20 Years on from *Nakhodka* Incident
Looking backwards and Looking forwards

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My presentation today will comprise three parts. The first part, "Incident Overview," will revisit the *Nakhodka* incident from my perspective as someone who was engaged in the spill response. The second part, "Challenges and Improvements," will examine the challenges identified by the Japan Coast Guard, or JCG, through the incident, and what measures have been taken to remedy these. The third part is entitled "New Challenges." Twenty years on from the *Nakhodka* incident, fortunately Japan has not experienced any major oil spills requiring a national response, but now the personnel who were involved in the *Nakhodka* response are getting older and retiring. Given this situation, what should we consider in the future?

Part I: Incident Overview—What I Saw during Response Operations

Let's start by reviewing the incident—20 years and one month back in time.

At 2:51 a.m. of January 2, 1997, the JCG received a distress call from the *Nakhodka* (GT:13,157), a Russian tanker with a crew of 32 Russians that was sailing around 60 nautical miles north-northeast of the Oki Islands in Shimane Prefecture.

Back in Shanghai, China, the *Nakhodka* had loaded 19,000 kiloliters of heavy fuel oil to be used for power generation, and the vessel was travelling at 7.3 knots on a compass course of 50 degrees en route to Petropavlovsk in Kamchatka, Russia, when she met with stormy weather—23 meters per second of westerly wind and six-meters in wave height.

A huge following sea was causing the vessel to lose steering, so at, the compass course was reversed to 265 degrees with the captain's direction. Immediately after this, at around 2:41 a.m., the hull received a strong shock, and when it was confirmed that the cargo of heavy fuel oil was leaking from a position close to No.2 tank, around 50 meters from the bow on the about 180-meter-long hull, a distress call was issued.

After a while, the *Nakhodka* was broken into two.

At 4:34 a.m., the divided stern section listed heavily to the left and seemed likely to sink. All 31 crew members except the captain transferred into two separate lifeboats.

Upon receiving the distress call, the JCG immediately sent out patrol vessels and aircraft to rescue, and also asked the Air Self-Defense Force for an aircraft dispatch.

The rescue operation for the 31 crew members who had fled the ship was completed just after 1 p.m.

The stern section sank at around 8:20 a.m. approximately 80 nautical miles northeast of the Oki Islands in Shimane Prefecture.

The bow section capsized and began to drift. Driven by seasonal wind and current, it grounded on the rocks around 200 meters off the coast of Mikuni Town in Fukui Prefecture at 2:30 p.m. on January 7.

Back then, I had been assigned to the first generation of the JCG's National Strike Team, and was in fact its youngest member. I received the first report on the *Nakhodka* incident by phone at around 3 p.m. on January 2 in the middle of making a New Year's temple visit with my wife and 10-month-old child.

Early in the next morning—January 3—I headed by plane from Haneda Airport in Tokyo to the incident site, where I remained for two months.

Before I go into my experience, I would like to explain a little about the JCG National Strike Team.

The team was established in April 1995 ahead of Japan's signing of the OPRC Convention. Modelled on the US Coast Guard's National Strike Team, it comprised two units of eight members set up in the Maritime Disaster Response Office, Rescue Division, Guard and Rescue Department, Third Regional Headquarters of the Japan Coast Guard in Yokohama City as a group of experts who could direct, advise and coordinate measures in the event of maritime disasters involving oil, hazardous and noxious substances discharged at sea.

Again, 20 years ago, I was the youngest member of the team. I was only 31 then, but as you can see, I'm a bit older now, and even as the white hairs and wrinkles increase, my memory and my physical strength have faded. It's really no fun getting old.

The *Nakhodka* incident, however, still remains as vivid in my mind as though it happened only yesterday, so let's get back to that.

As I said before, the 31 crew members except the captain transferred into two separate lifeboats. All 31 were rescued in the afternoon of January 2 by the patrol vessels and helicopters sent out for the rescue operation.

That makes the operation sound easy, but seasonal winds howled across the Sea of Japan in winter, and huge six-meter high waves, driving snow and very low temperatures made the rescue operation really difficult. This photo shows the patrol vessel *Wakasa* rescuing crew members from a lifeboat.

Sadly, the body of the captain, who had remained on board, was washed up on Fukui's Echizen coast a few weeks later, but at least we managed to save all 31 of his crew.

There was the oil which originally leaked out when the incident occurred, while the divided bow section of the *Nakhodka* also continued to discharge the remaining oil from the tanks as it drifted.

This is a photo of the bow section of the *Nakhodka* which I saw from a helicopter in the morning of January 3.

You can see huge oil mass surrounding it.

That oil mass, with an area of around 160 square meters, approached the coast along with the bow section.

From above, we could see the spread of oil but not confirm the condition, so a patrol vessel was sent out to take a proper obsevation.

Heavy fuel oil seen on the surface was absorbing water and expanding. And not only the oil had increased in volume but it had hardened like clay.

How hard and how thick was the oil? We tried to stick it with a bamboo pole to measure thickness, but it was so hard that we struggled to get the pole right through. When we finally succeeded, we then found ourselves struggling to pull it back out.

When we finally pulled it out, we found oil adhering to the pole up to roughly 70 or 80 centimeters from the tip by my visual estimation, I remember. We experimentally put a red flag on the pole and stuck it back into the oil, and over the following days that pole remained upright in the oil as it drifted all the way to the Fukui coast.

If oil like this were to wash ashore, the damage would be serious.
From the beginning of the incident, we turned our major concern to the bow section as well as saving lives.

Tracking the drifting of the bow section and the oil patch, we mobilized the latest knowledge to perform detailed drift prediction calculations to ascertain when and how far those would drift given ocean current and wind conditions, and whether those would wash up on the coastline.

Desperate to prevent the bow section reaching the coast, rather than leaving the operation to the tugboat supplied by the shipowner, as you can see, two JCG patrol vessels also attached towropes, working to keep the bow section offshore while also trying to recover the spilled oil from the rough seas.

While these patrol vessels' efforts somewhat delayed the wash-up, they had no major effect, and the bow section of the *Nakhodka* ran aground on the rocks 200 meters off the coast of Mikuni Town in Fukui Prefecture on January 7 at 2:30 p.m.

Our task was then to recover the oil patch floating on the ocean surface behind the bow section and prevent it from washing ashore. We also wanted to recover any oil that did wash ashore as soon as possible to minimize the environmental damage.

A massive number of booms were also deployed to prevent the oil washing up on fishing facilities and the beautiful coastline, as well as to protect the water intakes of the many nuclear power plants along the Fukui coast.

Such a major incident brought many oil spill response experts from around the world to the site. They questioned us sometimes with ridicule: "Why do you conduct oil recovery operation on stormy seas even when it puts people in danger?"; "Why don't you just apply a large quantity of dispersant?"; "Wouldn't it be more efficient to use skimmers rather than the primitive approach of scooping up oil manually?"; and "Wouldn't it be better and safer to recover oil after washed up on the coast rather than doing it offshore?"

I suppose these due to cultural difference, but I'd like to explain each of these aspects in the context of the whole operation.

The first question is, "Why do you conduct oil recovery operation on stormy seas even when it puts people in danger?"

We Japanese love eating seafood.

We go to a lot of effort to gather and process fish, shellfish, seaweed, and nori for eating, and we enjoy not only the taste of these but also their flavor and smell.

The Mikuni Town coastline in Fukui Prefecture where the bow section of the *Nakhodka* ran aground is a nori-producing area, and winter is harvest period.

The aroma of nori is an important part of its appeal, and even if oil never actually touched the nori but was just drifting in the vicinity, rumors of a poorer flavor or an oil smell would cause the nori to lose value, even if these rumors were not actually true.

Along with nori, some shellfish also attach themselves to rocks or burrow into the sand. If the environment deteriorates, fish can swim away but shellfish cannot escape easily.

The reason why people have been able to continue to enjoy eating nori and shellfish is the careful approach which local fishermen have taken to harvesting these resources, making sure that they do not deplete or disturb the ecosystems of marine life which has been developed over such a long period of time.

So the reason why we tried to recover spilled oil at sea was to protect the livelihoods of local fishermen and maintain local ecosystems.

The second question is, "Why don't you just apply a large quantity of dispersant?"

The dispersant available on the Japanese market at the time, so-called traditional type, did not actually work on highly viscous heavy fuel oil.

If I may go back a few more years, in January 1990, seven years before the *Nakhodka* incident, in neighboring Kyoto Prefecture the lumber carrier *Maritime Gardenia* ran aground off Cape Kyoga, spilling a huge amount of Bunker heavy fuel oil; and at that time, we conducted a two-month cleanup operation on the Sea of Japan right in the middle of winter.

> Note: *Maritime Gardenia* incident
> In January 1990, Liberian lumber carrier *Maritime Gardenia* (GT:2,027) ran aground off Cape Kyoga in Kyoto Prefecture en route to Yamaguchi Prefecture and became unnavigable, spilling 916 kiloliters of Bunker heavy fuel oil. The oil contaminated not only the coast of Kyoto Prefecture but also spread as far as Fukui Prefecture where the *Nakhodka*'s bow section went aground in 1997.

This incident taught the local residents that heavy fuel oil absorbed water to double in volume and became increasingly viscous to be rather like solid or clay, the so-called mousse, than liquid, and that it was extremely difficult to recover.

Dispersant manufacturers subsequently put a lot of research for developing a product that would work on highly viscous oil, and the *Nakhodka* incident actually occurred just when a commercial product had finally been manufactured for highly viscous oil response—perfect timing, really!

So this brand-new dispersant developed specifically to deal with highly viscous oil was delivered at the incident site—only to be met with fierce opposition from the local residents, who pointed out how, seven years before, application of a large quantity of dispersant had turned waters cloudy while oil still remained obstinately at the shoreline, and they could no longer harvest nori or shellfish.

Going back even further to the November 1971 incident involving the Liberian tanker *Juliana* when it was waiting outside the port of Niigata ready to enter, older fishermen remembered how spraying large amounts of highly toxic dispersant had caused massive damage to marine life—there were no clear standards for dispersants back then, and a highly toxic dispersant was used, whereas legal standards were subsequently introduced, and the dispersants today have extremely low toxicity. The subsequent generation too had personally witnessed the failed cleanup operation of the *Maritime Gardenia* oil spill, and was extremely suspicious of dispersant as a result.

> Note: *Juliana* incident

> In November 1971, Liberian tanker *Juliana* (GT:11,684) which was carrying 20,000 tons of crude oil, was waiting outside the port of Niigata to enter when strong winds caused its anchor to be dragged and the ship ran aground. The ship subsequently broke in two, spilling around 7,000 kiloliters of crude oil.

As a law enforcement agency, the JCG does not intervene in civil matters, but we have learned that, given the damage to the fishing industry in the future, compensation negotiations would become highly complicated if the various stakeholders could not reach an agreement on application of dispersant.

I had also spent two months on a patrol vessel responding to the *Maritime Gardenia* incident. Based on that experience, I explained at stakeholder meetings that a new type of dispersant had been developed that would be effective for highly viscous oil, unlike the dispersants previously used, and that it would be sprayed in appropriate volumes with experts watching the effect on the site. However, when fishermen and other local residents agreed to the use of the dispersant, huge oil mass had already reached the coast.

The third question is, "Wouldn't it be more efficient to use skimmers rather than the primitive approach of scooping up oil manually?

"Let's show you Japanese how to recover oil," the foreign experts said, and brought in weir skimmers. Given the skimmer specs, they should have been able to recover even viscous oil.

Here's a photo at that time.

While the pumping capacity of the skimmers was sufficient, the claylike oil patches could not flow over the weir into the skimmers.

While the technique we had learned from experience seven years before—manual recovery using scoops— , might be primitive, it was nevertheless most efficient.

As you see here, big oil patches too could be recovered in several hours by multiple fishing boats working together.

This indescribably backbreaking task not only required considerable physical strength but was also complicated by stormy seas, but the organizations involved went at it day after day.

Experience had also shown that to boost recovery efficiency, in parallel with manual recovery, crane vessel normally used for carrying sand, which is called in the industry "self-propelled grab dredgers", could use their buckets to efficiently scoop up solid oil like clay without picking up seawater at the same time.

Learning from the incident involving the tanker *Toyotaka Maru*, which collided with another vessel in Wakanoura Bay in Wakayama Prefecture in June 1994, we also arranged such crane vessels to response the *Nakhodka* incident.

Note: *Toyotaka Maru* incident
In June 1994, tanker Toyotaka Maru(GT:2,690) was anchored in Wakanoura Bay in Wakayama Prefecture with 5,137 kiloliters of Rabi Blend crude oil on board, when it was struck by a coastal tanker. Crude oil was discharged out of the hole opened on the *Toyotaka Maru*'s starboard side. The calm waters within the bay meant that booms could be promptly deployed to contain oil. Furthermore, highly viscous property of ethis oil made it possible to be scooped up with crane vessel buckets, collecting almost all of it.

I worked nearby in Osaka at the time of the *Toyotaka Maru* incident, but I remember that, because booms were deployed so quickly and recovery work was completed in just three days or so without oil spreading beyond booms, the Coast Guard Station in Shimotsu, Wakayama, didn't ask for help.

In the *Nakhodka* incident, however, winter conditions in the Sea of Japan rendered the crane vessels useless. These small vessels, only a few hundred tons, couldn't sail in the Sea of Japan, where storms could raise waves up to six meters high. When spring approached and sea became calm enough that we could finally bring the vessels in, there was nothing left for them to do.

The fourth question is, "Wouldn't it be better and safer to recover oil after washed up on the coast rather than doing it offshore?"

As I said earlier, we wanted to avoid damaging fishing industry at all costs. That's why we conducted manual recovery on the rough seas.

Naturally, we couldn't recover all of oil at sea, with remaining oil flowing on the shore in large patches. Oil coming out of the bow section was also continuing to contaminate the Mikuni Town coastline.

We had thousands of people at work every day, as volunteers flocking from all over the country. People were definitely the main force of the cleanup operation. It was called a "human wave" approach, which meant gathering oil manually and then relaying back the oil-filled buckets from hand to hand.

More specifically, oil was scraped off the rocks with spatulas and put in buckets. Each bucket would then be relayed back by a line of people and transferred to tanks placed on the coast.

The skimmers might not have been much good at sea because of the weir problem, but as you can see here, when we took away their float sections and used them on the coast short of hands, they were extremely useful in pumping oil up to the tanks in place of relaying.

The tanks were filled up almost immediately, at which point they should have been transferred to tank trucks and transported to a final disposal site—but things didn't go that smoothly.

We were forced to find a temporary oil storage site, so we built a big pool as a temporary storage facility in Fukui New Port, which we called “pit”.

Recovered oil was temporarily stored there and then transferred either by land or sea, using boat or tank truck, to industrial waste treatment plants and incinerator facilities for final disposal.

Going back to oil recovery, we also considered beyond manual to mechanical.

Vacuum trucks for collecting industrial waste were used to collect oil flowing into shallow coastal waters or forming thick layer along the quay. This was a very efficient method at the beginning, but as oil grew more viscous day by day, they couldn’t suck oil up properly any more, or even if they did, oil clogged in the hoses.

Just when we thought there was no way other than manual recovery, someone came up with a good idea of using concrete pumping trucks that deliver concrete to high place at the construction sites. Their pumps have enough capacity to deliver concrete very rapidly to high place. By rotating pump reversely, could it perhaps suck up highly viscous oil? Experiments proved this to be a highly efficient oil recovery technique.

Together with oil recovery operation, we also deployed booms to protect vulnerable area. Given rough and violent waves in the Sea of Japan, deployment of booms in this areas facing open sea would only have been ineffective, and booms would be torn apart in the space of a few hours.

Because of that, we deployed booms primarily to protect some facilities in the bay—away from open sea—and to induce oil away from the area requiring protection and toward the coast where oil would be easily recovered.

As I noted earlier, many nuclear power plants were located along the coast of the Sea of Japan in Fukui Prefecture. Power supply shouldn’t be decreased. We deployed booms in multiple rows to prevent oil from entering the water intakes of the nuclear power plants.

Moreover, we also deployed booms to protect the water intakes of the Echizen Matsushima Aquarium in Mikuni Town where the *Nakhodka*’s bow section had been drifted ashore. Some dolphins were raised in this aquarium, but it was said that they needed to be regularly supplied with a large amount of fresh seawater not to be weakened. I remember I watched the dolphins getting weaker every day and desperately hoped that booms we deployed would keep oil away at least from the water intakes.

In addition, nearby on the southern side of the bow section, there was the scenic wonder of Tojinbo, a rugged, precipitous cliff carved out by the raging waves of the Sea of Japan, and there was Oshima Island, that it was respected as “the island of the god” and that Ominato Shrine was raised. The whole area was designated as the Echizen-Kaga Kaigan Quasi-National Park.

To protect that coastline, we deployed booms under the bridge leading to Oshima Island, preventing oil leaking from the bow section from coming around to the southern side of the coast.

There are legal regulations for booms in Japan, with the most common boom being 20 meters long for a unit. Cylindrical floats made of foamed polystyrene are attached for buoyancy, and booms stands 30 centimeters above the sea surface and 40 centimeters below, with chain attached at the bottom as an anchor.

In case of boom application, some units are connected to required length, but at that size, wind and waves would easily take oil over them. To prevent that from happening, oil adsorbent material like bunting was stretched along the inside of the booms to catch oil, but fierce winds and waves meant this was still not an effective oil-stopper. So, as a second-best measure, we applied booms to change the direction in which oil was flowing.

Because of the conspicuous yellow color of booms, it was immediately apparent to the observer that booms were deployed, which was at least reassuring. So while booms might not have been effective in stopping oil, they did serve to make people feel better and stemmed criticism from the public and the media.

Incidentally, oil adsorbent material stuck inside the booms was apparently used for the first time in the world by Japanese manufacturers' pioneering efforts to adsorb oil using polypropylene at the time of the *Juliana* spill I mentioned earlier.

One manufacturer surprisingly brought a response tool. It was composed of 15-meter rope to which 30 objects shaped like pompon were attached. JCG called it, "Highly Viscous Oil Catcher", with each plastic strip catching and holding highly viscous oil.

We jumped at this proposal immediately after we saw the manufacturer's demonstration and it has been stockpiled across the country.

While we initially used oil adsorbent material stuck to the inside of booms, we used thereafter this "highly viscous oil snare" to prevent oil from spreading any further.

Of course, as a fundamental measure, we also planned to remove oil from stranded *Nakhodka's* bow section, but winter conditions in the Sea of Japan and the surf-lashed rocks made it almost impossible to moor a workboat there.

Even when the boat was finally moored, there was only a very brief work window of one to two days at the most before the sea became stormy again. And by the time that the mooring and the pump installation were completed, that left only a few hours for oil removal.

Work proceeded at a snail's pace.

It was then that the salvager contracted for oil removal operation came up with an innovative method that would not be affected by weather or rough seas—to construct a causeway out to around 200 meters offshore where the *Nakhodka's* bow section sat.

We called it the “dream bridge,” but in the space of a month or so, the causeway was really built out to the bow section. Using this causeway, we were able to take in the pumps and remove all the remaining oil from the bow section.

Removing oil from a grounded tanker from the land was actually applied when the tanker *Juliana* ran aground. In this case a pipeline was laid from the coast along the seafloor to the vessel and remaining oil was taken out via pipe, so the above-mentioned response was effectively a variation of this approach.

We managed to remove all the remaining oil in the bow section by February 25, but at this season, ironically enough, the seas had calmed too.

Then, on April 20, we set about removing the bow section itself. A large floating crane lifted it in chains and placed it on a barge. Our battle with the bow section was finally over.

Incidentally, after it was removed, the bow section was taken to the city of Kure in Hiroshima Prefecture for investigation for the causes of the accident and subsequently dismantled.

The stern section, meanwhile, had come to rest 2,500 meters down on the seafloor around 80 nautical miles northeast of the Oki Islands in Shimane Prefecture.

This is the stern section of the *Nakhodka* as confirmed by the Japan Agency for Marine-Earth Science and Technology’s deep-sea exploration vehicle “Dolphin 3K”.

You can see the ship name “Nakhodka” and where the ship’s cargo of heavy fuel oil is seeping out of the cracks in the hull.

To get rid of the thick oil that continued to seep from the sunken hull for some time, we took various measures such as spraying dispersant by patrol vessels.

When the hull broke up, oil from the ruptured tank formed large patches and drifted toward the coast, but in the case of the sunken stern section, oil was just pushed out from the cracks and from the air vent pipes by water pressure. And there was no major discharge and oil didn’t float up as patch.

However, at the time, various theories were circulating, for example, “Would the sunken hull be destroyed by water pressure?” or “Even if it wasn’t destroyed straightaway, would it be broken down over time as a result of corrosion?”, so we also prepared for these scenarios, as I will explain later.

Because the stern section was thought to have sunk with around 10,000 kiloliters of heavy fuel oil on board, we continued to send out patrol vessels and aircraft on regular patrols for the next 10 years or so to monitor the situation just for a emergent major spill.

However, with no sign of such major spill or even sufficient oil to require cleanup, these days we occasionally send an aircraft out in the area on patrolling.

Part II: Issues to deal with and Improvements—What Were the Problems and How Were They Addressed?

I've dealt so far with our response to the *Nakhodka* incident. As the worst oil spill Japan had ever experienced, many issues were unveiled.

Next I would like to examine from the standpoint of the JCG those amendments which the government made to the legal system and plans, and then improvements to organizational arrangements and equipment instituted by the JCG.

What were the issues, and how were they improved?

In terms of the legal system, there was insufficient coordination with the relevant ministries and agencies. As a national issue, this required amending legislation and plans derived from it.

Next, there were JCG issues, starting with a weak oil spill response structure which we needed to bolster. The lack of equipment capable of dealing with highly viscous oil or applicable even in rough weather was also noted, along with the insufficient allocation of equipment to the Sea of Japan side of the country compared to the Pacific side with its heavy ship traffic and with industrial complexes. Immediate action was therefore required to get equipment capable of dealing with highly viscous oil in place and bolster our equipment allocation on the Sea of Japan side.

Let's go through these in order.

- **Insufficient coordination with the relevant ministries and agencies—Review of laws and plans**

On the legal system, the Act on Prevention of Marine Pollution and Maritime Disaster, or the Marine Pollution Prevention Act, was amended.

This Act regulates the discharge of oil, noxious liquid substances and waste from ships, aircraft, and marine facilities, obligating captains and shipowners to take the necessary measures to prevent maritime pollution irrespective of whether or not there was negligence involved. The polluter is required not only to shoulder the cost of preventing pollution and restoring the status quo—in other words, compensation for damage as well as execution of cleanup measures.

Under public law, captains and shipowners have an obligation to take the necessary measures to prevent maritime pollution. Accordingly, the Marine Pollution Prevention Act was enacted in December 1970 in response to the strong public demand that, in addition to civil law obligations and responsibilities—that is, compensation for damage—shipowners should also engage in cleanup measures in order to protect the public interest.

Apparently people from another countries found it difficult to understand why Japan could pass the law that goes as far as requiring shipowners to take cleanup measures, but back then, when pollution was a major social problem, our public opinion demanded that much.

Obviously, an incident on the scale of the *Nakhodka* incident was beyond the capacity of the shipowner and other stakeholders to deal with, so it needed a joint operation amongst such parties as the government, local public bodies, ports, the fishing industry, local residents, and volunteers who came from all over the country to help.

Major oil spills like the *Nakhodka* incident require cooperation between all relevant institutions with certain capacity, but there was no law enabling such cooperation.

The Marine Pollution Prevention Act was therefore amended so that in case when the JCG commandant, who is in the best position to accurately assess the situation of cleanup measures taken by shipowners and other stakeholders, deems that cleanup measures are urgently required, the commandant can ask the heads of the relevant government institutions to take the necessary cleanup measures, opening the way for those institutions to work together to deal with a spill.

In other words, while shipowners and other stakeholders are legally obliged to take cleanup measures, the amendments have enabled the JCG and other related institutions to join forces for the purpose of alleviating damage.

Pursuant to the Marine Pollution Prevention Act, the JCG has also—from even before the *Nakhodka* incident—been able to demand shipowners to reimburse the costs incurred.

This provision was instituted on the grounds that if the JCG were to shoulder the cleanup costs, not only would it give rise to unfairness between those who conducted cleanup measures by themselves and those who didn't, but it would also hamper action on the part of those who should take cleanup measures—because they would reason that if they didn't take cleanup measures, the JCG would do so instead, and that if the JCG was going to use taxpayers' money to cover the cleanup, it would be better for them to do nothing by themselves—which would be extremely inappropriate.

At the same time, there was no clear provision enabling other parties taking cleanup measures to make claim legally for the costs incurred, unless they were working under the contract with the shipowner and other stakeholders. This meant that related government institutions could not make a legally enforceable claim for the cost of any cleanup measures they took.

Therefore, because it was appropriate that the shipowner and other stakeholders should be required to pay the costs for cleanup measures conducted at the request of the JCG commandant in the same way that they were required to pay the JCG, provisions were added stipulating that the costs for the cleanup measures taken at the JCG commandant's request must be borne by the shipowner and other stakeholders and that the heads of related government institutions may directly demand the shipowner to pay the costs.

As a result, when related government institutions or local public bodies took cleanup measures in response to a request from the JCG, they too have now a legally enforceable right to receive the costs just like the JCG, making the responsibility of shipowners much clearer.

In addition, measures for dealing with oil spills in open seas have been added to Japan's oil spill response plan. Pursuant to the Marine Pollution Prevention Act, this plan divides Japan into 16 sea areas and lays out matters needed to swiftly and accurately implement cleanup measures and prevent danger associated with these in cases where extremely large volumes of oil and other substances are spilled in these areas. The additional measures are set out for cases in which incidents occur in coastal areas facing open seas and sea areas around Japan that lie outside territorial waters but inside Japan's exclusive economic zone.

To move away slightly from today's theme, a review was conducted recently—at the end of 2016—regarding to the oil spill suppositions which are the basis of the oil spill response plan as well as to the equipment performance evaluations, so as the person in charge of that review, I'd like to run briefly through the amendments made.

> Note: Amendments to the oil spill response plan
> The oil spill response plan was established in 1978. Dividing Japan into 16 sea areas, it lays out the matters needed to clean up extremely large spills of oil or noxious liquid substances and prevent danger associated with them. The recent amendments reduce the plan's oil spill suppositions in reflection of amendments to international conventions requiring tankers to now be built with a double hull, whereby tank walls and the outside plates of the hull are separate.

Japan also has a National Contingency Plan for Preparedness and Response for Oil Pollution Incidents, or simply National Contingency Plan, estblished when the OPRC Convention was concluded pursuant to OPRC requirements. This plan has also been amended.

> Note: OPRC Convention
> International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990. An international agreement adopted by the International Maritime Organization to establish an international cooperation regime as well as national regimes for the purposes of preparedness, response and cooperation in the event of large-scale oil spills from ships.

The main amendments are as follows.

Large-scale oil spills are tackled together by the relevant national, local, and other institutions. A provision has therefore been added for the government to establish a Precautionary Headquarters headed by the JCG commandant in cases the information gathered suggests that the scale of the incident and the wide area of the damage require a powerful and immediate response.

To that end, it has been decided that, when the initial incident report is received by the JCG, we will immediately pass on the outlines and other details of the incident to the relevant institutions and local public bodies.

At the time the *Nakhodka* incident occurred, we sent out flash bulletins and then a string of follow-up reports to the fax numbers registered as emergency contacts.

Unfortunately, however, because it was in the middle of the New Year's holidays, the faxes we sent were simply piled up in empty offices.

Of course, the JCG also made public announcements from the beginning of the incident, but not only occurred the spill 80 nautical miles offshore, but 31 of the 32 crew members were rescued the next day. The media paid little attention, and there were no big news.

The relevant institutions too took no action—perhaps reasoning that while there might be a spill, it was all of 80 nautical miles out at sea, and therefore unlikely to lead to a disaster by oil washing up on the coast straightaway.

On January 4, the personnel on duty returning to work for the first time in the New Year saw the pile of faxes and realized the seriousness of the incident. By the time the impending crisis finally sank in and the relevant institutions started considering preparations for oil coming onshore, the bow section of the *Nakhodka* was steadily approaching the Japanese archipelago, accompanied by a large oil patches.

At the time, the JCG received a number of complaints: "Why did the JCG not contact us even when it knew that a major disaster was on hand?"; "We didn't get any faxes"; and "There were so many faxes that we didn't have time to read through them all."

Learning from that experience, the oil spill response plan was amended. While the old plan simply required the relevant government institutions to exchange information timely and appropriately, the amended plan obligated the JCG to supply the necessary information, and the relevant government institutions, local public bodies, and others to inform the JCG of measures planned in response to that information and their implementation status. In other words, we have now deliberately written into the plan exactly who will make contact first, and also that the information exchange will be not one-way but two-way.

As you can see, the idea is that, pursuant to the Marine Pollution Prevention Act, the ship captain or other members will inform the JCG if an accident occurs and take immediate emergency measures. In addition, the shipowner and other stakeholders will fulfil their obligation to engage in cleanup measures by sending in their own cleanup team to the site or contracting an operator to do so.

If the JCG deems that the shipowner alone will not be able to conduct a sufficient cleanup, we too will put in a cleanup team and work with the relevant institutions to deal with the spill.

The JCG will also issue a request for cleanup measures to the heads of the relevant government institutions.

By arrangement among the relevant ministries, a liaison conference will be held among those ministries, and subsequently, according to the seriousness of the situation, a Precautionary Headquarters will be set up pursuant to the National Contingency Plan to organize a response structure among the central ministries and agencies. Those ministries and agencies will then make a comprehensive judgment on the establishment of an Emergency Response Headquarters as required under the Basic Act on Disaster Control Measures, setting national response in motion.

This process was put into action six months after the *Nakhodka* incident, when the Panamanian tanker *Diamond Grace* ran aground on the Nakanose reef in Tokyo Bay and spilled its cargo of crude oil.

> Note: *Diamond Grace* incident
> In July 1997, Panamanian tanker *Diamond Grace*(GT:147,000), which was carrying 257,000 tons of crude oil, was crossing Tokyo Bay en route to the Keihin Kawasaki Sea Berth when it ran aground on the Nakanose reef in Tokyo Bay, spilling its cargo of 1,550 kiloliters of crude oil.

The Marine Pollution Prevention Act was right in the middle of being amended at the time, so there was no provision for requesting the heads of the relevant government institutions to engage in cleanup measures, but the process of the response was proceeded as I just described.

By the way, it was the only case that the National Emergency Response Headquarters was set up pursuant to the Basic Act on Disaster Control Measures to deal with an accident or disaster.

- **Weak JCG oil spill response organization—Revision of structure**

Turning now to strengthening the JCG structure, the eight members of the small JCG National Strike Team which I mentioned earlier spent two months for conducting cleanup, but with increasing concerns that the team needed to be bolstered, there was no objection getting the approval of the financial authorities to add four personnel the following year. This made the National Strike Team a three-unit, 12-person entity. It also moved out of the Maritime Disaster Response Office, Rescue Division, to become an independent office named the "National Strike Team Station" within the Third Regional Coast Guard Headquarters in Yokohama City.

Today, I might add, the National Strike Team comprises four units and 16 personnel, prepared to deal with hazardous and noxious liquid substance spills anywhere in Japan, 24 hours a day, 365 days a year.

April 2015 marked the 20th anniversary of the team's establishment, and during that time it has responded to 332 oil spill and other incidents.

- **Lack of equipment capable of dealing with highly viscous oil or usable in rough weather—Upgrading of equipment**

Looking at the equipment issue, the JCG urgently needed to prepare to deal with large spills of highly viscous heavy fuel oil, so a massive amount of money was invested in getting the necessary equipment in place across the country.

Earlier when I ran through the *Nakhodka* incident together with the pictures of what I actually saw, I noted that the weir skimmers didn't work effectively.

With help from the industry, we gathered information on what kind of equipment might be effective in recovering such highly viscous oil and found brush skimmers, which would apparently collect oil efficiently without picking up any water in the process.

Developed by a Norwegian manufacturer, brushes rotate to collect oil, as you can see here. The oil is then pumped into and stored in a lancer barge.

A Japanese supplier adjusted these brush skimmers, called "LSCs," to mount them on any of the large general-purpose patrol vessels deployed nationwide. The JCG has now 10 LSCs in place.

There are 10 LSCs because the JCG divides Japan into 11 regions, and each LSC has been allocated to each regional coast guard headquarters, with the exception of the one responsible for the Seto Inland Sea.

In terms of dispersant, a product applicable to highly viscous oil was just developed, so it has been stockpiled throughout the country.

In addition, at the time of the *Nakhodka* incident, a large amount of dispersant was sprayed from an aircraft over floating oil on open seas, but the dispersant then had to be stirred after spraying in order to disperse oil.
It was expected that wave and swell might do stirring, but because its efficiency was not clear, Japanese manufacturers began working to develop a self-mixing type dispersant based on the overseas dispersants.

In 2000, after a considerable struggle, they put a self-mixing type dispersant on the market. It met Japan's toxicity standards, and it has been stockpiled throughout the country too.

The aerial sprayers for this dispersant, of course, were also replaced or deployed additionally.

Part III: New Challenges—What I want to deliver for the future as an experienced hand

Having outlined the incident and what we have done to address the issues that emerged, I would like to conclude by expressing what I want to deliver you as an experienced hand, titled new challenges.

In 1997, the year of the *Nakhodka* incident, the Korean tanker *Osung No. 3* sank off the southern coast of Korea in April. Heavy fuel oil laden in it was spilled and washed up on the islands of

Tsushima and Iki in Nagasaki Prefecture and then the northern coast of Kyushu, necessitating a month-long cleanup operation.

> Note: Korean tanker *Osung No. 3* (GT:786) was carrying 1,700 kiloliters of heavy fuel oil from Ulsan to Busan in Korea when it ran aground on the southern coast of Korea and sank.

In July, three months later again, Panamanian tanker *Diamond Grace* ran aground on the Nakanose reef in Tokyo Bay and spilled its cargo of crude oil. As a major incident occurring right in front of the capital Tokyo, the first-ever national Emergency Response Headquarters targeted an accident or disaster was set up, and cleanup operation ensued for two weeks.

Having experienced a string of large-scale oil spills, Japan became extremely sensitive to oil spill incident at sea, reviewing both government and private-sector arrangements and capacities while developing and deploying necessary equipment.

The public paid an attention to the situation with strong interest and private sectors also promoted this movement by paying a lot of money for preventing and responding to oil spills.

Perhaps various measures mentioned above could be said to have borne fruit. Fortunately Japan has not experienced a large-scale oil spill incident requiring national response again since 1997.

In Japan, an old proverb says “The danger past, and God forgotten.” For these 20 long years, public interest has gradually waned, while private sectors have slowed down their development effort for response equipment due to poor profit and reduced the budget for purchasing them.

We are continuing to train our personnel regularly using equipment that we developed or bought back then, but now those equipment are getting older and need to be replaced.

Personnel with actual response experience are also getting older and retiring.

Even though conducting ongoing training and building up knowledge by learning about the past oil spill responses at the event like this, there are some limits.

On the other hand, concerning hardware, large crude- oil tankers now have a double-hull structure, whereby the outer plates of the hull and the outer walls of the tank are separated by a certain space. As a result, even if the outer hull is cracked or holed through collision or grounding, the tank walls are not immediately damaged, so oil does not leak.

Regarding bunker fuel oil, regulations have also been introduced as a means of preventing air pollution due to exhaust gas, so after 2020 use of the heavy fuel oil for bunker fuel will be prohibited.

As an even more epoch-making environmental measure, new type ships have been also developed, which use new fuel such as liquefied natural gas or liquefied hydrogen.

As above, oil spill risk from the ship has been mitigated, so the possibility of occurrence of major oil spills should be mitigated in10 or 20 years.

However, petroleum will remain essential in manufacturing chemical products, and petroleum has to be supplied by marine transportation using ocean tanker.

If, as in the case of the *Nakhodka* incident, the hull actually breaks up, even a double hull tanker will never help, and furthermore we also have to prepare for spills from the land-based facilities.

Incident will never be eliminated entirely.

What helps most in actual oil spill responses is knowledge grounded on experience.

I believe that we have responsibility to communicate to and tell the next generation with no experience of incident response what is needed and what they should do, training them up and guiding them. We should not let the knowledge of how to respond to oil spills be something resting in the hands of only a few. The technical know-how must be passed on, for some emergency affairs.

All of you here are experts in your fields. Why don't we join forces to ensure that oil spill response know-how remains alive and well?

Remember *Nakhodka*!

Here I would like to conclude with the hope that my presentation today will be useful to those who will be involved in disaster management 10 or 20 years from now.

Thank you.