-deck tankers with double-sided hulls to be an alternative to double-hull construction. Also acceptable are other methods of design and construction so long as they ensure the same level of protection against pollution in the event of a collision or stranding.

The United States did not believe the mid-deck design was as effective as the double-hull and unsuccessfully resisted changes allowing alternatives to the double-hull. Under the United States Oil Pollution Act of 1990, all new tankers built after 1994 must have double-hulls, with no exceptions. The United States wanted MARPOL 73/78 to be consistent

100. Hugh Carnegy, Slowly Acquiring A Thicker Skin, FIN. TIMES, June 8, 1993, at 9. The additional construction cost is explained by the greater complexity of the double-hull design. To build a double-shell very large crude carrier (VLCC) typically requires 20 percent more steelwork and man-hours than a single-skin ship. MARPOL Prompts Building Push In Japan, SHIPYARD WK., May 5, 1993, available in LEXIS, Nexis Library, Reuters File.

101. Steering Committee Report Backs Double-hull and Mid-deck Tanker Designs, supra note 93, at 3.

102. See Carnegy, supra note 100.

103. Developed and advocated by Japan, the mid-deck tanker design fits ships with wing ballast tanks to provide protection against collision and arranges cargo tanks so that there is upward pressure at the bottom of the hull. If the hull is ruptured, this pressure prevents most of the oil on board from escaping into the sea. Steering Committee Report Backs Double-hull and Mid-deck Tanker Designs, supra note 93, at 3. A U.S. Coast Guard study comparing the mid-deck design with the double-hull concluded that the mid-deck design performs better than the double-hull when punctured, spilling less oil, but that the double-hull is superior in groundings where its second hull is not punctured. U.S. Engineering Company Delivers Study on Alternative Tanker Designs to USCG, OIL SPILL INTELLIGENCE REP., Vol. XV, No. 34, Aug. 27, 1992, at 1, available in LEXIS, Nexis Library, Reuters File. One expert succinctly put the difference between the two designs this way: “Do we (the U.S.) want a lot of small spills (with the mid-deck), or a few large spills (with the double-hull)?” Id.

104. MARPOL 73/78 Amended for New and Existing Tankers, supra note 10, at 3.


with this Act.\textsuperscript{107} In response to the United States, the IMO established a steering committee to study the effectiveness of the mid-deck design.\textsuperscript{108} This study, which was financially supported by industry groups, concluded that the mid-deck and double-hull designs were basically equivalent.\textsuperscript{109} Based upon the study, the final amendments allowed the mid-deck design to be an alternative to the double-hull.

Currently tanker accidents account for only five percent of all oil pollution at sea.\textsuperscript{110} While the comparative merits of the double-hull and mid-deck designs are debatable, unquestionably either will reduce the amount of oil that enters the ocean from spills. Like past MARPOL structural requirements, the double-hull regulations have the advantage of upgrading the quality of the shipping fleet and protecting the ocean independent of any state involvement. The impact of these regulations, however, will not be as dramatic as past structural regulations. During the mid-1970s the demand for tanker tonnage, especially VLCCs, peaked and then collapsed. Nearly half the world's tanker tonnage consists of ships of 160,000 dwt or above and the majority of them are now at least fifteen years old. Since these very large crude carriers (VLCC) do not comply with MARPOL 73/78, they have less than a decade to meet the recent double-hull

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\item \textit{IMO Says Japanese Tanker Design As Effective As Double-hulls In Oil Spills}, BNA INT'L ENV'T DAILY, Feb. 4, 1992, available in LEXIS, Nexis Library, BNAIED File. The study was undertaken under pressure from the industry, the Japanese government, and the leading Japanese shipbuilder, Mitsubishi. \textit{Id.} Mitsubishi was involved because it initially developed the mid-deck tanker design. See \textit{Mitsubishi Heavy Industry Hopes for First New VLCC Order}, LLOYDS LIST, Oct. 9, 1992, available in Westlaw, International News File. This heavy Japanese involvement led to a subsequent protest from the Republic of South Korea, which, before the double-hull amendments were approved, discovered an application for an international patent from Mitsubishi Heavy Industries for its mid-deck tanker design which was identical to the mid-deck design alternative included in the double-hull amendments. \textit{IMO Agrees New Rules on Design—Committee Fixes Criteria For Double-Hulled Tankers to Reduce Pollution}, supra note 105.
\item Among the groups which funded the study were the oil and tanker industry, classification societies, shipbuilders, and model testing basins. \textit{Steering Committee Report Backs Double-hull and Mid-deck Tanker Designs}, supra note 93, at 3-4.
\item Today, with MARPOL 73/78 in force, tanker accidents account for only 5% of all oil pollution at sea, tanker operations account for 7%, other shipping accounts for 14%, and the remaining 74% comes from industrial waste. \textit{Camegy}, supra note 100, at 9. Given that tanker accidents account for such a small share of ocean oil pollution, a legitimate question is whether the benefits of double-hulls are worth the economic cost. In 1992, the U.S. Coast Guard (USCG) released an interim regulatory impact analysis on the impact of the Oil Pollution Act of 1990 and concluded that the total cost to industry of implementing its double-hull requirement would reach $1.5 billion per year by 2015. \textit{USCG Sets Dimensions for Double-Hull Spaces on Tankers}, OIL SPILL U.S. L. REP., Jan., 1993, available in LEXIS, NEXIS Library, Current File.
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standards or they will be scrapped.\textsuperscript{111} In the VLCC class, these regulations will have a significant impact. Conversely, during the 1980s, there was considerable demand for tankers of up to 60,000 dwt, the vast majority of which do comply with MARPOL 73/78. For these younger, more recently built ships, the double-hull compliance window is thirty years after the date of delivery. With these smaller ships, the regulations in the short term will have only a minor impact, as most can operate unmodified well into the next century.\textsuperscript{112}

\textbf{VI. CONCLUSION}

MARPOL 73/78 is environmentally less effective than it should be. While SBTs are one of the most reliable ways to ensure clean discharges, the treaty only requires new ships to have SBTs. Older vessels are allowed to sail under more relaxed standards. From the point of view of an environmentalist, all vessels, both new and existing, should be required to have these tanks. Equally lacking is MARPOL’s enforcement regime. The best way to ensure that ships comply with the treaty would be to allow all States to inspect vessels and punish detected violators. The treaty, however, leaves enforcement primarily in the hands of flag States, who lack the resources and the will to prevent and catch polluters.

While MARPOL 73/78 could be stronger environmentally, it is still a good treaty for two reasons. First, notwithstanding the failings of ship operators and flag states to observe and enforce the treaty’s discharge standards, the treaty has had a direct impact on vessel pollution through its technical standards for ships. Second, generally speaking, the treaty is as strong as it could have been, given the practical need to have marine states ratify the Convention. This analysis holds true even with the latest amendments to MARPOL 73/78, which deal with double-hulls. With these new amendments, there was, on the one hand, an obvious focus upon structural solutions which would be effective; on the other hand, drafters took care to ensure that the amendments were not so onerous as to face rejection by MARPOL 73/78’s signatories.

There were many groups involved directly and indirectly in the drafting of MARPOL 73/78. There were the environmentalists and coastal states,

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\item \textsuperscript{111} MARPOL 73/78 Amended for New and Existing Tankers, supra note 10, at 9.
\item \textsuperscript{112} Id.
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who lobbied for a treaty which would impose tough standards on vessels and extend the jurisdictional authority of nonflag states. These interests were countered by those of ship owners, oil importers, and flag states, who wanted cost-effective regulations and who were unwilling to cede authority to nonflag states. The resulting treaty reconciled these conflicting interests.

Arguably, the final treaty conceded too much to the shippers and flag states. After all, it was a major concession to these interests that older existing vessels were exempted from the expensive SBT requirement and that the flag state regime was left basically untouched. However, the underlying goal of the treaty was to bring the world's shipping fleet under the sphere of an international convention. Had MARPOL 73/78 not made these concessions to shipping interests, there was a risk that it would not have been ratified by the major maritime states. As it was, it took ten years from the drafting of the original MARPOL 73 before enough nations signed the Convention to bring it into force. Today, ninety percent of the world's merchant fleet is subject to the Convention's imperfect regulations, which is better than having 100 percent of the world's fleet subject to no international environmental controls.

113. The two preconditions which had to be met before the treaty could come into force were: it must be signed by at least 15 states, and the combined merchant fleets of the signing parties constitute not less than 50% of the gross tonnage of the world's merchant fleet. MARPOL 78, supra note 8, art. V(1), at 548.

114. By 1976, for example, only three minor states had ratified MARPOL 73. States were reluctant to commit for several reasons. First, they were leery of the monitoring systems requirement, doubting that the necessary technology existed. Second, they viewed the obligation to build reception facilities as being too expensive. Third, they were unhappy with the inseparable linkage between Annex I (oil pollution) and Annex II (hazardous chemicals). M'GONIGLE & ZACHER, supra note 12, at 122. This hesitation shows that States were carefully measuring the costs and benefits of signing and that, in the eyes of marine States, the costs, as the treaty was drafted, were particularly high.