The Nakhodka Spill and Lessons for the Future

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1. Opening remarks

This is the third international symposium on oil spills to have been held by the Petroleum Association of Japan

In the two previous symposia, we discussed the clean-up operations engaged in by the Association, and we received valuable instruction from the vast experiences of public and private-sector authorities from the U.S., Europe, Oceania, the Middle East, and Asia. I am pleased to report that the Association has done all in its power to act on the deficiencies pointed out to us by these distinguished guests.

As there are some here today who are joining us for the first time, I would like to begin with a very brief explanation of the "Major Oil Spill Response Program me of the Petroleum Association of Japan.

The Programme began in 1991 with a subsidy from the Japan Ministry of International Trade and Industry made available in the wake of the Exxon Valdez spill.

There are three main thrusts to the program: preparedness and response, research and development, and international symposia.

The first, preparedness and response, involves stockpiling oil spill response equipment-for example, booms and oil skimmers-and lending them free of charge for use in clean-up operations should the disaster-response authorities lack sufficient equipment and request support. We currently have six stockpile bases and one sub-base in Japan, and five stockpile bases overseas.

The Association further assists borrowers by arranging for the transportation of materials and equipment and also for the dispatch of supervisors to overseetheir use.
In addition, we provide operational training for potential borrowers.

The second focus of the program, research and development, seeks to make the clean-up operations of disaster-response teams more effective. Among the areas we are currently studying are: 1) the development and provision of a diffusion-drift model of spilled oils, 2) gathering and testing of data on the changes overtime in spilled oils, 3) the self-cleanup mechanisms of the ocean for spilled oils, and 4) safer tanker navigation so as to prevent tanker accidents in the first place. The Association publishes its results from time to time so that they are available for the use of interested parties.

The third and final focus of the program is international symposia, which is what we are engaged in today. Our purpose in this is to learn from the experiences of people in Japan and other countries and to tell them about the programs of the Petroleum Association of Japan.

I would now like to review with you the incident in question. At 2:51 the morning of January 2, 1997, the Russian tanker Nakhodka, traveling from Shanghai to Petropavlovsk, broke into two and sank in the Sea of Japan about 106 kilometers north-northeast of Oki Island off the coast of Shimane Prefecture. The bow of the ship began to drift. At the time of the accident, the wind is estimated to have been about 20 meters per second, waves 6 meters,
and swells in excess of 4 meters.

The Nakhodka was carrying 19,000 kiloliters of heavy fuel oil, of which an estimated 6,240 kiloliters was spilled.

The first step taken by the Japan Maritime Safety Agency was to rescue the tanker crew. Following that, the Agency, together with the Maritime Self- Defense Force, began to recover spilled oil. Work had to be repeatedly suspended, however, because of inclement weather and maritime conditions, which threatened to cause secondary disasters.

Ultimately, severe weather impeded recovery of the spilled oil at sea, and on January 7 the oil, together with the bow of the tanker, washed ashore at the town of Mikuni in Fukui Prefecture. Heavy oil would eventually pollute a largeswath of coastline stretching from Shimane Prefecture to Niigata Prefecture, leaving in its wake significant economic and environmental damage. The spilled heavy oil congealed into a highly viscous mousse.

After the oil began to wash ashore on January 7, recovery work was undertaken by the P&I insurance agents, Ground Self-Defense Force, local government, local citizens, and volunteers.

In spite of these efforts, it was not until the end of April, some four months later, that the "Headquarters for Disaster Countermeasures established by the governments of the affected communities had fulfilled their mission and were able to disband.
This spill was the worst experienced by Japan since the Juliana spilled 7,000 kiloliters off the port of Niigata twenty-five years ago in 1971.

The challenge before all of us is to use the lessons from the Nakhodka incident to minimize the economic and environmental damage incurred should similar spills occur in the future.

The Petroleum Association of Japan needs to draw lessons on disaster-response from this incident and use them to improve its clean-up operations.

One of the things that the Nakhodka incident has forced us to reconfirm is the fact that the Sea of Japan is an international waterway used by the ships of many, many countries. Improving our ability and institutions for cleaning up oil spills in the Sea of Japan will involve strengthening cooperation among the countries that use its waterways. We are therefore pleased that the Ministry of Transport, spurred by this accident, is taking the initiative in this direction.

2. Response of the Association to the Nakhodka Incident

I would like to review with you the response of the Petroleum Association of Japan to the Nakhodka incident and report to you our analysis of the results.

(1)Response

On January 5, the third day after the spill and before the oil reached the shore, the P&I Club, the ship owner's insurance agent, contacted the Petroleum Association of Japan with its initial request for the loan of materials and equipment.

In response, the Association delivered skimmers and other equipment to a location specified by the P&I Club the following day, January 6. In the weeks and months that followed, the Association made a total of seven loans of material and equipment to the P&I Club and arranged for its delivery.

After the oil began washing ashore on January 7, the Association received requests for equipment loans from four prefectures (Kyoto, Ishikawa, Niigata, and Toyama), four electric power companies (Hokuriku Electric, Kansai Electric, Japan Atomic Power, and Tokyo Electric), the Fisheries Agency, and two national oil stockpiling companies.

While we had many borrowers to deal with, the Association endeavored to meet all of their requests and cooperate with the transport of the equipment to the sites where it was needed.

In the end, we had equipment and materials from all six of our domestic stockpiles on-site and in action at the clean-up.

Most of the transportation was accomplished by land using trucks. Equipment from our Hokkaido stockpile was transported by aircraft from the Air Self- Defense Force and by ferry; equipment from the Okinawa stockpile was transported by private aircraft and ferry.

At the peak, the Association provided 8.6 kilometers of solid booms, 4.7 kilometers of inflatable booms, 22 weir-type oil skimmers (GT-185s and DESMI-250s), 4 Komara 12K compact oil skimmers, 12 beach cleaners, and 104 Fastanks.

The peak extended for nearly two months from early February through the end of March, at which time most of the clean-up had been finished.

Most of the equipment and materials lent out was not cleaned, repaired, and returned to its stockpiles until after the end of May.

(2)Examples of equipment utilization

The skimmers loaned by the Petroleum Association of Japan went into action on January 8, the day after the bow of the tanker washed ashore. The first day for which recovery amounts are known (January 8), the skimmers recovered about 70% of all the oil that would be recovered, 21 kiloliters, which is equivalent to about 105 drum cans. Later they were also instrumental in the clean-up activities of the Self-Defense Forces in rough-terrain areas like Anto and Oshima.

The solid booms were ultimately washed away by storms but were wrapped around the bow of the tanker preventing any further spillage of oil from that section of the ship.

Solid booms and inflatable booms loaned by the Association were also strung along the water intakes of nuclear power reactors.

Fastanks loaned by the Association were used as temporary storage at many sites, particularly by volunteers.

The beach cleaners were used to recover oil that washed ashore.

(3)Areas where improvements are required

A. Emergency transport

The first issue I would like to discuss is that of transporting materials from stockpiles to the spill in times of emergency. Basically, this was done extremely accurately and quickly in the Nakhodka spill.

Under the government subsidiary, the Association is only obligated to deliver equipment to borrowers at the stockpile base, but we have gone farther than that to establish a response system that, at the request of borrowers and with the cooperation of storage and maintenance contractors, is able to deliver equipment quickly to locations designated by the borrower. This system was set up with studies and verification tests conducted on a stockpile-by-stockpile basis. The fact that we were able to speedily deliver equipment was because the system worked extremely smoothly, and for that we must thank all of the cooperating companies involved.

However, that is no reason to be complacent. We need to check how the system operated in detail and work with cooperating companies to make any improvements that are needed.

B. Equipment availability

I would like to first give you some ratios between the equipment held in Association stockpiles and the amounts loaned out at the peak. For solid booms, we loaned 8.6 of our 20 kilometers, or 43%; for inflatable booms, we loaned 4.7 of 6 kilometers, or 78% of what the Association owned.

Likewise, we loaned 22 out of a total of3O skimmers (GT-185s and DESMJ-250s), or 73%. We also loaned 50% of our beach cleaners. When the spill occurred, we had 88 fastanks. We loaned out all 88, for a lending rate of 100%, and we also imported 48 more on an emergency basis.

As you can see, in responding to this disaster, we almost emptied our stockpiles. Had there been another large spill occur at the same time, we probably would have been unable to respond to requests for equipment loans. That raises the questions of how to increase our stockpiles in the future and what kinds of equipment need to be increased. We must also consider whether we need to build more stockpiles along the Sea of Japan.

However, we should also point out that about half of the equipment we lent out and delivered to the spill site was not actually used in clean-up operations. This equipment was held in standby along the long coastline involved.

The oil spill moved along an extensive area of coast, washing ashore at points along the way. There was also a large volume of heavy oil remaining in the sunken tanker and it was impossible to predict just what would happen with it. Local governments and others in the affected area made the obvious and correct choice of having clean-up equipment on hand just in case.

Regardless, there are many factors for uncertainty in how an incident such as this will play out, and the Association believes that it is important to be able to respond speedily to requests for loans of standby equipment.

C. Supervisors and operators

Under the terms of the subsidy, the Association is obligated only to stockpile and loan oil spill clean-up equipment. However, we also recognize the need to provide as much support as possible for borrowers, so with the cooperation of those involved in the stockpiles, we also sent personnel to supervise the operation of the equipment when requested by borrowers.

During the three or so months from January 6 to the end of March, our supervisors put in about 300 man-days. These supervisors taught workers sent in by the borrowers and Self-Defense troops called up for disaster-relief by the prefectural governors how to operate the equipment. In addition, Association employees also put in about 100 man-days on site helping to ensure that equipment was used properly and assisting supervisors in accomplishing their duties.

This process revealed several problems that need to be addressed.

The first is the lack, in absolute terms, of adequate numbers of supervisors. In responding to this spill, we loaned out large amounts of equipment to a large number of borrowers. This resulted in supervision requests from many different locations and for prolonged periods of time.

The supervisors sent by the Association have their own jobs at their own companies. It was impossible to ask them suddenly to drop everything for a period of two or three weeks, both for personal reasons and from the perspective of their employers. In the future we will need to have a system in place that enables us to smoothly relieve our supervisors with a group of substitutes. Doing this will require the training of as many supervisors in as many areas as possible.

We would also note the fundamental problem of there being few people on staff at the borrowers who are able to effectively operate the equipment involved. Up until this point, the Association has provided hands-on training mainly for people in the oil industry. Our experiences with this spill indicate the need to enhance our training programs and expand the range of their coverage so that we are able to aid a wider spectrum of people.

I would like to draw your attention in this regard to the training session we held at our Okinawa stockpile in May, after the Nakhodka incident. This session was attended by people form the Maritime Safety Agency and the electric power companies other than staffs 6 PAJ member companies, and proved very successful.

Ultimately, the people who are sent in to deal with emergencies must be rotated as required by the different companies involved. The Petroleum Association of Japan looks forward to making a substantial expansion in its training programs so that, with the cooperation of all interested parties, we are able to train as many supervisors and operators as possible.

D. Applied operations

Conditions will vary widely from disaster site to disaster site and there is no single piece of clean-up equipment that is suited to all of them. In some cases, conditions at the site may prevent clean-up equipment from exerting 100% of its capacity. That means that we must have a thorough understanding of the different ways in which equipment can be used and be able to take as much advantage of the equipment as conditions permit. During this clean up, the flotation mechanisms were removed from the oil skimmers and they were used as transport pumps for high viscosity oil. We will need to provide better training in such applied operations in the future.

E. Open sea systems

Up to this point, our system structures and training have mainly envisioned clean-up operations in closed-in waterways. The Nakhodka incident has taught us the importance of clean-up operations on the open seas.

This will require that the Maritime Safety Agency be prepared to spray oil dispersant on the open sea from the air during the early stages of a spill. It will also require that the Association develop systems for open-sea oil recovery that utilize the equipment currently owned as effectively as possible, and that it engage in ship-based oil recovery training for open-sea operations.

For instance, the Association should develop a system for emergency loading of skimmers, booms, and other equipment on 1,000-ton class ocean-going vessels for open-sea recovery and induction or lead boom installation. This is something we would like to work on in cooperation with other interested institutions.

F. Wider variety of joint training sessions

Next I would like to point out the need for a wider variety of joint training. In cleaning-up this spill, the disaster-relief troops of the Self-Defense Forces made great use of the Association is skimmers. The disaster-relief troops receive special training and are used to operating machinery, so they were able to master the skimmers almost immediately when our supervisors demonstrated how they worked. The troops were also able to improvise ways to use the equipment in an efficient and organized fashion as called for by the natural and other conditions to which they were subject.

This indicates to us that there is much both sides could learn from joint training sessions in which both the disaster-relief troops and the Association get hands-on experience with the equipment. While there are institutional issues that will have to be resolved before this can take place, we do wish to discuss with the Self-Defense Forces how it might be accomplished.

H. Drift forecasting software

The Association has developed forecasting software that runs on personal computers and is able to predict how spilled oil will disperse and drift during the initial stages of a spill. These predictions can then be used in drafting effective clean-up plans. The software, which is already in the hands of interested parties, covers the twelve maritime zones with heavy tanker traffic to Japanese refineries.

However, few Japan-bound tankers travel in the area around Shimane Prefecture, where the Nakhodka incident occurred, or Fukui Prefecture, where most of the oil ended up. We did not, therefore, create forecasting software for these areas since we assumed there would be little likelihood of a super tanker having a large spill there.

Ironically, these were the areas where the Nakhodka spill occurred. Having learned its lesson, the Association is now at work creating drift forecasting software for areas not covered by the twelve heavy-traffic zones by the end of fiscal 1997. This task has been given urgent priority, and when completed will enable us to forecast drifts for virtually all of Japan is territorial waters.

I. Public relations

During the spill, NHK television reported in a nationwide morning broadcast about the Association is equipment stockpiles and lending operations. Many local governments and electric power companies first learned about the Association is work from this broadcast and only then did they contact us about loans. This indicates to us that we have not done enough to publicize our operations to local government bodies. While we have tried to inform all interested parties about our equipment lending system, we need to make sure that they are known to the broad spectrum of potential disaster victims.

We would also like to work with these parties in joint response simulations, desk top exercise, and equipment operations training.

These are the main areas of improvement for the Petroleum Association of Japan that we have uncovered as a result of the Nakhodka incident. We will be doing all in our power to overcome these defects and any others that you may wish to advise us of over the course of this symposium.

3. Other oil spill-related activities

I would like to also take this opportunity to report to you about the Association's involvement in the clean-up of other oil spills besides the Nakhodka.

(1)Loans of equipment

It has been five and a half years since the Petroleum Association of Japan established its first stockpile of oil spill response equipment. During that time we have lent out equipment for five spills; 1) the spill from the "Sea Prince" tanker in South Korea; 2) the fuel spill caused when a Chinese cargo ship ran aground near the island of Okushiri off Hokkaido; 3) the spill from the Russian tanker "Nakhodka; 4) the collision and sinking of the South Korean tanker "Osung" in the waters off Tsushima and 5) crude oil spill from "Diamond Grace" in Tokyo Bay this month. We also lent lighting equipment for relief efforts for the Great Hanshin-Awaji Earthquake.

(2)Stockpile increases

In March 1997 the Association placed four new kinds of oil spill response equipment in its domestic stockpiles; 1) beach booms, which are used to gather oil that washes up on beaches so that it does not disperse; 2) crane sweep systems, which are used to transfer large volumes of recovered oil from temporary storage to other facilities; 3) oil/water separators, which are used for easy, on-site separation of recovered oil and water; and 4) inflatable barges, which are used for temporary storage and transportation of large volumes of oil recovered at sea.

(3)Research into the self-clean-up mechanisms of the ocean

At the International Oil Spill Conference that was held from April 7 to 10 of this year in Fort Lauderdale, Florida in the United States, the Petroleum Association of Japan read a paper called "Results of a Long-term Tracking Study of a Coastline Subject to an Oil Spill," which contained many of the findings from its research into the self-clean-up mechanisms of the oceans.

The study in question tracked for one year spilled oil concentrations (aromatic and aliphatic hydrocarbons) in the soil and the organisms that live in it along the coastal bottom (the tidal bottom) polluted by the October 17, 1994 spill of crude oil in Wakaura Bay. This spill polluted the coastline with 570 kiloliters of oil.

The main conclusions reached by the study were:

1.All traces of the crude oil from the Wakaura spill had been completely cleaned by the end of the year. There was a rapid decline in spilled oil concentration in the soil and organisms of the area during the first three to six months after the pollution, and by one year the concentration had declined to the same levels as observed at other unpolluted coastlines.

2.In this cleaning, biodegradation by microscopic marine organisms played a major role. In other words, the pattern of concentration decline was similar to the pattern observed in crude oil biodegradation experiments with sea water collected from the area of the spill.

(4)Creation of a database on changes over time

Some crude oil will turn into a mousse and become highly viscous depending on the seawater and waves involved. The degree to which this happens differs markedly depending on the type of crude oil involved. There is, however, no comprehensive, quantitative data on this. The Association has therefore embarked on a project to create a database on viscosity changes over time in spilled oil. Our target is to have the database cover the fifty major types of oil imported by Japan. We have been conducting experiments in circulating water channels since 1990 to collect the data necessary.

We currently have data on twenty types of crude oil and one type of heavy oil. We will be computerizing this data and making it broadly available as a common asset to be used by those involved in oil-spill disasters the world over.

(5)Upgrades of the drift forecasting software

In April of this year, the Association released a new version of its drift forecasting software for oil spills in twelve heavy-traffic maritime zones (version 3.0). The new version is easier to use and has substantial improvements in forecasting precision.

The biggest improvement is that it is now able to directly download and use data on forecast wind direction and speed from the Japan Weather Association. This data is vital to predicting drifts and it can now be retrieved on-line in real time.

In previous versions, wind direction and speed data had to be obtained by telephoning to the Weather Association, asking for their forecasts and then inputting it by hand. This was both time-consuming and troublesome, but the only other choice was to sacrifice forecasting accuracy and use past averages that had been built into the software itself.

The updated version has already been distributed to and put in use by the members of the Association and others. All of our members are therefore able, if needs be, to retrieve wind direction and speed forecasts on-line from the Weather Association and use it to create quick and accurate predictions of spill drift in the twelve zones.

The Japan Weather Association provides wind direction and speed forecasts for the software on a 2-kilometer grid within the twelve zones. Data is available in three-hour increments for up to forty-eight hours in advance. It is updated twice a day (at 9:00 AM and 9:00 PM).

This September we will see another boost to forecasting precision as the system moves to a 1-kilometer grid and wind forecasts for each hour up to 51 hours in advance.

The new software we are creating for previously uncovered areas will be able to retrieve weather data on-line in real time from the very beginning.

At the end of this lecture I would like to demonstrate the software for you by simulating a large spill. If you would like a copy of the software we are willing to provide it upon request, although certain conditions will be attached.

4.The themes of this symposium

Now that the work of cleaning up the oil spilled by the Nakhodka is over, we want to take the opportunity to review our response to the accident and analyze problem areas. We also wish to hear lectures on advanced technologies from around the world and on ways of building cooperative systems between those involved in oil spill clean-up. This information will be of value both to the Petroleum Association of Japan and to all others in attendance here today as we endeavor to improve and enhance our response systems.

We would therefore like to divide this symposium into two large themes having to do with response to oil spill disasters.

During the first part, we will hear from those involved in recovery operations for the Nakhodka spill on their response and areas they see for improvement. Our speakers during this session will represent: 1) the International Tanker Owners Pollution Federation, which sent technical advisors to the ship owner 2 s insurance agent to advise them on spill response; 2) the Maritime Safety Agency, which was responsible for rescuing the crew of the Nakhodka and overseeing the clean-up of oil spilled by the ship; 3) the Ground Self-Defense Force, which was responsible for recovering stranded oil at the request of the afflicted prefectures; 4) East Asia Response Limited, a Singapore-based firm that was involved in the clean-up at the request of the ship owner; and 5) Fukui and Ishikawa Prefectures, the two prefectures that received the heaviest damage.

We will also hear from Professor Hiroshi Tokuda, one of Japan is foremost authorities on marine environmental issues, who will speak on protection of the marine environment with emphasis on the application of oil dispersants during spill clean-ups in such a way as to minimize harm to coastal ecosystems.

The second section will feature authorities from overseas who have experience in controlling spills in their waters under the same sorts of severe weather conditions as experienced in Japan. We have asked them to relate to us their experiences in developing cooperative relationships between: 1) the government and private sectors; 2) the central and local governments; and 3) regions and countries that are situated along common bodies of water.

Our speakers come to us from: 1) the Norwegian Ministry of the Environment and Oil Spill Control Association, which is involved in the North Sea area; 2) the British Oil Spill Response Limited(OSRL); 3) the Australian Marine Oil Spill Centre, which will discuss that country is experiences dealing with spills; and 4) the Marine Spill Response Corporation and the Ship Escort Response Vessel System of the United States, who will speak on the US response system and on tanker transportation systems in Alaska since the Exxon Valdez spill.

Also, we would like to make a report on the Petroleum Association of Japan is findings from research into safe tanker navigation.

5.Closing remarks

There are probably insufficiencies and deficiencies in our analysis of the response to the Nakhodka spill, and we look forward to your comments and observations on them during this symposium. The Association wants to put your ideas to work.

We hope that all in attendance will be able to use the information they gain during this symposium to prepare for future spills.