Insights into the MOTEMS Audit Process

Presented by

William M. Bruin, P.E.
Principal Marine Engineer

Halcrow

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Co-Author of MOTEMS as Han-Padron Associates (HPA)
Conducted 2003 Northern California Trial Audit
Participated in 5 of first 10 Initial MOTEMS Audits of “High” Risk Terminals Submitted in 2008
MOTEMS AUDIT

- Periodic Review of the Complete Facility
  - Inspection / Condition Assessments
  - Engineering Evaluations / Verifications
  - Documentation
  - Determination of “Fitness-for-Purpose”
FITNESS-FOR-PURPOSE

- Section 3102F.3.1 – Audit Objective
- Expressed by MOTEMS Condition Assessment Ratings (CARs)
  - Considers Current Operational Function
  - Understanding of Existing Condition
- Requires Engineering Analysis
- Demand ≤ Capacity
STRUCTURAL INSPECTION

- **Section 3102F.3.5**
  - Document Existing Structural Condition
  - Establish Subsequent Inspection Intervals

- **Issues:**
  - Existing Condition Drives the Audit Process
  - Not Determination of Fitness-for-Purpose
  - Global vs. Local Condition
  - Above Water/Underwater CARS
    - Unclear – What is being rated?
    - Subject to misinterpretation
  - “Snap Shot” in Time
GEOTECHNICAL HAZARDS

- Section 3106F.4
  - Flow Slides
  - Slope Movements
  - Lateral Spreading

- Issues:
  - Inertial & Kinematic Loads on Piles?
  - Backland Surcharges are Important (Tanks, Piping, Buildings, etc.)
  - Big Consequences
  - Poison Pill
MOORING & BERTHING ANALYSES

- Section 3105F
- Issues:
  - Terminal Operating Limits
  - What is the “Design Vessel”?
  - Not All Fixes are Structural
    - Berthing Controls
    - Wind Limits
  - Mooring Ownership
SEISMIC ANALYSIS

- Section 3104F
- Issues:
  - Level 1 EQ May Govern Response
  - Strain Limits ≠ Structural Failure
  - “Low” Risk Classification
  - Focus on Oil Spill Prevention
FIRE MONITORS

- Section 3108F.6.5 - Fire Monitor System
  - Coverage of Vessel Manifold Required
  - “Unobstructed Path” Between Monitor & Target

- Issues:
  - Targeting
    - Direct Line-of-Sight vs. Ballistic Arc
    - Pre-Aiming vs. Remote Operating
    - Vessel Position Changes
  - First Responder Safety
Note Fire Monitors in RED Circle
FIRE HAZARD ASSESSMENT

- Section 3108F.2.1

- Issues:
  - Talking to the Right People
  - Exploring the Right Scenarios
  - Event vs. Consequence
  - Risk Ranking
## Risk Assessment Matrix

<table>
<thead>
<tr>
<th>Harm To People</th>
<th>Environment</th>
<th>Damage</th>
<th>Project Schedule</th>
<th>Facility Availability</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negligible</td>
<td>First aid injury</td>
<td>Within site boundary</td>
<td>Less than $50,000</td>
<td>Impacted up to 1 hour</td>
<td>Production Revenue loss less than 12 hours</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>Moderate</td>
<td>Medical treatment/ restricted work case</td>
<td>Within site boundary. Short term environmental impact</td>
<td>$50,000 to $250,000</td>
<td>Impacted 1 to 12 hours</td>
<td>Production Revenue loss 12 hours to 1 day</td>
<td>L</td>
<td>L</td>
<td>L</td>
<td>M</td>
</tr>
<tr>
<td>Significant</td>
<td>Day away from work case (temporary or permanent partial disability)</td>
<td>Outside site boundary. Localized pollution giving rise to significant environmental impact</td>
<td>$250,000 to $1,000,000</td>
<td>Impacted 12 to 48 hours</td>
<td>Production revenue loss 1 day to 1 week</td>
<td>L</td>
<td>L</td>
<td>M</td>
<td>M</td>
</tr>
<tr>
<td>Severe</td>
<td>Single fatality, injury resulting in permanent and severe disability. May prevent operational safety case acceptance.</td>
<td>Extended exceedance</td>
<td>$1,000,000 to $2,000,000</td>
<td>Impacted 48 hours to 7 days</td>
<td>Production revenue loss 1 week to 1 month</td>
<td>L</td>
<td>M</td>
<td>M</td>
<td>H</td>
</tr>
<tr>
<td>Catastrophic</td>
<td>Multiple fatalities, multiple serious injuries. Likely to prevent operational safety case acceptance.</td>
<td>Massive &amp; uncontrolled release</td>
<td>Over $2,000,000</td>
<td>Impacted greater than 7 days</td>
<td>Production revenue loss more than 1 month</td>
<td>L</td>
<td>M</td>
<td>H</td>
<td>H</td>
</tr>
</tbody>
</table>

- **1**: Very Unlikely
- **2**: Unlikely
- **3**: Possible
- **4**: Likely
- **5**: Very Likely
Unusual Scenario?

Truck goes over the curb and onto the pipelines!

Crash!
PIPELINE STRESS ANALYSIS

- Section 3109F.3 – Pipeline Stress Analysis
  - “Significant Seismic Displacements”

- Issues:
  - What is “Significant”? 
  - Linkage between the seismic structural analysis & pipeline stress analysis 
  - What is “Failure”? 
  - Consequences of “Failure”
MITIGATION ACTION PLAN

- Section 3102F.3.9
- Issues:
  - Mitigation is Continuous Process
  - How “Temporary” is Temporary?
  - Short/Medium/Long Term Repair Schemes
  - Repair vs. Rebuild
  - Continued Operations/Minimal Disruption
  - Early Discovery of Problems
FINAL COMMENTS

- Every MOT is Unique