Effective Storage Tank Risk Management Solutions

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What is “Risk”?

(Exposure to) the possibility of loss, injury, or other adverse or unwelcome circumstance;

a chance or situation involving such a possibility.

Saying it like an engineer…

- Risk = Σ (expected loss from an accident) x (probability of the accident occurring)

Regulations

- Federal, State and Local Government have established regulation to mitigate the most egregious and unacceptable risks
  - Worker Safety (OSHA)
  - Clean Water (SPCC)
  - State and Local Building Codes
  - State and Local Fire Codes

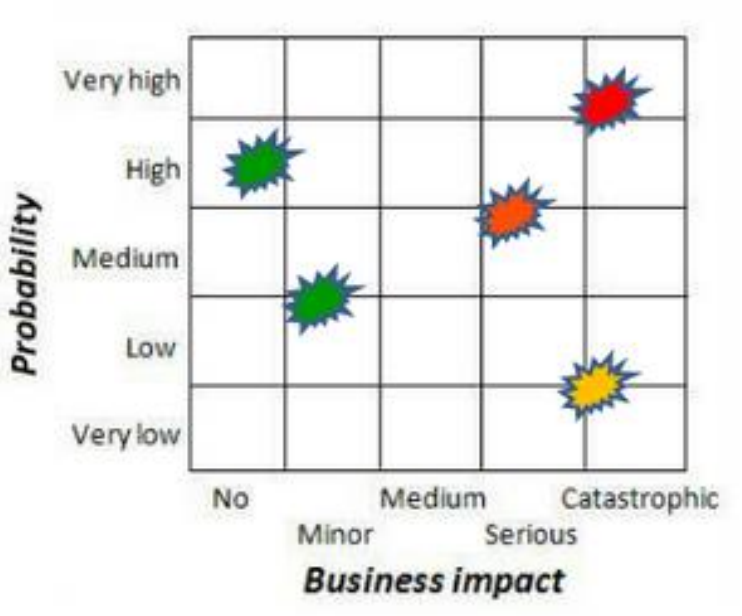
Industry Standards

- API 653 – Tank Inspection, Repair, Alteration and Reconstruction
- API 575 – Inspection of Atmospheric and Low-Pressure Tanks
- API 570 – Piping Inspection Code
- STI SP001 – *Standard for the Inspection of Aboveground Storage Tanks*
- UL 142 – Steel Aboveground Tanks for Flammable and Combustible Liquids

What is Risk Management?

- Is it…
  - Doing nothing and hoping that $h*t doesn't happen? (aka "risky business")
  - Covering up $h*t so it looks like it never happened? (aka "eyewash")
  - Hiring a consultant and doing all the $h*t that they tell you to do? (aka "are you nuts?")

Risk Analysis



A commonly used method for risk analysis is by plotting unforeseen or unwanted events in a **risk matrix**. This can be done **qualitatively**, where probabilities and impacts are subjective values (e.g. low/high and minor/major),or **quantitatively**, where probablities and impacts are objective values (e.g. frequency and cost in $$$).

Norman, A. and Lindroth, R. (2004) *Categorization of Supply Chain Risk and Risk Management*. In: Brindley, C. (Ed.) *Supply Chain Risk*. Ashgate, pp. 14-27.

What are the most probable “unwanted events”?

- Overflow/overfill
- Piping / Fitting Failure
- Internal Corrosion
- Alarm Failures
- Structural Failure

- Secondary Containment Failure
- Fire
- Lightning / Earthquakes / Hurricanes

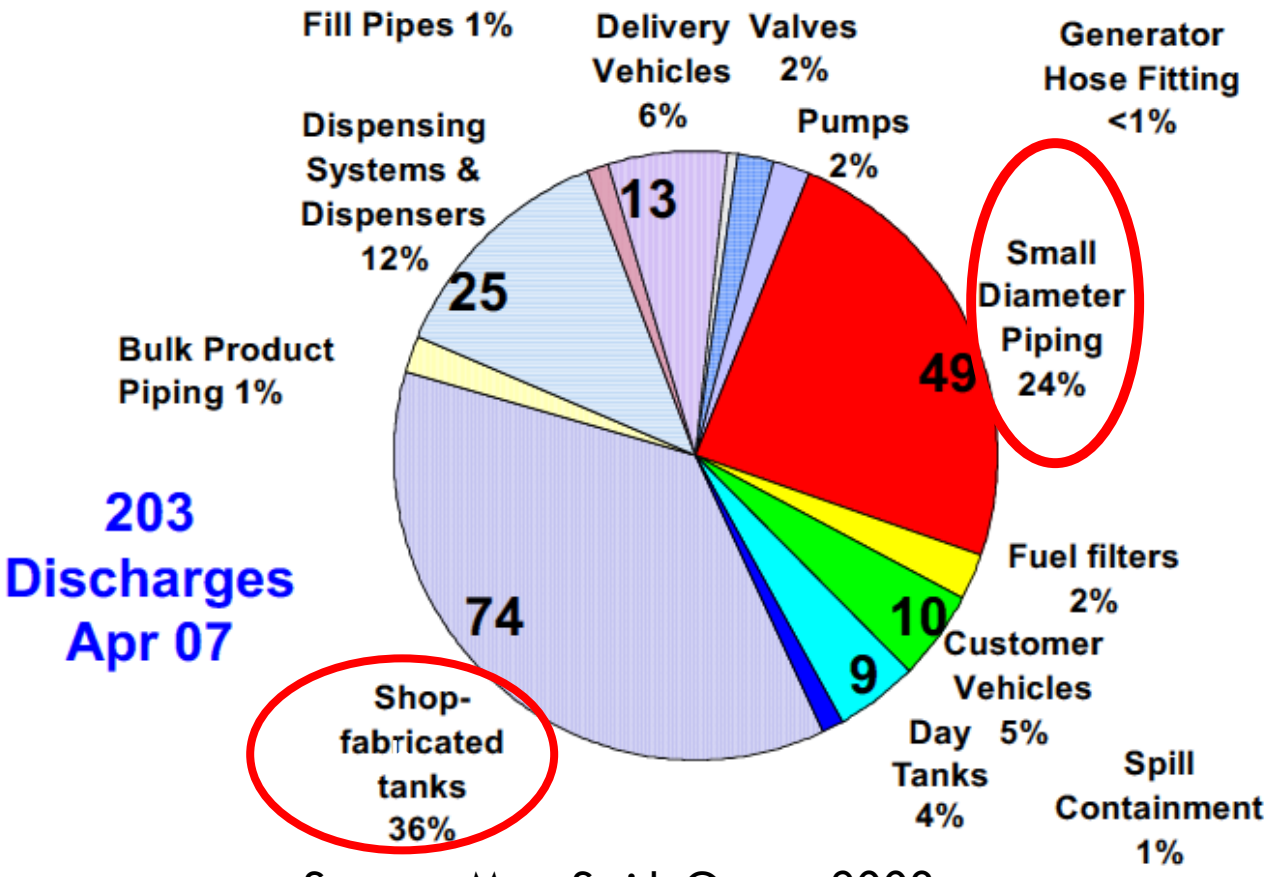
Tank and Petroleum Use Mishaps (STI, October 2014)

- 9/23/14 30,000 gallon tank bursts, spilling liquid asphalt in Vallejo, CA
- 9/24/14 Lightning strikes tank battery in Kansas, causes fire
- 10/8/14 Lightning strike ignites oil fire in Dorchester, TX
- 10/15/14 PA fines Western PA company over tank explosion

http://www.steeltank.com/Portals/0/tank_use_mishaps/news%201014.pdf

Florida Leak Autopsy (2007)

Sources of Discharges - Shop-fabricated ASTs



Source: Mott-Smith Group, 2008

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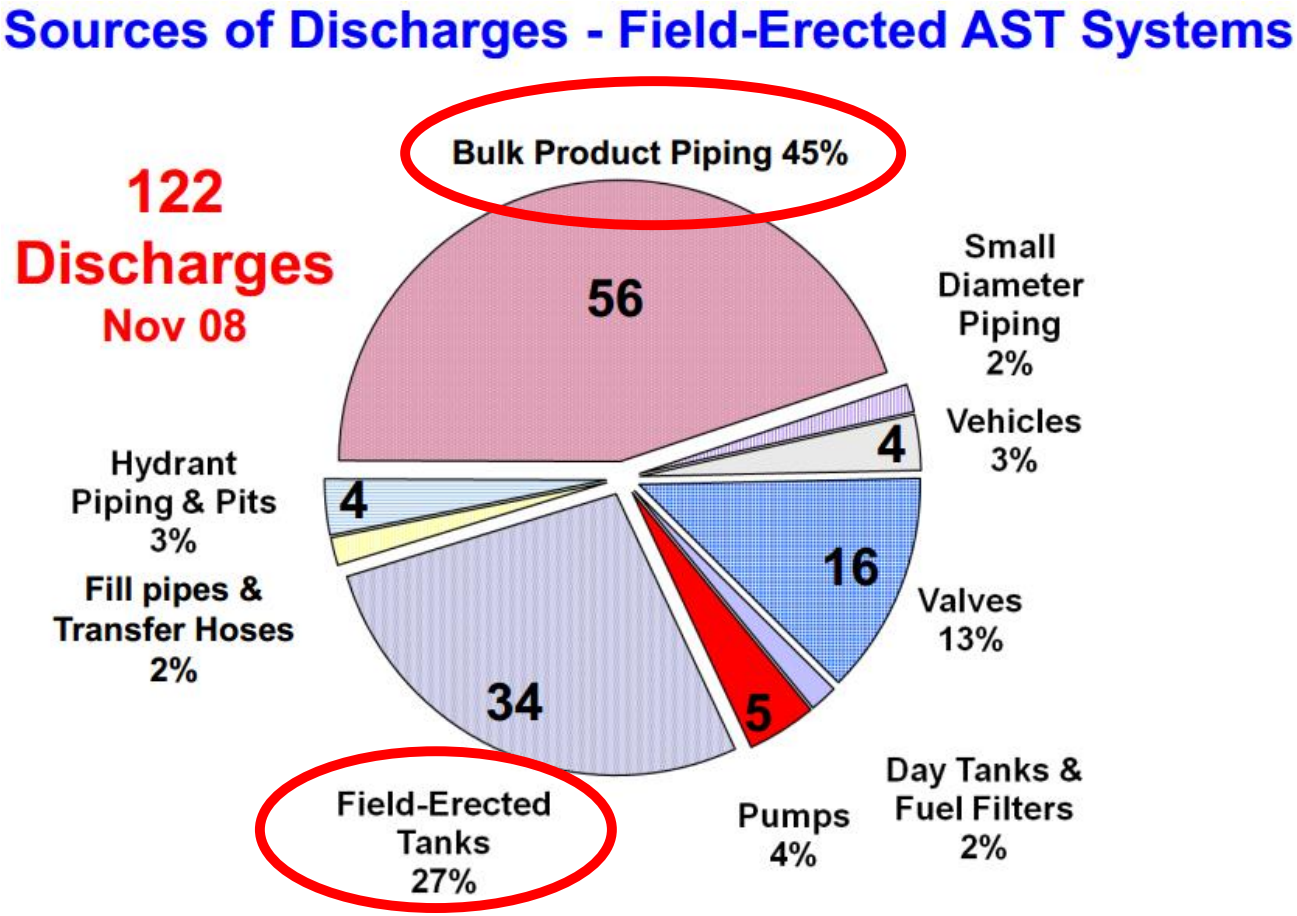
Florida Leak Autopsy (2008)



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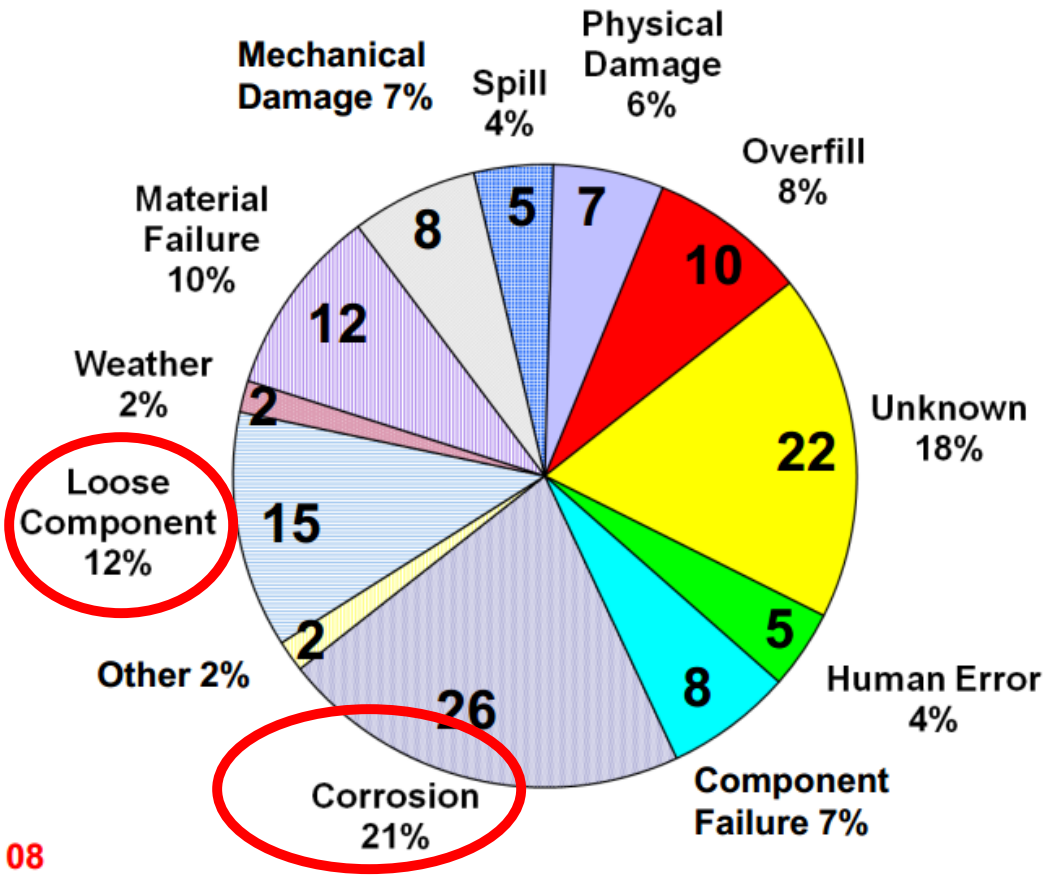
Causes of Discharges from All Sources



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What are the “Impacts” to your business?

- Loss of Inventory
- Loss of Equipment Use / Revenue Generation
- Administrative Hassle
- Financial Penalties
- Loss of Reputation
- Natural Resource Damages
- Loss of Business
- Criminal Penalties
- Loss of Life

Costs of Non-compliance - EPA Penalties

Pursuant to 40 C.F.R. Part 19 (Adjustments of Civil Penalties for Inflation) …….the maximum civil penalties that may be administratively assessed have been increased as follows: For violations occurring after January 12, 2009, up to $16,000 per violation per day for each day during which the violation continues, up to a maximum of $187,500.

EPA Enforcement Actions

- Transportation Company in MA
  - failure to prepare SPCC and submit MSGP
  - RFI covered 7 facilities
  - Multiple violations resulted in $237,000 penalty
  - PLUS, structural and administrative upgrades
- Bulk Fuel Distributor in VT
  - Oil released to river in 2003
  - Second release in 2007
  - RFI covered 5 facilities
  - Multiple violations resulted in $157,500 penalty
  - PLUS, structural and administrative upgrades over $250,000

Example: Asphalt Storage Tanks

- High sulfur products with elevated H2S
- Interior corrosion - tank bottom and roof
- Exterior corrosion – beneath insulation
- No inspection standard due to heated product

Risk Analysis

- High Probability Occurrence
  - Site personnel conducting tank gauging is exposed to H2S
  - H2S levels at manways can exceed 200 ppm
    - NIOSH IDLH is 200 ppm
  - Temperature exceeds 300 deg
- Business Impact
  - Injury or loss of life
  - Nuisance odors to neighbors

The resulting risk is in the upper right quadrant of our matrix.

This risk is unacceptable and must be addressed

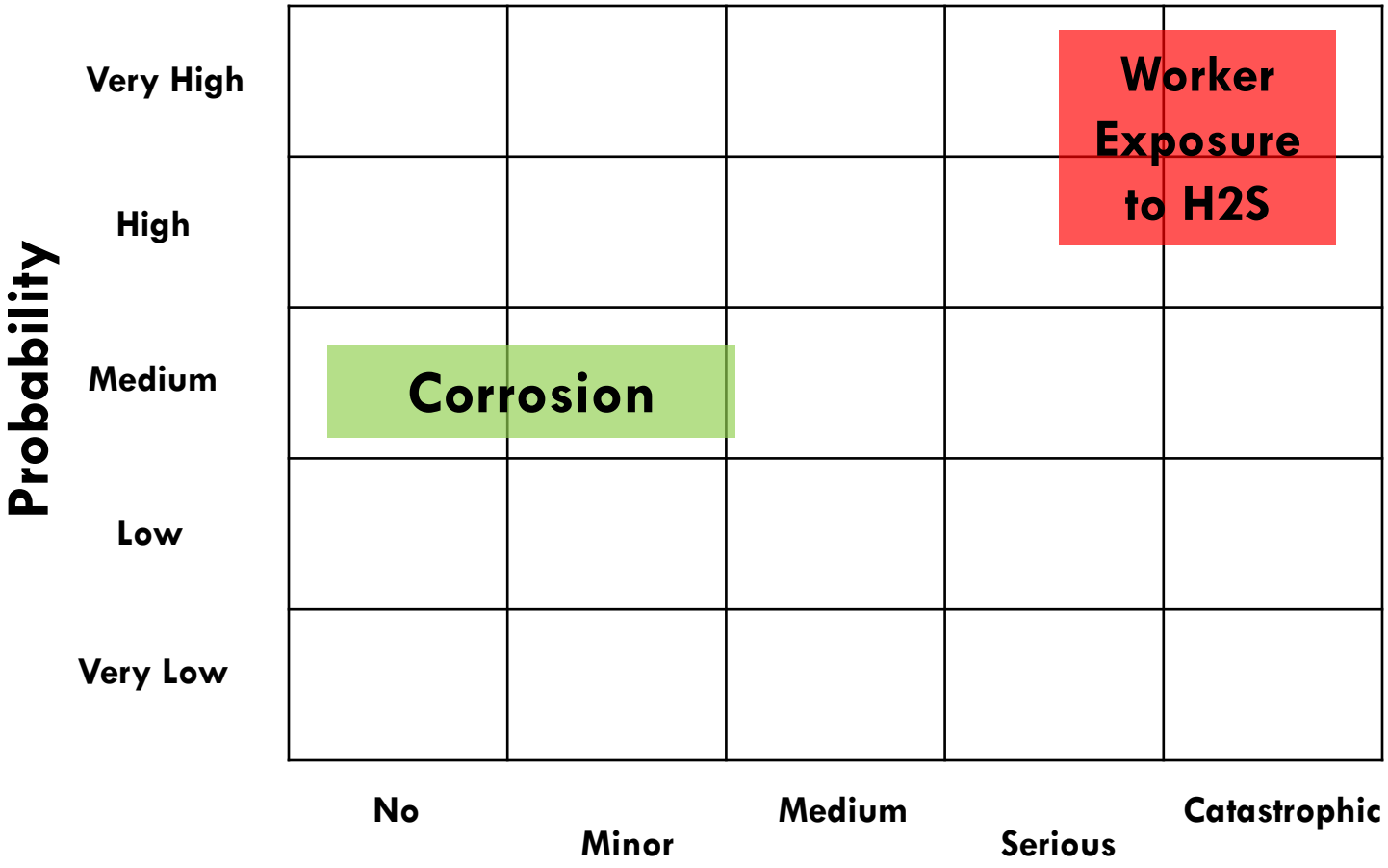
Risk Analysis

- Medium Probability Occurrence
  - Corrosion likely to cause leak in tank
    - Internal – high sulfur product
    - External – moisture beneath insulation
- Potential Impacts
  - Asphalt flows out of tank and solidifies with minor impacts

The resulting risk is low to moderate.

This risk can be addressed through a routine inspection and testing program and proper maintenance of insulation

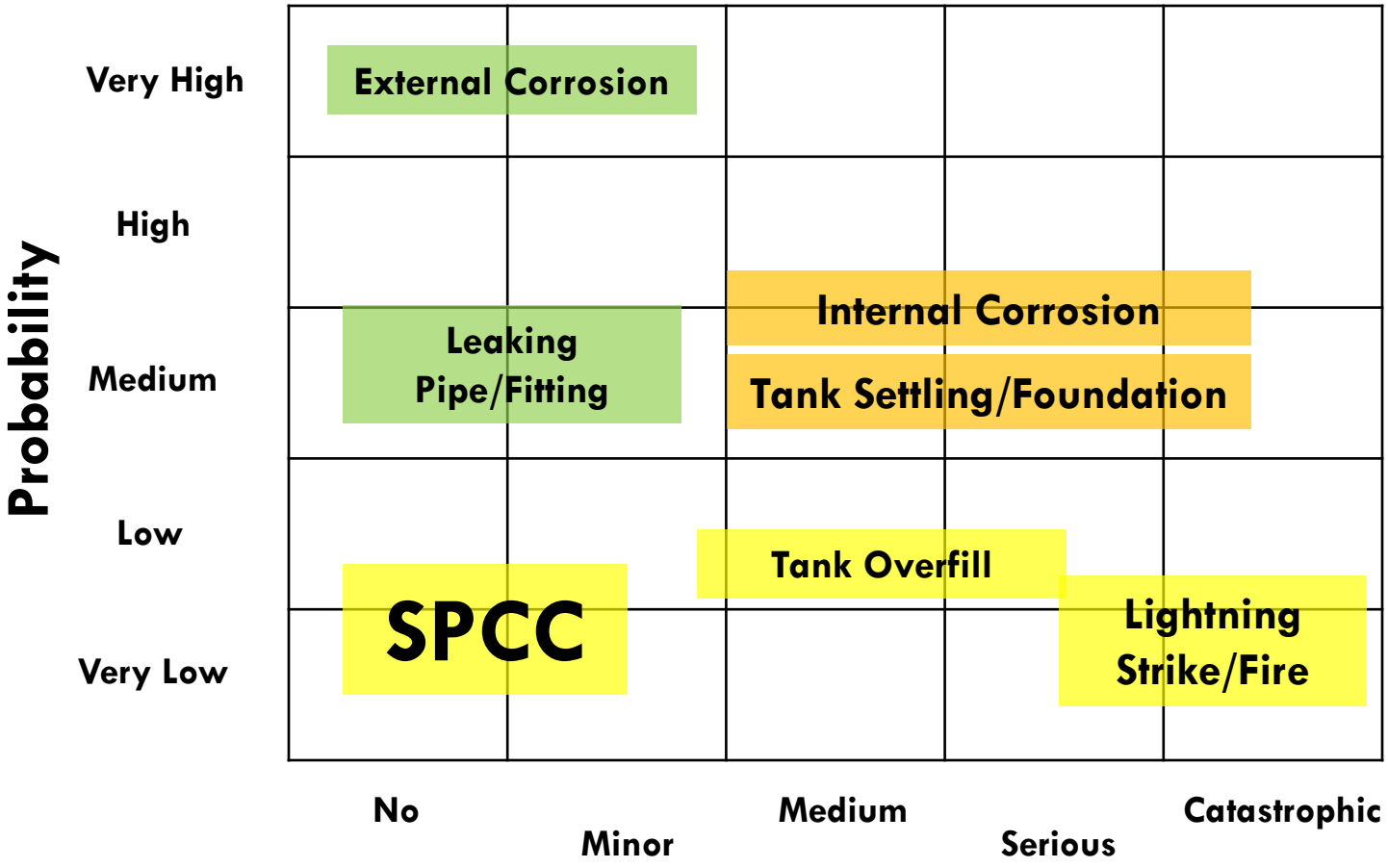
Risk Analysis-Asphalt Tank



Where does SPCC Fit in?

- SPCC Plans are typically treated as low priority and/or are superficially implemented.
- Arguably, SPCC Plans should be in the upper right quadrant of the Risk Analysis Matrix if you don't already have one.
- The SPCC Plan has inspection, testing, maintenance and training elements that help reduce risk across the matrix

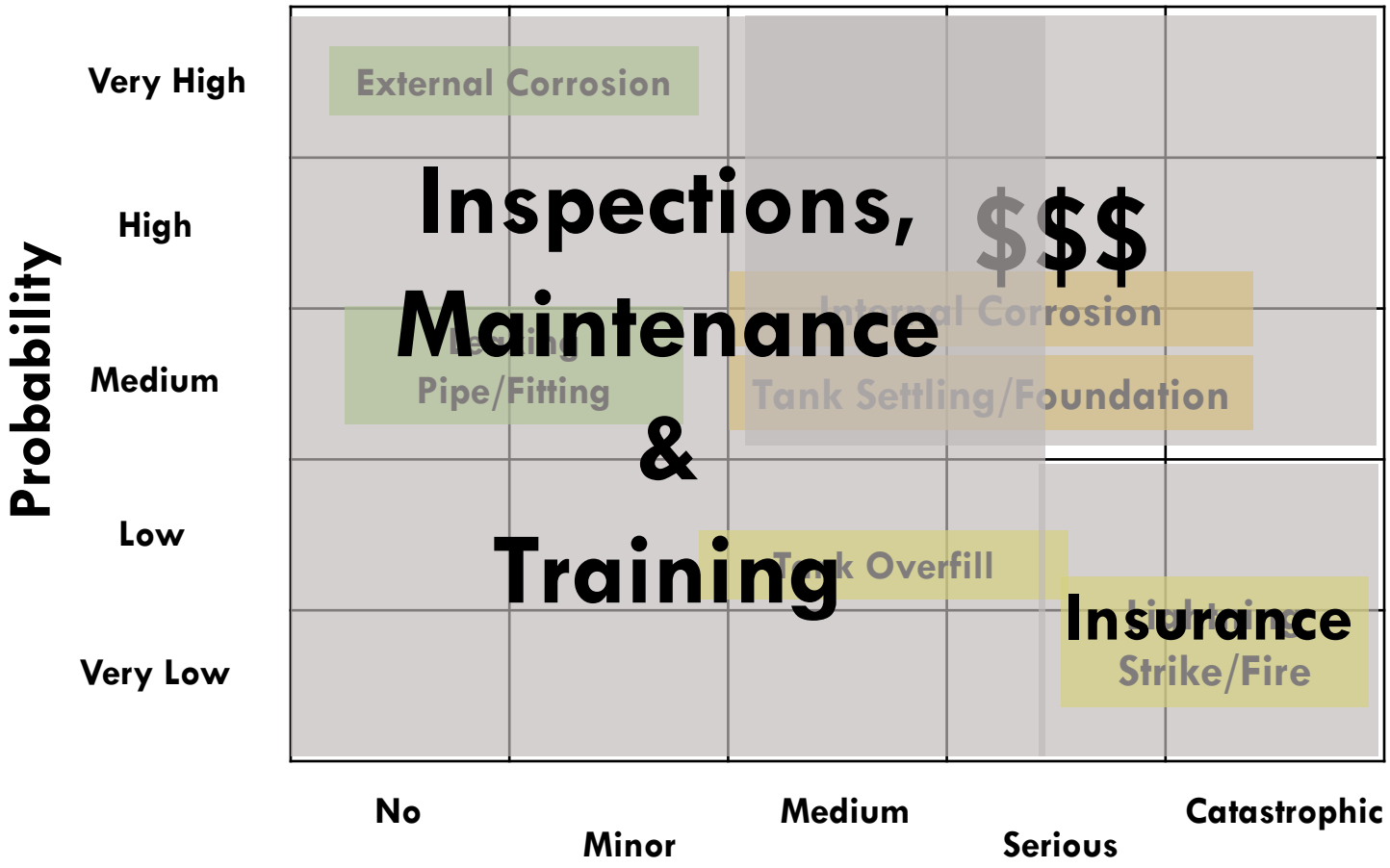
Risk Analysis-Typical Bulk Petroleum AST



News Releases from Region 1: Seven New England Companies Take Action to Improve Oil Spill Prevention Measures under Settlements

- Two Bulk Fuel Storage and Distribution Facilities in MA paid a combined $4,000 penalty to settle EPA allegations that they did not have a required oil spill prevention plan.
- Tool manufacturer in MA paid a $5,400 penalty to settle EPA claims that it did not have a spill prevention plan. The company has now prepared and implemented a spill prevention plan.
- A Charter Bus Company in Maine paid a $4,800 penalty to settle EPA claims that it did not have a spill prevention plan. The company has now prepared and implemented a spill prevention plan.
- A Marina in CT paid a $3,200 penalty to settle claims it did not have an adequate spill prevention plan. The company has now prepared and implemented a spill prevention plan.
- A Bulk Fuel Distributor in CT paid a $9,500 penalty to settle EPA allegations that it did not have an adequate spill prevention plan. The company is now in compliance with spill plan prevention requirements.
- A Bulk Fuel Distributor in VT paid a $3,000 penalty to settle EPA claims that it did not have a spill prevention plan. The company prepared and implemented a spill prevention plan.

Risk Analysis-Typical Bulk Petroleum AST



Strategic Tasks

- Inspections
  - Daily, monthly, yearly
  - Address issues promptly
- Testing
  - UT and internal inspections are invaluable
- Training
  - An educated employee is your best offense
- Maintenance
  - A stitch in time saves nine
- Documentation
  - If it's not documented, it never happened!

Inspections and Testing

Case Study: Why do I need testing?

- During annual inspection of facility, it was determined that one of the tanks was due for an in service SP001 inspection with UT testing.
  - That test (completed in 2004) indicated thinning of the steel on the tank bottom.
- Why test, he asked?
  - If the tank leaks, he'll see it, throw a mag patch on it and then fix the tank. From his intuitive risk analysis, this was not a high priority.

Case Study (con't)

- From a risk management perspective, there are many potential outcomes to consider:
  - A pinhole leak is a possibility, but a rupture is also a possibility if internal corrosion is extensive.
  - Rupture would shut the terminal down, potentially during heating season. That much oil puts everything else to the test. What if there is an undetected problem with the containment? What if there is already water in the dike? Cleanup costs begin to increase.

Documentation-Compliance Tracking Programs

- Storage of key documents
- Scheduling of Key Events
- Issue Tracking and Resolution

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Strategic Thinking

- Your best defense is a good offense
  - Be proactive with compliance
  - During or after a spill is NOT the time to start your compliance program!
- Collaborate with the regulators
  - Their main objective is to prevent releases
  - They will help you if asked
  - A cooperative attitude and quick response goes a long way
- There are many ways to achieve compliance
  - Evaluate your options first

Before Upgrade

Strategic Thinking

- How much storage do you really need?
- Do the tanks need maintenance?
- Is the containment adequately sized and sufficiently impervious?
- Perhaps right sizing the storage makes the most sense?

After Upgrade

It Won't Happen to Me…

- Nearly every one of my clients has had a major spill in the past 10 years
- Causes ranged from massive overfill of an AST to a dime sized hole in the tank bottom
- Nearly all of them were preventable
- In every case, operating changes were made to prevent reoccurrence

- How many consultants does it take to change a light bulb?

- It depends – “How large is your budget?”

Questions???