Title: Tackling the Difficulties of Marine Oil Spill Incidents: Dual Aspect of Safety and Management

Presenter: Takahiro Hagihara
Affiliation: Maritime Disaster Prevention Center
Position: Director, Operations Division

Introduction

I have tremendous respect for the efforts of the Petroleum Association of Japan in dealing with major oil spills over the years, and am honored for the chance to make a presentation here today.

As a representative of the Maritime Disaster Prevention Center (MDPC), responsible for emergency response on behalf of positions of the polluter, this is my third opportunity to speak to you. My presentation in 2012, titled "Incident Also Occurs in the Conference Room," described our response to maritime disasters following the Great East Japan Earthquake of 2011, and outlined an Incident Command System (ICS), an international standard for operation and management of incident response efforts. Then in 2014, I spoke to you on the subject, "Current Status of Oil Spill Response in Japan and a New Sensible Approach to the Issues," introducing development of a chemical agent for removal of oil adhering to docks and ship hulls.

This Oil Spill Response Workshop is about matters to consider in future oil spill response management and operations. Since today's presentation is in the framework of a workshop, I would like to address two difficult issues from a more practical standpoint, closely tied to frontline operations. The first is an operational issue, that is, safety standards for toxic gas at the pollution site and how to confirm them. The second is management of a centralized accident response headquarters, made up of many polluters, when multiple oil spill incidents occur at the same time.

I will introduce initiatives of the MDPC to address these two issues, which have been largely ignored up to now, even if people were vaguely aware of them. Please note that this presentation will be limited to the initiatives of the MDPC only.

1. Role of the MDPC as representative of polluters

The MDPC was legally established in 1976 as a government-authorized corporation. After later becoming an incorporated administrative agency, in October 2013 the status changed to that of a general incorporated foundation. It is commonly assumed that when hazardous materials (whether gas or liquid) are released in an explosion, fire, or spill, the responsibility for emergency response activities

lies with public agencies such as the Fire and Disaster Management Agency or the Japan Coast Guard. The reality, however, is different. Businesses that handle hazardous materials, such as transporting, storing, or manufacturing them, include the shipping industry, land transport industry, operators of petrochemical complexes, and storage industry. So long as these businesses derive profit from handling such materials, they must bear substantial risk. For this reason, when an accident or disaster occurs, they are obligated to make an emergency response and to follow up by cleaning up the resulting pollution.

We at the MDPC, as representatives of "polluters"—those with the misfortune to incur an incident, such as shipowners handling hazardous materials, or operators of petroleum or petrochemical companies—are a professional disaster response group, operating on the front lines to carry out timely and effective activities in response to incidents of hazardous materials-related fires or spills, whether on sea or on-shore. Since our founding, we have dealt with more than 170 disasters.

2. Assumed oil spill incidents

The types of oil spill incidents assumed in this presentation involve large amounts of crude oil and other pollutants leaking into the sea from multiple petrochemical complexes along the coasts of major bays. It is also assumed that the cause of an incident is a major earthquake, such as one with its epicenter directly under the Tokyo metropolitan area or along the Nankai trough. Keep in mind that Tokyo Bay, Ise Bay, Osaka Bay, the Seto Inland Sea, and other such waters are highly enclosed. They are also lined with petrochemical complexes, visited constantly by ships and vessels. They can be called central stages for the economic activities of Japan.

Oil and other such substances spread rapidly. As the polluted area grows wider, a countless number of public and private sector parties are likely to become concerned about the matter. Then if leaks and spills occur simultaneously from multiple petrochemical complexes and ships, it is not hard to imagine the pollution going beyond black oil to become mixed with clean oil and chemicals.

This situation can be roughly thought of as like a large crude oil spill with the properties of black oil, clean oil, and chemicals. Going further, the responsibility for emergency response activities lies with many business operators. This assumption, that a mixture of pollutants is similar to crude oil while there are multiple polluters, presents us with immense difficulties. In the first case, the difficulty is ensuring safety of those carrying out the initial response to mixed pollutants, in reality a large flow of crude oil. The difficulties in the second case include how to have a mixed team of multiple polluters devise strategy and carry out tactical operations in response to a widening, increasingly complex and long-term incident, and how to manage operations of the accident response headquarters.

I would like all of you here today to understand that such a shocking, worst-case scenario is by no means outside the realm of possibility.

3. Dual Aspect of safety: Safety in ordinary times and safety in an emergency

(1) Safety in an emergency

In ordinary times, occupational safety and health standards and rules are prescribed for permissible levels of concentration of toxic and hazardous gases in the manufacturing processes of oil and chemicals, to ensure safety of the everyday working environment. Japan does not, however, have any standards or guidelines for short-term exposure of personnel working at the site of an accident or disaster emergency.

The only concept of safety existing is that accidents must not happen or be caused. The concept of safety guidelines when an incident does arise is lacking. While the MDPC is a professional disaster response group, we are neither kamikaze-spirit firefighters who will rush into an accident site ignoring the dangers, nor are we chickenhearted firefighters who will run away from danger. Armed with a grasp of yardsticks or rough guidelines for on-site safety, we measure the site environment, devise strategies, and make use of the necessary equipment and materials in carrying out tactical operations.

The standards and guidelines referenced by the MDPC at the initial response site include the US and Canadian Acute Exposure Guideline Levels, Emergency Response Planning Guidelines (ERPGs), and Temporary Emergency Exposure Limits.

(2) Thresholds for toxicity in the work environment (long term) and emergency response environment (short term)

Two risks lurking in the accident site are toxicity to humans and flammability. These are confirmed from the on-site viewpoint. Assuming the target is mixed pollutants, it is treated as “crude oil.” Crude oil contains propane, isobutane, hexane, and benzene. It is said to have an average flash point of 0°C, and is of various types from light oil to heavy.

Even though we want to detect toxic gas at the site, the fact is, Japan has standards only for individual substances, and only for allowed exposure for eight hours a day, five days a week. There is no safety standard, for example, for initial short-term exposure in work such as laying a boom. At oil spill sites, this matter is recognized as a case of looking the other way. The MDPC can deal with this issue at the site on an emergency basis and in simple ways, which I will introduce today. Our top priority, however, is taking measures suited to the occasion for achieving an initial response while confirming site safety.

(3) Issues for toxic gas detection

One issue for detecting toxic gas is that the targets for which detection is possible are basically single substances. There are no detection instruments or methods for comprehensively confirming the presence of toxic gas in the kind of mixture of substances assumed here, which may contain black oil, clean oil, chemicals, and crude oil vapors.

The other issue is the range of concentration that can be measured with a detector tube for use in the field, even with detection of a single substance. Since these tubes were originally manufactured for detection of concentrations considered safe in ordinary times, the high concentrations that are safe for short-term exposures in an emergency are outside the range of such a detector tube. Specialized detectors for detailed detection of single-substance concentrations do exist, such as photoionization detectors, although they are expensive.

No matter how much people talk about measuring safety in an emergency, the fact is, while this is possible for a single chemical, physical measurement of mixed pollutants or crude oil vapors is not possible.

(4) Gap between flammability and toxicity

While the reality is that in the case of an oil spill, it is difficult to confirm the presence of toxic gas in the emergency response work environment at the disaster scene, there seems to be a tendency to feel that it is enough to detect the danger from flammability (using a flammable gas detector). The gap between concentration of flammable gas and that of toxic gas can be seen as similar to the gap between kilometers and centimeters.

For example, the lower explosive limit of benzene is 1.2 volume percent (with the upper explosive limit of 8.0 volume percent), which in parts per million (ppm) units translates to 12,000 ppm. On the other hand, the ERPG-3 value for benzene is 1,000 ppm, ERPG-2 is 150 ppm, and the threshold limit value–time-weighted average, the safety standard for ordinary times, is 0.5 ppm (all of these being US standards).

Considering the initial stages of a major oil spill and one that flows continually, the need is for procedures for continually and easily confirming both flammable gas and toxic gas at the same time (even as rough guides), so as to confirm the safety of the emergency site. In this presentation, I would like to show you the MDPC's simple procedures, which can be carried out on an emergency basis.

Given the MDPC's strong desire for the concept of "safety of the emergency site" to take hold firmly in the oil spill cleanup field, we would be pleased to have Japan's prestigious institutions start by determining the short-term exposure concentrations for single substances, and draw up guidelines for them.

4. Readiness for multiple simultaneous major oil spills

The second difficult issue I want to talk about in this presentation is multiple simultaneous oil spills.

If oil spill incidents occur due to a large earthquake, public rescue agencies will no doubt give top priority to the evacuation and guidance of ordinary citizens and ships, and to rescue and firefighting operations.

In the kind of oil spill incident assumed in this presentation, it is also assumed that multiple polluters will collaborate in a mixed team to battle a single enemy, marine pollution.

Firefighting inside a petrochemical complex is the work of employees thoroughly familiar with the equipment and facilities, and of in-company fire brigade personnel. In the case of an oil spill incident, however, the venue is the public seas, including near and far business sites, public wharves, water intake and discharge facilities, and beaches and other recreational facilities.

A further difficulty is that, if everyone involved simply carries out cleanup efforts in their own individual ways, the suitability of those cleanup activities will be called into question before payment or in negotiations with insurance companies beginning soon after the activities come to an end; and in some cases, court battles must be kept in view.

As preparations to this end, it is important to share in ordinary times the knowledge and skills of cleanup work. It is also necessary to share rules for effective and long-term management of operations by a mixed-team accident response headquarters. Most petrochemical complex operators have over the years developed their own individual approaches to running their accident response headquarters. These methodologies, however, are applicable only to actions within their own site or on the seas right in front of them. They cannot be used for management of mixed-team operations or in the public seas.

(1) Five functions needed for managing the response to an oil spill incident

The response to any kind of accident or disaster, not only oil spill, can be divided into *incident management* at the site and *issue management* in the accident response headquarters. Issue

management, the responsibility of the accident response headquarters, requires the following five types of functions:

- Operations functions, for managing the response activities currently being carried out at the site;
- Planning functions, for planning short- to long-term emergency response activities;
- Logistics functions, for maintaining and supporting the on-site response efforts and the accident response headquarters;
- Finance/administration functions, for public relations activities and assurance of funds and compensation; and
- Command functions, for directing and taking responsibility for the other functions.

In the kind of oil spill incident assumed in this presentation, the process of running an accident response headquarters, of which the MDPC is very likely to be a part, is as follows:

The mixed team draws up a plan that clearly defines the cleanup strategy and tactics. For carrying out those tactical operations, the plan details comprehensively how to rationally and effectively manage operation of the equipment and materials, ships and vessels, and the in-company fire brigades at each business site. This plan is called an incident action plan (IAP). After the IAP has been approved by agreement of the command section of the mixed team, made up of responsible parties representing multiple polluters, consensus is obtained from government agencies and others in the region. The team then moves to the implementation phase. This process is called the "P" of planning.

(2) Four sections responsible for the functions

Duties are assigned to four sections responsible for each of the functions needed for managing the response to the oil spill incident.

- Operations section: The role of implementing emergency response activities, while providing assistance and coordination so the activities currently under way can proceed smoothly, properly allocating equipment, materials, and personnel, and monitoring their utilization.
- Planning section: The role of collecting, evaluating, and sharing information, and devising and writing up an IAP.
- Logistics section: The responsibility for responding to all requests for support needed in emergency response activities, including ordering resources such as equipment, materials, and personnel. When requested, this section arranges for installation of facilities or transport of resources, equipment maintenance, supply of food, provision of communication equipment, medical services to workers on the site, and many other kinds of services.
- Finance/administration section: The responsibility for highly important duties in a situation involving multiple funds provision. Basically, along with treasurer duties, its roles include keeping track of attendance by those engaged in emergency response activities (overtime hours and

allowances, etc.), making contracts and performing contracting procedures, and dealing with damage compensation and indemnification.

(3) The 14 rules for running an organization

To run an accident response headquarters that is a mixed team with a large staff of personnel from different companies, simple rules are needed. Those 14 rules are:

common terminology; transfer of command; chain of command and unity of command; unified command; management by objectives; incident action plan; modular organization; manageable; integrated facilities management; comprehensive resource management; integrated communications; information and intelligence management; accountability; and dispatch/deployment.

Based on these 14 rules, formats are defined for managing operations of specific accident response headquarters.

(4) Coming initiatives

As you know, a worldwide approach to managing operations of such an accident response headquarters is the Incident Command System (ICS). Standards for such a system were codified in Japan in 2013 as JIS Q22320 on emergency management, but this standard has still not gone beyond the academic field. This is likely because Japan already has different computer systems in each corporation, each central government agency, each prefecture, and each municipality, each of them based on their particular way of doing things. Given this situation, there are experts who believe the ICS approach will not become common unless the national government aggressively pushes introduction from the top down.

The MDPC, however, as representative of polluters, in reality must play a leading role, along with polluters, in carrying out emergency response activities, whether in individual incidents or in large-scale, multiple simultaneous incidents involving large numbers of polluters. While ensuring the safety of on-site workers, we must implement firefighting and cleanup efforts, collect and share information, prepare an IAP, order and pay for resources, and keep records of everything; and while making information public and obtaining consensus in the local region, in the end we must secure funds for the emergency response activities. For these purposes, the MDPC has for some time operated an ICS as a cloud-based crisis management pilot system.

We at the MDPC would greatly desire to see the spread of the ICS from the bottom up. I believe this is the “way of doing things” that is needed in Japan, which is forced to deal with natural disasters head-on. In addition to the map exercises and field training currently being provided by the MDPC in

areas with petrochemical complexes, we plan to offer ICS experiential training sessions, as we endeavor to raise the level of regional disaster prevention capabilities. //