

Potential Improvements to Consequence Calculator

API RBI User Group Meeting
Houston Marriott Greenspoint

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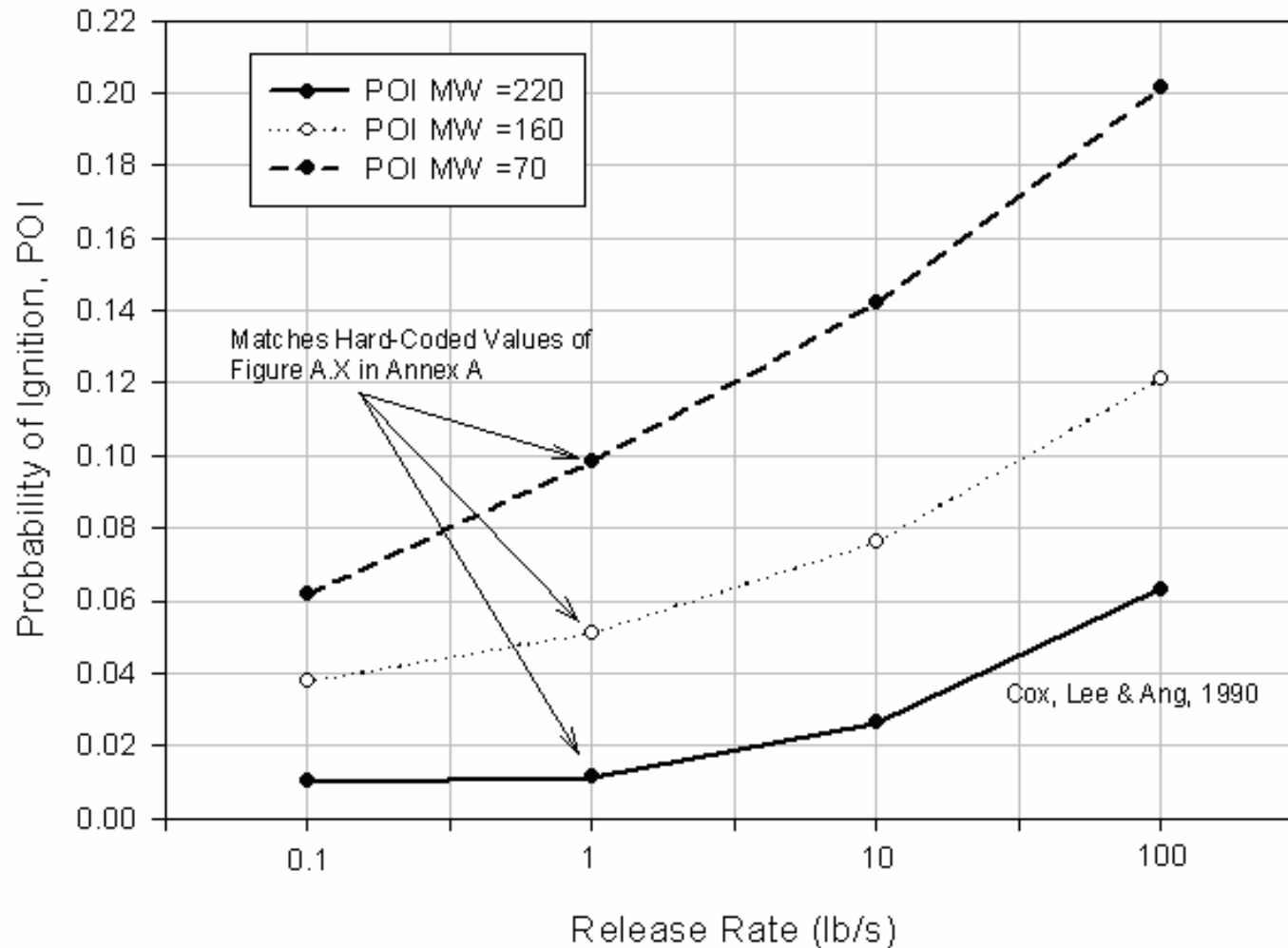
PROPRIETARY INFORMATION
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Potential Improvements

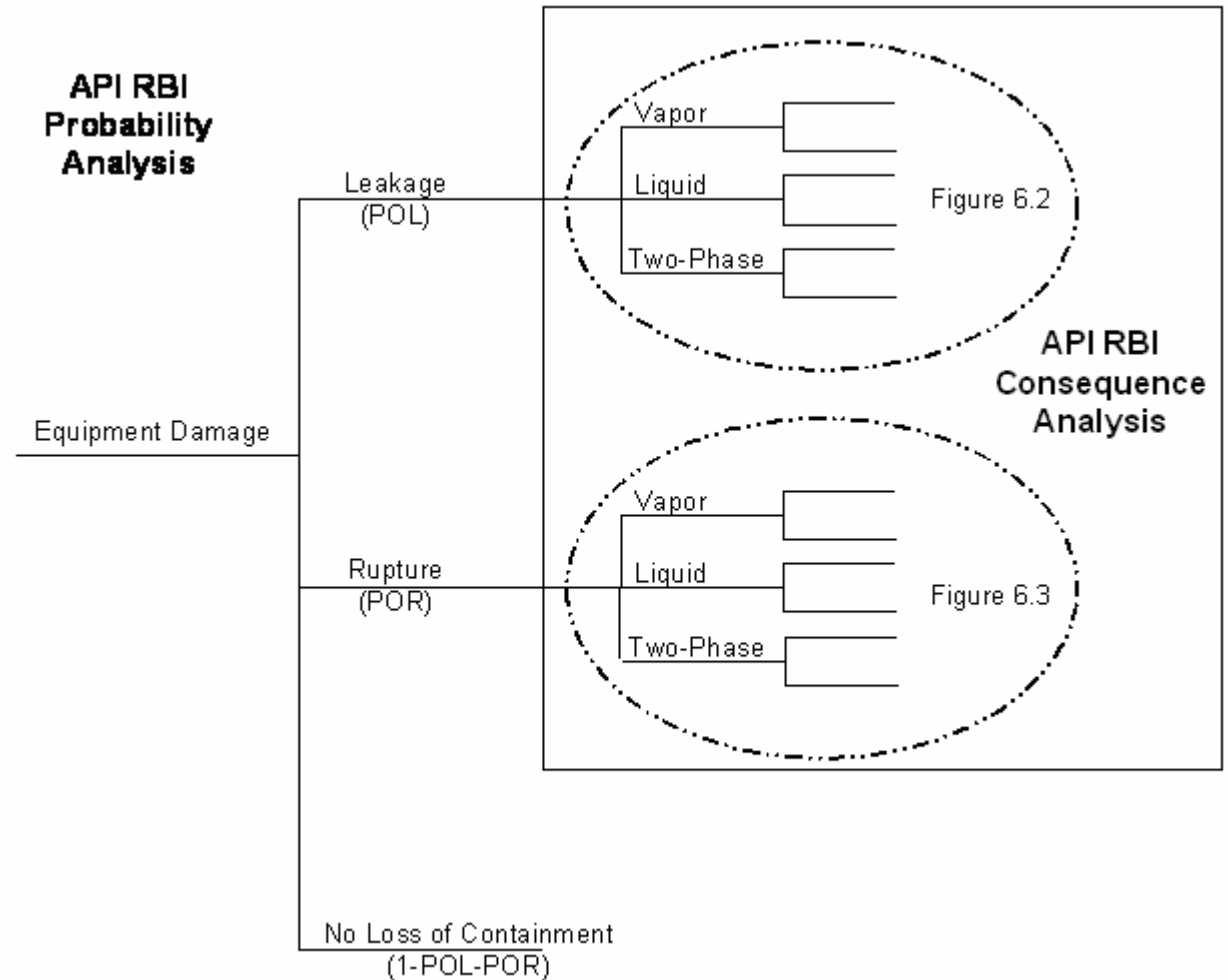
- Improvements to event tree probabilities
 - Research the Energy Institute in the United Kingdom work on POI, *Ignition Probability Review, Model Development and Look-up Correlations*, relates ignition probability to the mass release rate
 - Improve probability of immediate versus delayed ignitions, research Appendix 12 of the ARAMIS D1C July, 2004 document which includes a review of various immediate and delayed ignition probabilities found in the literature
 - Change probability of VCE versus Flash Fire to be a function of NFPA Reactivity coefficient
 - Change probability of ignition to be a function of flash point temperature instead of MW (see next slide)

Potential Improvements



Potential Improvements

- Modify event trees to incorporate the success or failure of operator intervention to limit a release



Potential Improvements

- Include financial consequences expected on control equipment after release of chlorine
- Current cloud modeling only includes calculations of concentrations related to inhalation effects
 - Modeling of specific fluids
 - Acetonitrile: Upon burning, produces a cloud of HCN gas
 - DMDS: Upon burning, produces a H₂S
 - Titanium Tetrachloride: Upon release, mixes with air and causes HCL rainout
- Add a neutrally buoyant cloud modeler to handle light gas releases such as H₂, Methane, etc.
- Several people have expressed the desire to be able to input new fluids from within the software
- Add proprietary lists of fluids to be activate based on license file

Potential Improvements

- Changes to Instantaneous/Continuous
 - Redefine the instantaneous release as 10,000 lbs in less than 1 minute (current is 3 minutes)
 - All liquid releases should be treated as a continuous release
- Release mass rate as a function of liquid level above leak point, include depressurization (i.e. pressure and flowrate is not steady state, decreases with time)
- Change explosion overpressure calculation from TNT equivalency method to TNO Energy method
 - Requires a measure of plant layout/equipment spacing
- Bring more results from the consequence calculation back to the front end of the software
 - Better understand what are main drivers
 - Individual event areas, event tree probabilities

Potential Improvements

- Release assumes inventory group mass is same fluid
- Bring more results from the consequence calculation back to the front end of the software
 - Better understand what are main drivers
 - Individual event areas, event tree probabilities
 - Why not provide a diagram of the actual event tree

Potential PRD Improvements

- Bring more results from the overpressure scenario calculation back to the front end of the software
 - Better understand what are main drivers
 - Why some PRD intervals do not match inspection plan for fixed equipment being protected
- Continue to improve reports to help validate inputs
- Add a single page output form for each PRD
- Allow other criteria for setting intervals
 - Financial Risk Target (\$/year)
 - Limit probability of fatality (1E-06)
 - Probability of Failure (failures/year)
- Ability to only evaluate Fail to Open risk by eliminating leakage risk at touch of button
- Calculator speed issues



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