Comprehensive Quantitative Assessment of an Offshore Firewater System

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Background

• Past Fire Protection design relies on codes
• Codes and standards are consensus derived & may not apply to offshore platforms because:
  • Flammable fluids under pressure
  • High population density
  • Tight spacing
  • Mixed activities
Problems with Code Designs

- Deluge systems may not protect from pressurized hydrocarbon releases
- High heat may prevent manual application of foam or water
- May not ensure escape is possible from fire hazards
General Steps in Fire System Design

1. Prepare general fire protection philosophy
2. Identify government, company, and industry requirements
3. Perform initial layout studies
4. Identify major hazards, fire zones & barriers
General Steps in Fire System Design

5. Establish preliminary water requirements by general guidelines

6. Determine preliminary pump and piping needs

7. Determine preliminary detection, shutdown and activation needs.
General Steps in Fire System Design

8. Check protection on escape paths and muster locations
9. Identify major hazards & system response.
10. Revise design to address shortcomings.
General Steps in Fire System Design

11. Refine the analysis by further iterations until all needs are met.

12. Once system demands are known, develop hydraulic model and test design.

Some Potentially Applicable Codes

- API 14G, C, J
- 46 CFR Ch 1
- ISO 13702
- NFPA 15
- NFPA 25
- NFPA 20
- NFPA 11
Typical Rule-set for Fire Analysis

• Typical Release Sizes
• Automatic & Manual systems detection and response times
• Transition pressures from jet to pool fires
• Pool sizes limitations
Example Radiation Limits

• Escape route blockage – >5 kw/m²
• Low pressure / light steel – 40 kw/m² > 5 min
• High pressure / heavy steel – 40 kw/m² >10 min
Example Radiation Limits

• Lifeboat failure – 10 kw/m² for > 5 minutes
• Hose Limit – 75 feet from 4 kw/m².
• Monitor Limit – 100 feet from 4 kw/m²
Fire Hazards Analysis Method

1. Identify major fire locations
2. Determine isolatable volumes
3. Assess release rates
4. Determine impacts
5. Identify required protection
6. Look for coverage gaps
Example
## FHA Results

<table>
<thead>
<tr>
<th>Time</th>
<th>Impacts</th>
<th>Demands</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Tanks 1-3, Escape Route</td>
<td>Mist 1</td>
</tr>
<tr>
<td>5</td>
<td>Tanks 1-3</td>
<td>Mist 1</td>
</tr>
<tr>
<td>10</td>
<td>Tanks 1, 3</td>
<td>Mist 1, FS 1</td>
</tr>
</tbody>
</table>
Hydraulic Model
Possible Enhancements

• Add additional barriers and controls

• Conduct more detailed structural response analysis

• Consider use of QRA to refine design focus