

# Response and Preparedness to HNS Incidents, including Implementation of the HNS-OPRC Protocol

Maritime Disaster Prevention Center (MDPC)

President Masami SHIRAISHI

- MDPC is one of the Oil Spill Response Organization (OSRO) in Japan and was established as an authorized corporation in 1976.
- MDPC used to be directly under Japan Coast Guard. In 2013, MDPC became a private organization and JCG commandant assigned MDPC as "Government Designated Organization for Maritime Disaster Prevention".
- MDPC does not receive any subsidies from Government of Japan.
- Since MDPC was established, MDPC has provided more than 200 incident response operations.



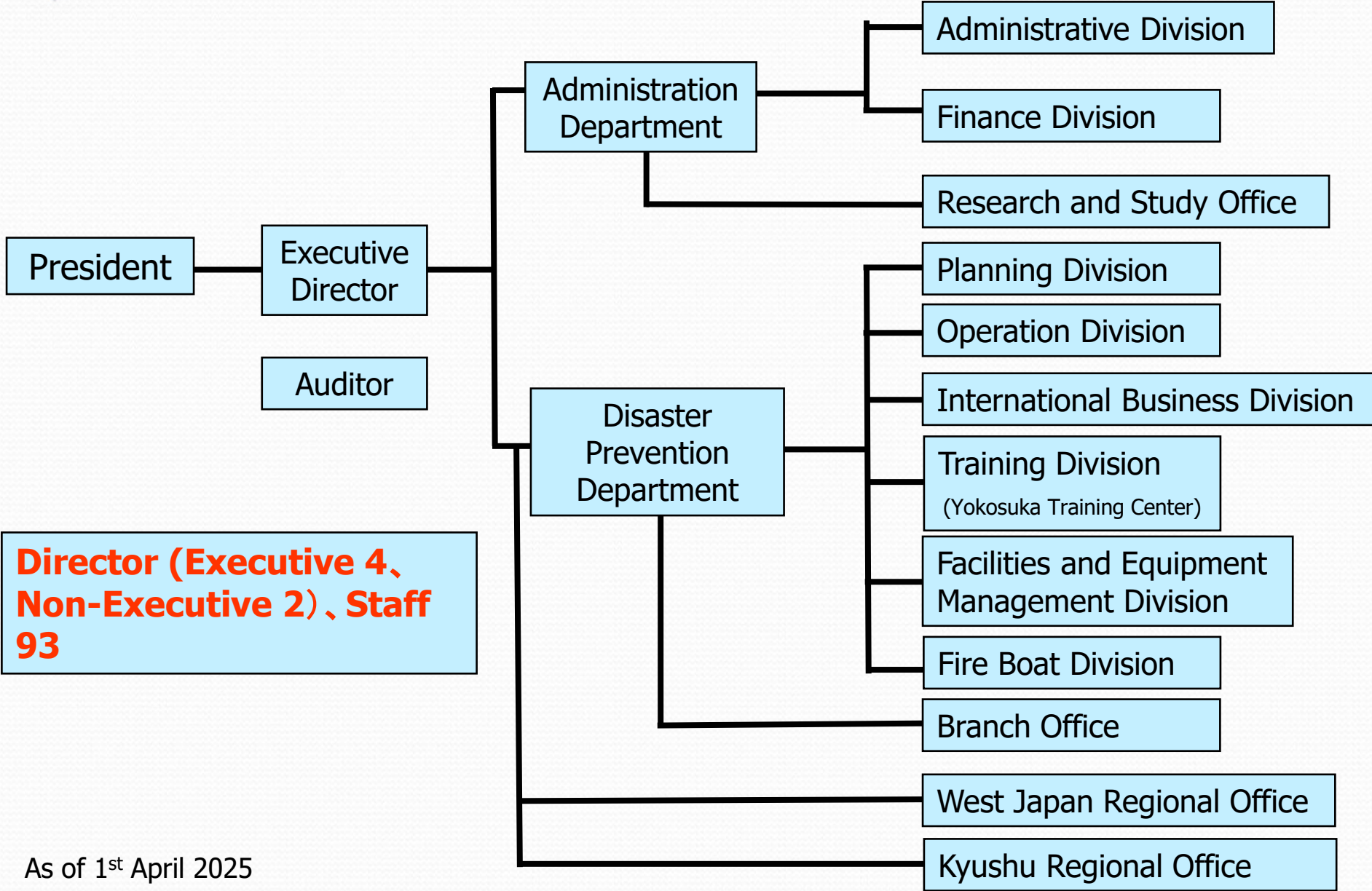
Benzene Tanker Fire & Spill



Ammonium Nitrate Spill from a container



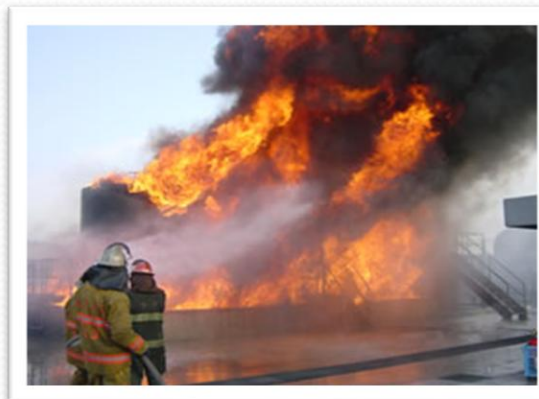
# Organization





- **Safety Measures Ability**  
Set up safety measures at hazardous incident site

- **Firefighting Measures Ability**  
Firefighting operation at a fire and an explosion site



- **Recovery Operation Ability**  
Recovery operation at a pollution site





Maritime  
Disaster  
Prevention

# MDPC Equipment base for oil and HNS incident response

(as of 31<sup>st</sup> March 2025)

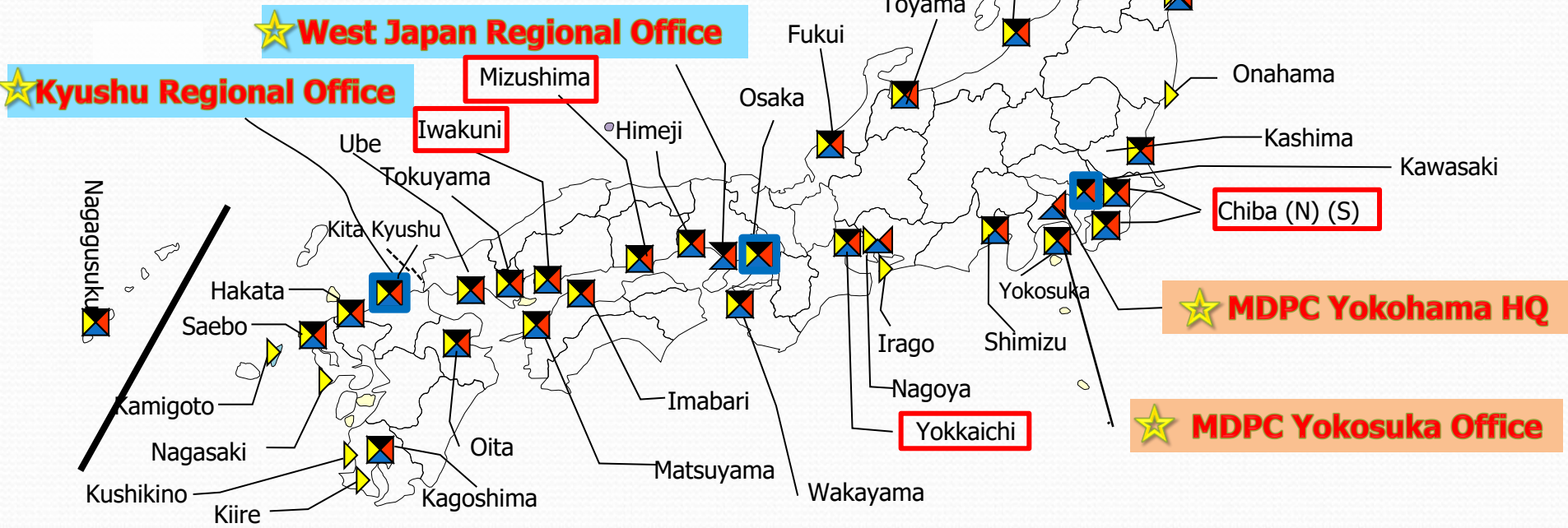
## \* MDPC Office Location

 Yokohama HQ, Yokosuka Office, West Japan Regional Office, Kyushu regional Office  
 Branch Office (Tomakomai, Chiba, Yokkaichi, Mizushima, Iwakuni)

## ● Incident Response Sub-contractors: 169

## ● MDPC Equipment Base: 44

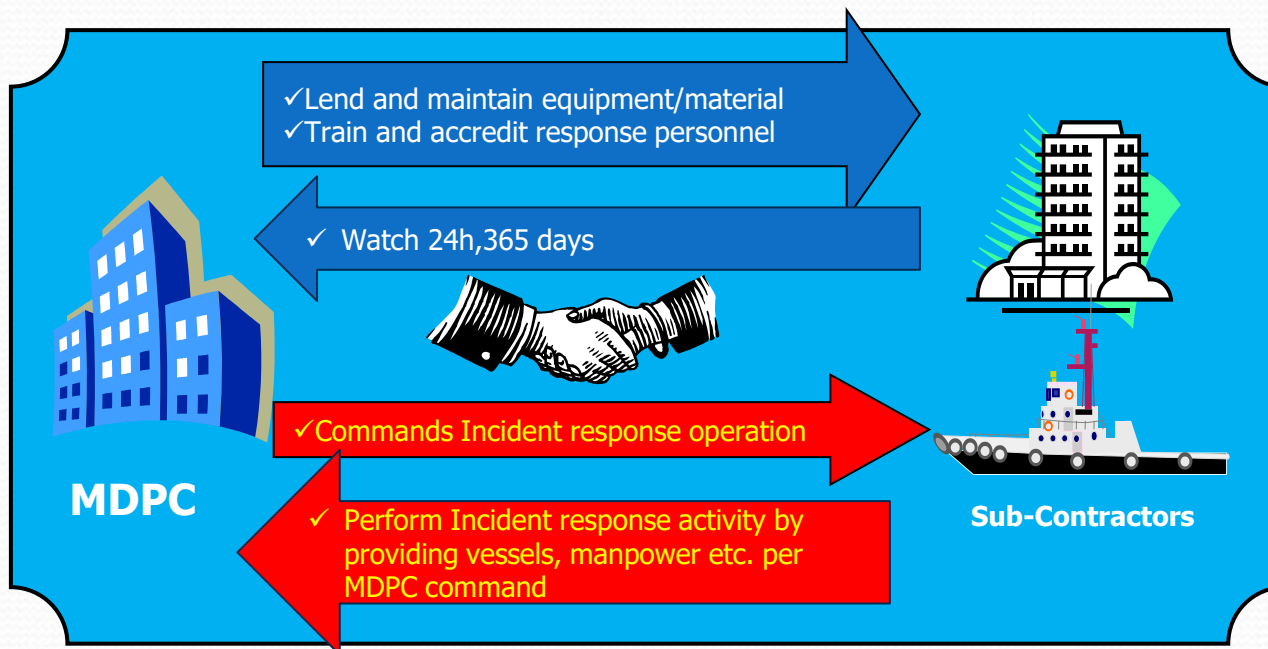
-  Oil recovery system
-  Oil boom, absorbent and dispersant
-  HNS PPE, materials, equipment
-  Oil & HNS response experts
-  Disaster countermeasures Depot





- ✓ MDPC has more than 169 subcontractors (SC) network for Incident Response.
- ✓ Contract Outline
  - ✓ Normal Time
    - ✓ MDPC prepares and maintains the necessary response equipment/materials.
    - ✓ SC stores the response equipment/materials at their location.
    - ✓ MPDC trains SC personnel periodically to accredited incident response experts.
    - ✓ SC watches the sea area 24hours/365 days.
  - ✓ When Incident happens
    - ✓ MDPC commands Incident Response operation.
    - ✓ SC performs Incident Response activity, such as providing vessels (work boats, tugboats), manpower, operating MDPC equipment/material, collecting spilled HNS/oil. etc.

\* SCs' own business are providing harbor tug, port service, local salvage, industrial waste disposal etc.





|                                |                                                          |
|--------------------------------|----------------------------------------------------------|
| Name                           | Hiragi                                                   |
| Built in                       | October 2024                                             |
| Type and Gross Tonnage         | Steel single-body ship 349 G/T                           |
| Length                         | 42.00m                                                   |
| Speed                          | 15.2 Kt                                                  |
| Power                          | Diesel Engine 2,200 PS x 2 sets                          |
| Capacity                       | Crew 8 person (Maximum Passenger 28 people)              |
| Water Spraying Equipment       | 20,000ℓ/min×2 sets (Water and Foam)                      |
|                                | 5,000ℓ/min×1 set (Hydro-Chem extinguisher)               |
| Dry-chemical Fire Extinguisher | 80 mm diameter nozzle Sodium hydrogen carbonate x 2 tons |
|                                | Potassium bicarbonate x 2 tons                           |

|                                |                                             |
|--------------------------------|---------------------------------------------|
| Name                           | Kiyotaki                                    |
| Built in                       | December 2001                               |
| Type and Gross Tonnage         | Steel single-body ship 263 G/T              |
| Length                         | 40.00m                                      |
| Speed                          | 16 Kt                                       |
| Power                          | Diesel Engine 2,200 PS x 2 sets             |
| Capacity                       | Crew 8 person (Maximum Passenger 20 people) |
| Water Spraying Equipment       | 18,000ℓ/min×1 set (Water and Foam)          |
|                                | 4,000ℓ/min×1 set (Water and Foam)           |
|                                | 1,800ℓ/min×1 set (Water and Foam)           |
| Dry-chemical Fire Extinguisher | Sodium hydrogen carbonate x 5.1 tons        |

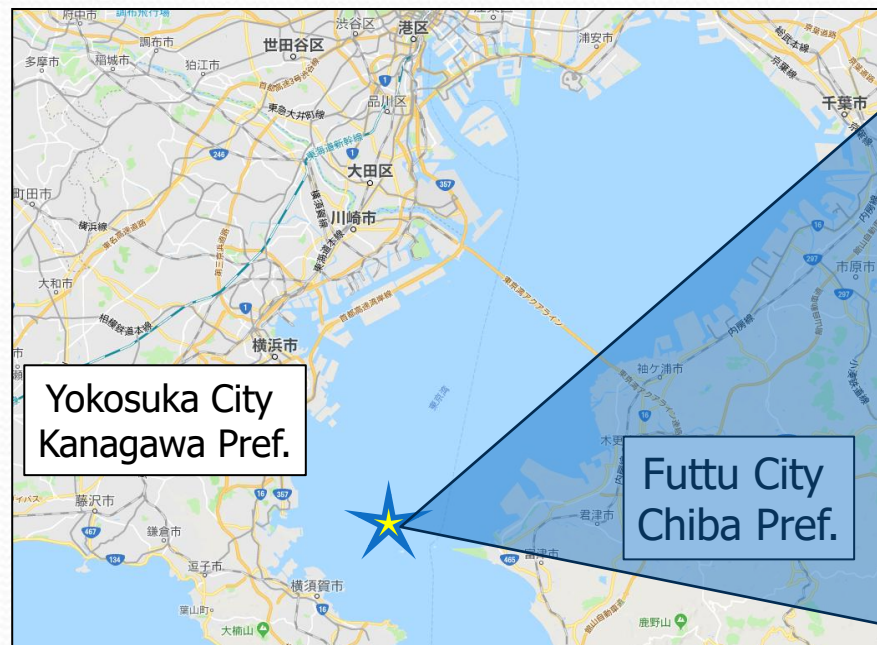




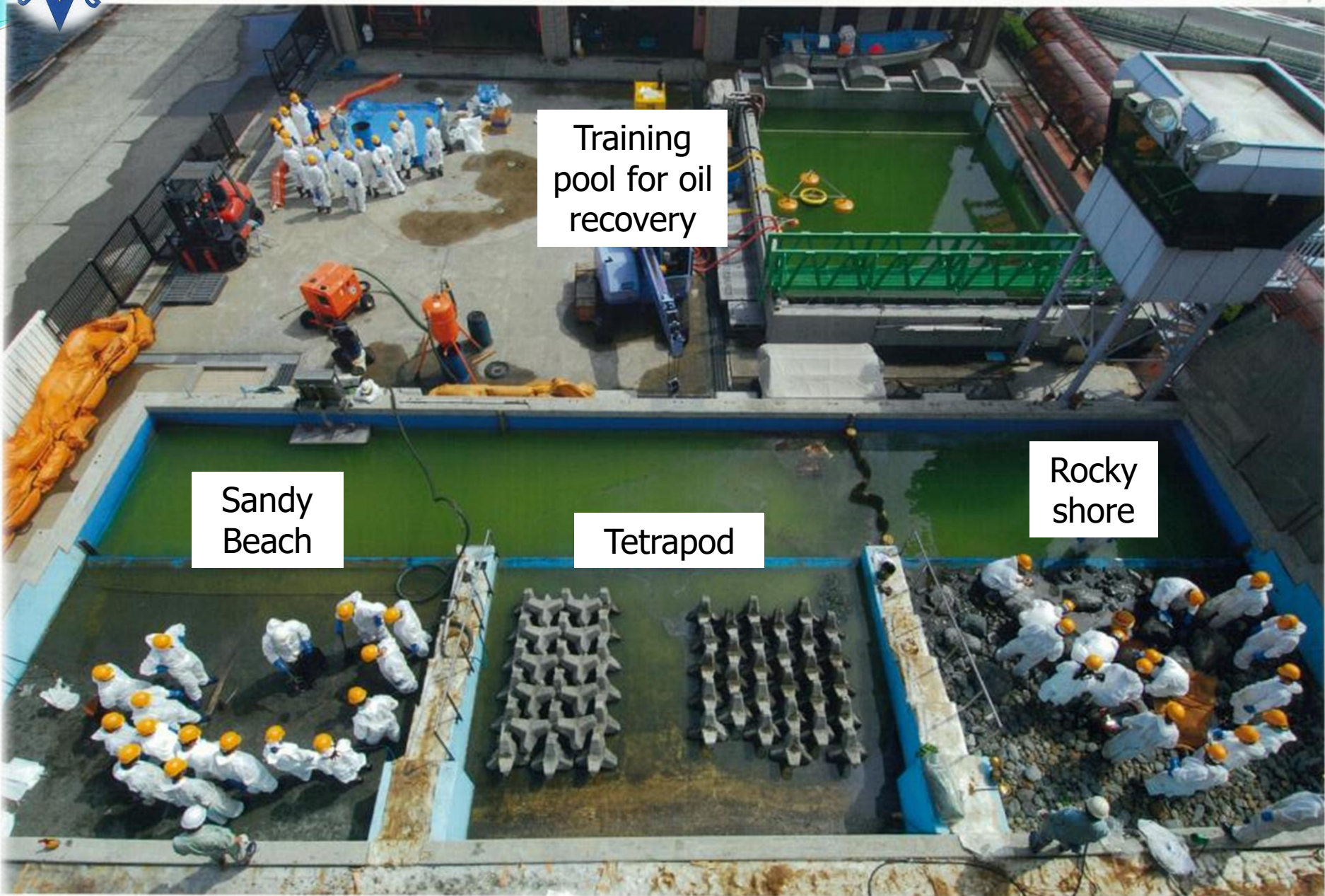


Maritime  
Disaster  
Prevention  
Center

# Firefighting Training Facility (No 2 Sea Fort)



Every year, over 2,000 attendees including but not limited to the tanker's crew, petrochemical fire brigade, municipal firefighters take part in the training.

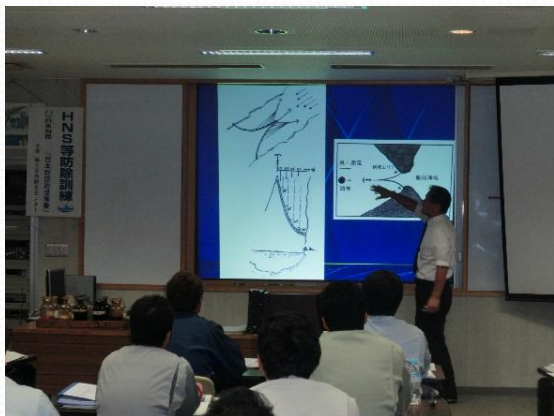


Training  
pool for oil  
recovery

Sandy  
Beach

Tetrapod

Rocky  
shore



Lecture



Oil boom deployment



Offshore recovery



Oil skimmer operation



Shoreline cleanup operation



Tabletop Exercise



Tabletop experiment of  
chemical properties



Donning and doffing  
Chemical Protective Clothing



Dilution by water spray for  
HNS gas concentration



Stop leaking

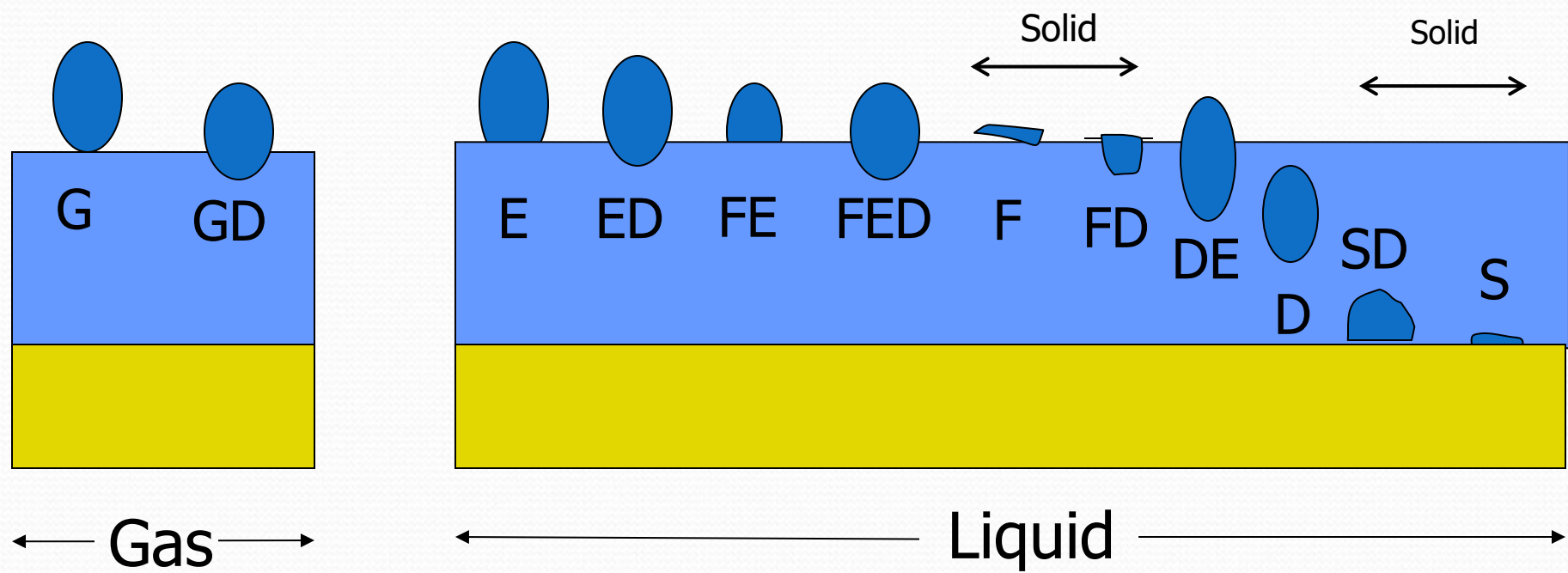


Decontamination



Sampling and Monitoring

## 12 different behavior



G: gas  
GD: gas/dissolver  
E: evaporator

ED: evaporator/dissolver  
FE: floater/evaporator  
FED: floater/evaporator/dissolver

F: floater  
FD: floater/dissolver  
DE: dissolver/evaporator

D: dissolver  
SD: sinker/dissolver  
S: sinker

# HNS spill incident response process

(Example of Toxic/Flammable substance)

## Safety Measures Ability

## Sampling (Marine Environmental Protection)

### Incident

### Spill & Spread

### Set up Zoning

### Detection operation

### Explosion & Fire

### 【Site safety measures】

→ To respond HNS spill and firefighting,  
Prepare appropriate skillful responders.

Check impact for marine  
environmental and fisheries  
• Water, sediment & gas sampling

### Firefighting

- Use firefighting boat
- HNS dilution by water spray
- Spray foam and dry chemical fire extinguisher



Firefighting operation by MDPC  
and sub-contractors

### Confine/remove HNS

- Decrease evaporation by foam
- Solidify by gelling agent
- Recover the solidify HNS



### Accelerate evaporation

- Deploy oil boom
- Accelerate evaporation by water spray



# HNS database

MDPC listed ordinarily HNS transported by HNS tankers and made original HNS database specially including spill response at sea water.

|         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |        |                   |           |                 |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------|-----------|-----------------|
| 品名      | キシレン                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |        |                   |           |                 |
| 英名      | Xylene                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                   |           |                 |
| 別名      | キシロール、ジメチルベンゼン、ザイレン o,m,pの3種の異性体がある                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |        |                   |           |                 |
| 国連番号    | 1307                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | CAS番号  | 1330-20-7<br>(混合) | IMDG CODE | Class 3.3/P3394 |
| 海防法分類   | Y類                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 消防法分類  | 第4類第2石油類          |           |                 |
| 危険則分類   | 中引火点 引火性液体類                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 港則法分類  | 中引火点 引火性液体類       |           |                 |
| 化学式     | C <sub>8</sub> H <sub>10</sub> (CH <sub>3</sub> ) <sub>2</sub>                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 分子量    | 106.17            | 爆発範囲(%)   | 1.0～6.0         |
| 外観      | 無色の液体                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 臭気     | 芳香族臭              | 溶解性       | 水に難溶            |
| 比重      | 0.88                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 蒸気比重   | 3.66              | 沸点(℃)     | 144.41          |
| 融点(℃)   | -25.18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 引火点(℃) | 17.0              | 発火点(℃)    | 463             |
| 蒸気圧     | 0.64KPa/4.83mmHg (20℃)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |        |                   |           |                 |
| 腐食性     | 人:なし 金属:なし                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        | 酸化性               | なし        |                 |
| 許容濃度、毒性 | 日本:50ppm 米国:100ppmTWA 150ppmSTEL A4<br>毒性:LD <sub>50</sub> 5000mg/kg(経口rat)                                                                                                                                                                                                                                                                                                                                                                                                                                          |        |                   |           |                 |
| 危険・有害性  | <ul style="list-style-type: none"><li>○ 分類の名称 : 引火性液体、急性毒性物質</li><li>○ 有害性 : 皮膚、眼、気道を刺激する。中枢神経抑制作用がある。中毒症状が遅れて出現することがある。ヒトに対する発がん可能性の心配がある。</li><li>○ 環境影響 : 生分解性がある。水生生物に有害である。水生生物への蓄積性は低い。</li><li>○ 危険性 : 蒸気は空気と混合して爆発性のガスになり、蒸気は空気より重い。引火性が高い。</li></ul>                                                                                                                                                                                                                                                        |        |                   |           |                 |
| 応急措置    | <ul style="list-style-type: none"><li>○ 吸入した場合<br/>被災者を直ちに新鮮な空気の場所に移動させる。<br/>身体を毛布などで覆い、保温して安静を保つ。<br/>呼吸が止まっている場合及び呼吸が弱い場合は、衣類を緩め呼吸気道を確保したうえで人工呼吸を行う。<br/>意識がないが呼吸をしている場合、意識はあるが呼吸困難な場合は酸素吸入が有効である。</li><li>○ 皮膚に付着した場合<br/>汚染された衣服、靴などは速やかに脱ぎ捨てる。脱ぎ捨てた衣服等は遠くに隔離する。<br/>皮膚への汚染を直ちに流水で少なくとも15分洗い流す。その後石けん水を使って良く洗い落とす。</li><li>○ 目に入った場合<br/>直ちに流水で少なくとも15分間まぶたを指で良く開いて眼球、まぶたの隅々まで水が良く行き渡るように洗浄する。</li><li>○ 飲み込んだ場合<br/>水でよく口の中を洗わせ、無理に吐かせてはならない。嘔吐が自然に起こったときは、気管への吸入がおきないように身体を傾斜させる。<br/>身体を保温して安静に保つ。</li></ul> |        |                   |           |                 |

|                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>火災時の措置</p>   | <p>○ 消火剤<br/>粉末、泡(耐アルコール泡)、二酸化炭素、水噴霧は時と場合によって有効。</p> <p>○ 消火方法<br/>初期の消火には粉末、二酸化炭素、水噴霧等を用いる。<br/>大規模火災の際には泡(耐アルコール泡)、水噴霧等を用いる。<br/>周辺火災の場合、周囲の設備などに散水して冷却する。<br/>移動可能な容器は速やかに安全な場所に移す。</p> <p>○ 消火を行う者の保護<br/>消火作業の際には自給式呼吸器等の保護具を着用する。</p>                                                                                                                                                                                                                                                                         |
| <p>漏洩時の措置</p>   | <p>○ 人体に対する注意事項<br/>作業の際は保護具を着用し、飛沫が皮膚に付着したり、ガスを吸入しないように注意して風上から作業させる。風下の人を退避させる。</p>                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>海上漏洩時の措置</p> | <p>○ 船上漏洩時<br/>発火源を管理し、閉鎖区域に蒸気が入り込まないようにして、大量の水で船外に洗い流す。その場合は水霧ノズルを使用した方が蒸気の発生を抑えやすい。大量流出の場合は、人体に有害な蒸気から乗組員を守り引火爆発を避けるため船首を風下に向ける。船首を風下に向けることができない場合は水霧を使用して蒸気を防ぐ。船外に洗い流すことができない場合は、吸収性ポリマーまたはゲル化剤を散布し固形化して、蒸気の発生を抑えた後に回収する。</p> <p>○ 海上流出時<br/>外洋等で蒸気が周囲に影響を及ぼすおそれのない場合は、蒸気及び液の拡散をモニタリングする。外洋等であっても陸岸に接近するおそれがある場合は、放水により拡散蒸発を促進する。蒸気が周囲に影響を及ぼすおそれがある場合は、風上からゲル泡を放射し海面を覆い蒸気の発生を抑える。キシレンは、液比重は0.88と軽く、蒸気圧は低く、水に難溶のため長時間海面上に滞留する。回収する場合は、オイルフェンス等で局所化し吸収性ポリマーまたはゲル化剤を風上から散布し固形化して、蒸気の発生を抑えた後に回収装置または回収ネット等で回収する。</p> |

Information about the HNS spill response procedure on sea water, based on MDPC research and study

MPDC sets up the advisory group consisted of professors to obtain advices for the special incident response operation.

## Special Disaster Response Support Group = Advisory Group



- Chemist
- Fire engineering
- Marine Technology
- Toxicology
- Occupational Safety and Health for ships crew
- Search and Rescue
- Marine transportation
- Marine Environment

# Case study 1

Date and Time: around 1600 on 1<sup>st</sup> March 2017  
Location: offshore around Toba, Mie Pref.  
Cause of incident: Grounding and sinking

Overview: An HNS tanker ran aground and sank and then, 48 % sodium hydroxide (740 KI) spilled from the tanker.



# Chemical tanker grounding and sinking

C131: SE



17/03/04

D044.4

10:23:45

R-06

H ≡ V \_ \_ S ≡



C193:SSW



17/03/04

D050.8

09:05:58

R-01

H V S



White sediments accumulated on the seabed. It seemed that the sodium hydroxide that had spilled from the tanker had reacted with the magnesium ions in the seawater to generate magnesium hydroxide.

## Sampling operation



MDPC conducted sampling operation for seawater and sediment. The sampled substances were tested at a certified laboratory owned by MDPC.



# Case study 2



**LPG tank BLEVE (Boiling Liquid Expanding Vapor Explosion) at Chiba Pref.**



Date: 11<sup>th</sup> March 2012

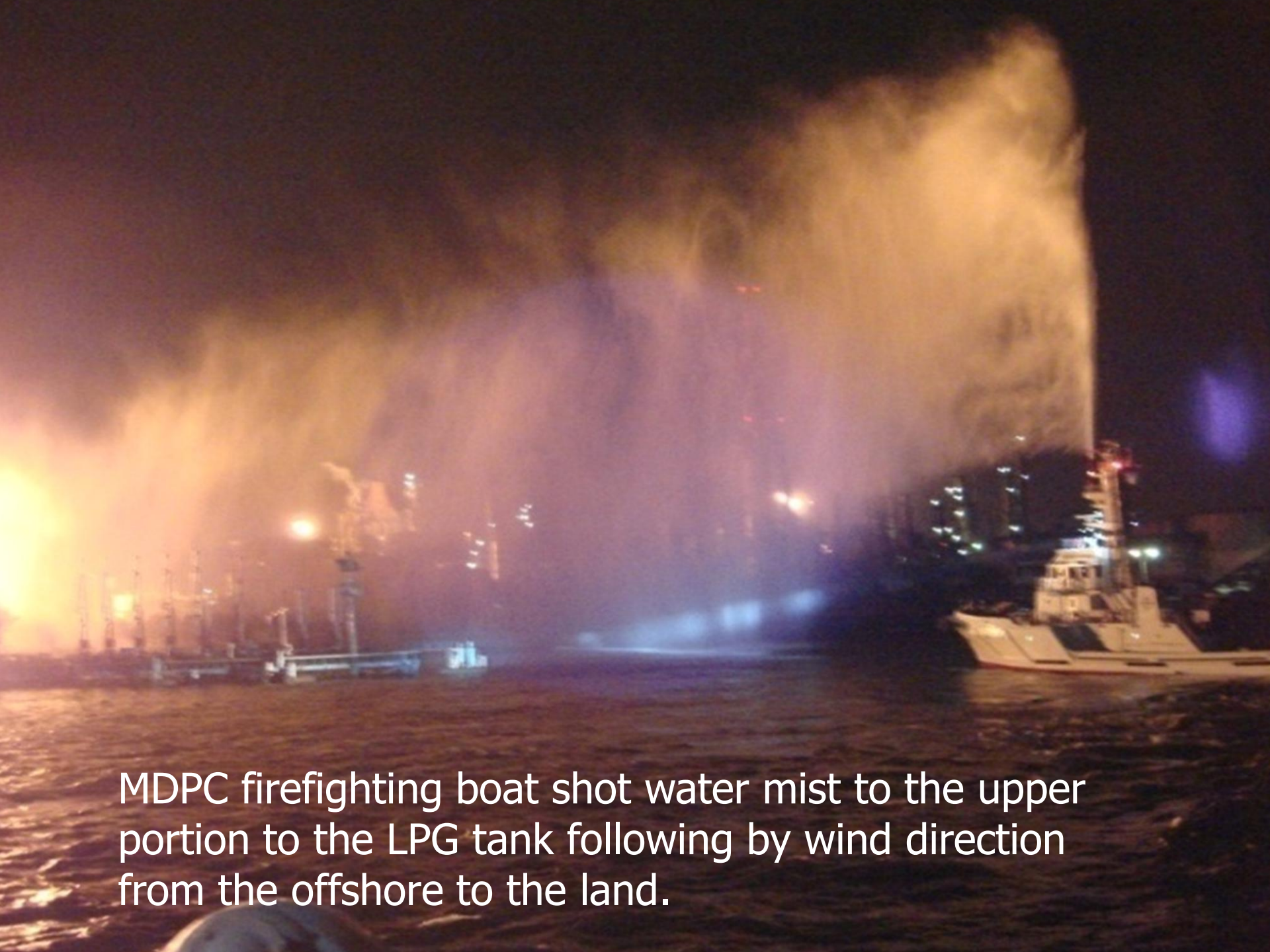
Location: Ichihara City, Chiba Pref.

Cause of incident: Earthquake

Overview: Fire caused by Great East Kanto Earthquake at Chiba refinery lead the LPG tank BLEVE

MDPC immediately dispatched MDPC firefighting boat to the refinery with special caution for the further BLEVE.





MDPC firefighting boat shot water mist to the upper portion to the LPG tank following by wind direction from the offshore to the land.



Fire flame became small by the water spray.

# **Preparation and readiness by MDPC considering**

## **for Protocol to the HNS convention**

### **(Expectation for the HNS convention)**

From an incident response viewpoint, it might be beneficial to have strong support for incident compensation under the HNS Convention.

→ To minimize the incident damage, it is important to allocate significant manpower and logistical support to incident response. This could enable a quicker initial response to the severe HNS spill incident by the HNS convention.

### **(Preparation and readiness by MDPC)**

As the concept of carbon neutrality gains momentum, MDPC is also concerned about incident response involving next-generation fuels such as ammonia and hydrogen.

MDPC will continue to take the following measures to respond appropriately to HNS incidents.

- With the spread of new fuels, seafarers and energy facility personnel will have more opportunities to handle new substances in the future. MDPC will therefore promote the establishment and development of systems to provide education and training that covers these new substances.
- In order to respond appropriately to ship owners and others requests for incident response, including new substances, the MDPC will promote the enhancement and strengthening of incident response systems, including the maintenance and development of necessary equipment and materials, and the education and training of staff and disaster prevention contractors who perform initial response measures with MDPC.



Thank you

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