An Overview of Oil Spill Modelling and Monitoring in Trinidad and Tobago

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Activities in the area

- Oil and gas exploration
- Port development and operations
- Marine transportation and transshipment
- Fishing
- Tourism
Oil Spills Reported for 2017

- 21st January 2017 - Coffee Beach, La Brea
- 29th March 2017 - Techier Village and Mahaica, Pt. Fortin
- 23rd April 2017 - (Tank 70)
- 5th August 2017 - Pt. Sable and Carat Shed, La Brea
- 14th October 2017 - Chaguaramas
- 16th November 2017 - Soldado
- 8th December 2017 - Moruga
# TT National Oil Spill Contingency Plan

<table>
<thead>
<tr>
<th>Spill Type</th>
<th>Tier 1</th>
<th>Tier 2</th>
<th>Tier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Spill (&gt;700 bbls)</td>
<td>Tier 3</td>
<td>Tier 3</td>
<td>Tier 3</td>
</tr>
<tr>
<td>Medium Spill (the greater of 700 bbls or 10% WCD)</td>
<td>Tier 2</td>
<td>Tier 2</td>
<td>Tier 3</td>
</tr>
<tr>
<td>Small Spill (the lesser of 50 bbls or AMPD)</td>
<td>Tier 1</td>
<td>Tier 2</td>
<td>Tier 2</td>
</tr>
</tbody>
</table>

*AMPD-Average Most Probable Discharge *WCD – Worst Case Discharge
Incident Command System

Incident Commander
Tier 1 - Responsible Party (RP) or TTCG for mystery spills
Tier 2 - Responsible Party, MEEA, TTCG, TTAG, TTR
Tier 3 - MEEA, RP, MSD, TTCG, TTFS, IMA, EMA

Command Staff
Information officer - MEEA, EMA, ODPM
Liaison Officer - MEEA
Safety Officer - OSHA, RP + TT Fire Service, MEEA (T2 and T3)

Operations-MEEA, TTCG, TTAG
Containment
Recovery
Disposal

Logistics-MEEA, RP
Spill Access
Equipment Expediting
Accommodation
Catering
Evacuation

Planning-MEEA, RP + EMA, IMA, MSD, TTCG
Status Report
Environmental Monitoring
Documentation
Demobilization
Resource and Response Strategies

Finance-MEEA, RP + EMA, MSD
Payments
Invoicing
Cost Control
Administration
Requirements

• Need for full implementation of the National Oil Spill Contingency Plan (NOSCP)

• Regulating and requiring that offshore operators prepare detailed Emergency Response Plans (ERPs)

• In-situ data on oil (type and presence)

• Maintain an operational forecast system to predict spill movement with quick response time
Institute of Marine Affairs (IMA)

Monitoring components

- **Dissolved/Dispersed** petroleum hydrocarbons
- **Adsorbed/Absorbed** petroleum hydrocarbons
- **Bioaccumulated** petroleum hydrocarbons
- **PAHs in mangrove oysters** as indicator

**Ground truthing**
- Aerial Imaging (e.g. UAV) and field surveys of beached spill

**Numerical modelling**
- Supported by CDL
- Predictions of landfall

**Predictions of landfall**
- Aerial Imaging (e.g. UAV) and field surveys of beached spill
Data collection for permitting process
CDL Operational Forecast Model

Oceanographic forecasting and oil spill modelling system for Trinidad and Tobago and the Eastern Caribbean Region.

Coastal Dynamics Ltd.
Environmental solutions

GFS
Global Forecast System

Copernicus
The European Earth Observation Programme

DHI
Oil Spill Trajectory Forecast / Hindcast Modelling

CDL uses three main oil spill models based on the desired output:

<table>
<thead>
<tr>
<th>Desired Output</th>
<th>Model Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quick response with probabilistic output</td>
<td>GNOME</td>
</tr>
<tr>
<td>Persistence of oil in the environment (Weathering of the oil)</td>
<td>ADIOS 2</td>
</tr>
<tr>
<td>Deterministic trajectory throughout water column and weathering of oil fractions</td>
<td>DHI’s Mike 3 Oil Spill (OS)</td>
</tr>
</tbody>
</table>
Case Study using CDL Forecast and DHI MIKE3 OS Model – Petrotrin Oil Spill
Petrotrin Oil Spill-17th December 2013

- Oil spill - Pointe-a-Pierre
- Origin of Spill – Lat 10° 19.1’N. 61° 28.4’ W
- Amount spilled: 7453bbls
- Type of Oils Spilled – Bunker “C” 6
- Time and Duration of Spill : 2 hours: 2:00 AM and 4:00 AM on the 17th December 2013
Case Study using NOAA’s GNOME OS Model – The Chaguaramas Oil Spill
Chaguaramas Oil Spill- October 15th 2017

- Oil spill observed along the Chaguaramas peninsula.
- Spill type: Bilge Oil
- Aim: Backtrack where the oil came from
- Scenario 8 (off of Point Cumana) gave results that were most comparable to what was observed.
Summary

• Develop a complete database of oils for Trinidad and Tobago
• Make reporting of spills easy and publicly accessible – social media
• Improve on implementation of NOSCP and public information dissemination
• No long term monitoring systems in place for spill monitoring
• Low spatial resolution in global model data for region
  • CDL (2011) developed 3D current forecast model – collaboration DHI Group (Denmark) to fill data gap
• Agencies do not have in-house modelling capabilities
• Accessibility to near real-time imagery at scale is not available
• Data needs:
  • Standardized methods for data collection, storage and presentation
  • Quality control of datasets
  • Confidentiality of data - Clarification of data ownership
  • Accessibility to public – data sharing
  • Training and capacity building (continuous QA of the data and methodology as staff is not continuous)
  • Inter-agency and inter-regional collaboration and agreement and execution of policies/goals - Many sources not well known to local users, such as satellite derived data etc.
• Encourage funding from the private and public sectors
Thank you

Questions?

Photo credit: Shaun Rambaran
CDL Forecast Model
Spill Assessment and Surveillance

• Confirmation made by TTCG-observations by aircraft, vessel, remote sensing, satellite

• TTCG reports to MEEA

• MEEA and IMA – arrange surveillance of oil slick and by use of met and hydrographic (supplied by met office and IMA respectively) predict probable movement

• If another state is likely to be threatened - MOFA (Min. of Foreign Affairs), TTCG and MSD (Maritime services Division will inform state through their counterparts
Sampling and Fingerprinting

- **IMA**
- **CARIRI and UWI St. Augusting Chemistry dept.** – assist in establishment of a National Fingerprinting Database for Trinidad and Tobago based on liquid hydrocarbons from oil, gas and petrochemical operations
- **TTCG** assist in collection of samples with EMA and MEEA- for marine spills
Clean up

• Incident Command Team – meet under chairmanship of the MEEA when summoned,

• A **National Resource Damage Assessment** must be carried out by EMA- supported by IMA, MEEA, MFP (Ministry of Food Production), WASA and the RP to determine the impact of the oil spill which will inform the best clean-up strategies and methodologies