# Basing Loss Prevention Recommendations on Risk

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# Introduction

- Recommendations arise from
  - » Underwriters
  - » Audit Teams
  - » Management
- Fail to consider the Risk
- NOVA Risk Management uses Quantitative Risk Analysis to evaluate

# Single Facility or Scenario

- Recommendation aimed at single event
  - » Pool fire
  - » Jet Fire
  - » Explosion
- Can reduce frequency, probability, or consequences
- Calculate difference in expected loss

# Example 1 - Single Area

- Fireproofing costing $15,000
- Release frequency = 1 in 500 years
- Ignition probability = 1 in 5
- Damage for existing situation
  - » 95% - PD=$90k; BI=90 days @ $10k/day
  - » 5% - PD=$25M; BI=16 mo @ $10k/day
- Probable loss = $2,430,500

# Example 1 - continued

- Expected annual loss = $972.20/year or about $1000 per year
- Losses with fireproofing = negligible
- Probable savings = $1000 per year
- Probable return on investment = $1000 per year/$15,000 = .067/yr or 6.7% per year.

# Probable ROI for a Facility

- Recommendation affects total facility
- Expected losses must be calculated for each area for existing situation
- Calculation repeated with modification
- Expected savings are calculated
- Probable return on investment is calculated

# Example 2 - Facility Study

- Recommended a third fire water supply pump
- Installed cost = $200,000
- Reliability of existing pumps is .9 i.e. 1 failure per 10 demands
- Four units within the facility
- Liquid pool fires are the concern

# Existing Situation Data

| | Event Data | | 2 Pps Operate Prob. = 0.80 | | 1 Pump Fails to Operate Prob. = 0.19 | | 2 Pumps Fail to Operate Prob. = 0.01 | |
|---|---|---|---|---|---|---|---|---|
| Area | Freq | Ign | PD ($) | BI ($) | PD ($) | BI ($) | PD ($) | BI ($) |
| Feed Prep | .05/yr | 0.1 | 100k | 100k | 300k | 500k | 2M | 10M |
| Reaction | .10/yr | 0.05 | 500k | 700k | 900k | 1000 | 4M | 20M |
| Distillation | .10/yr | 0.2 | 100k | 100k | 200k | 300k | 1M | 20M |
| Prod Storage | .05/yr | 0.05 | 50K | 100k | 100K | 300k | .5M | 20M |

# Probable Loss - Existing

| | Expected Loss due to Fire (k$) | | | | | |
|---|---|---|---|---|---|---|
| Area | 2 Pumps Operate | 1 Pump Operates | No Pumps Operate | Total Loss ($) | Freq (fires/yr) | Probable Loss ($/yr) |
| Feed Prep | 160 | 152 | 120 | 432k | 0.005 | 2,160 |
| Reaction | 960 | 361 | 240 | 1561k | 0.005 | 7,805 |
| Distillation | 160 | 95 | 210 | 465k | 0.02 | 9,300 |
| Prod Storage | 120 | 76 | 205 | 401k | 0.0025 | 1,002 |
| Total | | | | | | 20,267 |

# Data for Modification

| | Event Data | | 1 Pump Fails to Operate Prob. = 0.970 | | 2 Pumps Fail to Operate Prob. = 0.029 | | 3 Pumps Fail to Operate Prob. = 0.001 | |
|---|---|---|---|---|---|---|---|---|
| Area | Freq | Ign | PD ($) | BI ($) | PD ($) | BI ($) | PD ($) | BI ($) |
| Feed Prep | .05/yr | 0.1 | 100k | 100k | 300k | 500k | 2M | 10M |
| Reaction | .10/yr | 0.05 | 500k | 700k | 900k | 1000 | 4M | 20M |
| Distillation | .10/yr | 0.2 | 100k | 100k | 200k | 300k | 1M | 20M |
| Prod Storage | .05/yr | 0.05 | 50K | 100k | 100K | 300k | .5M | 20M |

# Probable Loss - Modified

| Area | Expected Loss due to Fire (k$) | | | | | |
|---|---|---|---|---|---|---|
| | 2 Pumps Operate | 1 Pump Operates | No Pumps Operate | Total Loss (k$) | Freq. (fires/yr) | Probable Loss ($/yr) |
| Feed Prep | 194 | 23.2 | 12 | 229.2 | 0.005 | 1,146 |
| Reaction | 1164 | 55.1 | 24 | 1243.1 | 0.005 | 6,216 |
| Distillation | 194 | 14.5 | 21 | 229.5 | 0.02 | 4,590 |
| Prod Storage | 145.5 | 11.6 | 20.5 | 177.6 | 0.0025 | 444 |
| Total | | | | | | 12,396 |

# Probable Return on Investment

- Probable annual loss - existing =$20,267/yr
- Probable annual loss - modified =$12,396/yr
- Potential savings = $7,871/yr or approximately $8,000/yr
- Probable ROI = .04/yr or 4%/yr

# Case Study - Nova Chemicals

- Recommended that Nova
  - » add a second diesel-driven pump
  - » install a supply from the county
- Installed cost of $600,000
- Analysis addressed loss due to fire
- Considered 19 separate systems
- Used plant personnel for data

# Case Study - Results

- The existing case represented an average loss of $148k/yr
- The modified case produced an average loss of $114k/yr
- Potential savings of $34k/yr
- Probable rate of return of 6%
- The modifications could not be justified

# Case Study - Other Concerns

- Potential failure of the water supply storage tank
- Major source of loss was from the compressor area due to poor drainage
- The deluge at the hexene storage bullet was designed for butene.

# Case Study - Recommendations

- Do not install a second diesel-driven firewater pump.
- Install a larger supply from the MOEE
- Provide a by-pass around the water supply tank.
- Install drainage and holding facilities for lube oil spills in the compressor area.

# Case Study - Recommendations

- Provide foam protection for the hexene storage area.
- Inspect the bottom of the firewater supply tank at the earliest opportunity.

# Follow-up to the Study

- Expected frequency of complete electrical failure was 1 in 50 years when the original study was completed.
- Recent events have resulted in three complete power failures in 3 years.
- Expected losses will be significantly higher given the higher failure rate.
- What will be the result when the calculations are repeated?