

Process Safety Risk Reduction Approach An Insurance Risk Engineering Perspective

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The insurance market

- Specialist oil and gas market
- Most upstream property risks placed in the marine market
- Most downstream property risks placed in non-marine market
- Historical differences in underwriting approach
- Some recent convergence in technical aspects of underwriting



The price you pay

- There is no direct correlation between risk quality and absolute premium costs
- The pricing drivers
 - Supply and demand
 - Estimated Maximum Loss (EML)
 - Claims record
 - Risk quality factors (asset integrity etc)



The risk quality factors

- Inherent risks
 - process conditions – temp, pressure, ΔH , corrosivity
 - risk type - floating, fixed, proven/ prototypical, well depth/pressures
- Location risks – windstorm, earthquake, flood, political
- Hardware – i.e. equipment design and construction
- “Software” – i.e. management systems
- Emergency control

Marsh Risk Ranking - Assessment basis

4 Excellent The very best of current day practice in the industry; an industry leader

3 Good Embodies some of the best practices in the industry

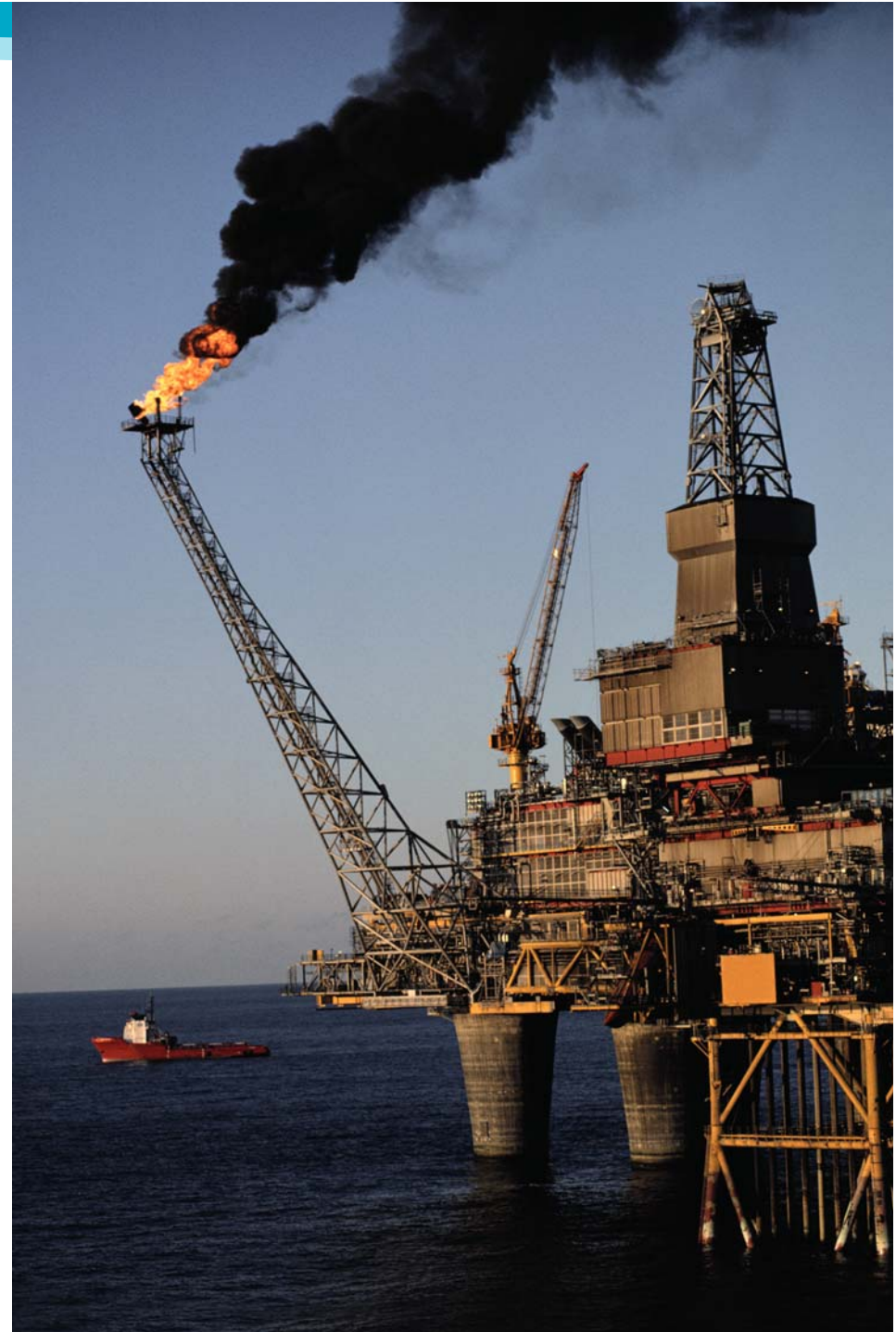
2 Standard Acceptable standards exhibited but with room for improvement

1 Basic Some areas below the standard of current day practice with considerable potential for improvement

0 Poor Embodies few or none of the standards expected of current day practice with major improvements required

Hardware features

- H1: Location/Climate
- H2: Engineering Standards
- H3: Installation Layout
- H4: Module Layout
- H5: Fireproofing & Blast Walls
- H6: Drainage, Kerbing, Effluent
- H7: Modules (Ventilation & Construction)
- H8: Control Rooms
- H 9: Installation Jacket
- H10: FSO / FPSO
- H11: Process Control
- H12: Isolation, Depressuring and Dumping
- H13: Pressure Relief and Flare
- H14: Utility reliability
- H15: Machinery features
- H16: Turbine Protection & Combustion Safeguards
- H17: Unloading / Loading Support Vessels
- H18: Standby Vessels
- H19: Drilling & Workovers
- H20: Wells & Subsea Assets
- H21: Associated Platforms / Installations



Management Systems

- S1: Corporate Loss Control Policy
- S2: Recruitment and Training (Operations)
- S3: Ergonomics & Operability
- S4: Systems of Work
- S5: Control of Ignition
- S6: Maintenance Overview
- S7: Maintenance Electrical
- S8: Maintenance Mechanical
- S9: Maintenance Instruments
- S10: Inspection
- S11: HS&E
- S12: Security
- S13: Housekeeping
- S14: Quality Assurance
- S15: Contractors
- S16: Environmental Monitoring

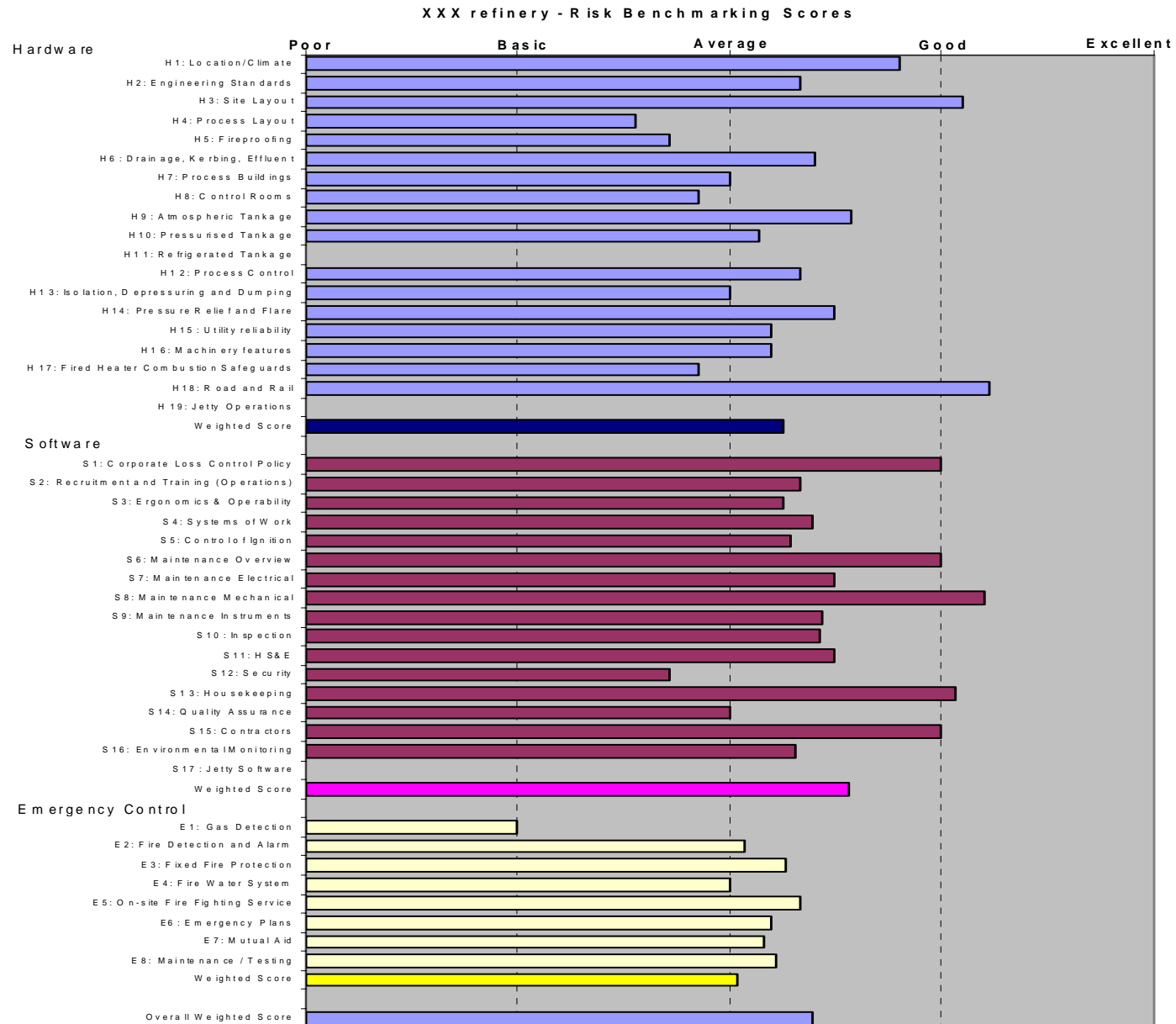


Emergency Control features

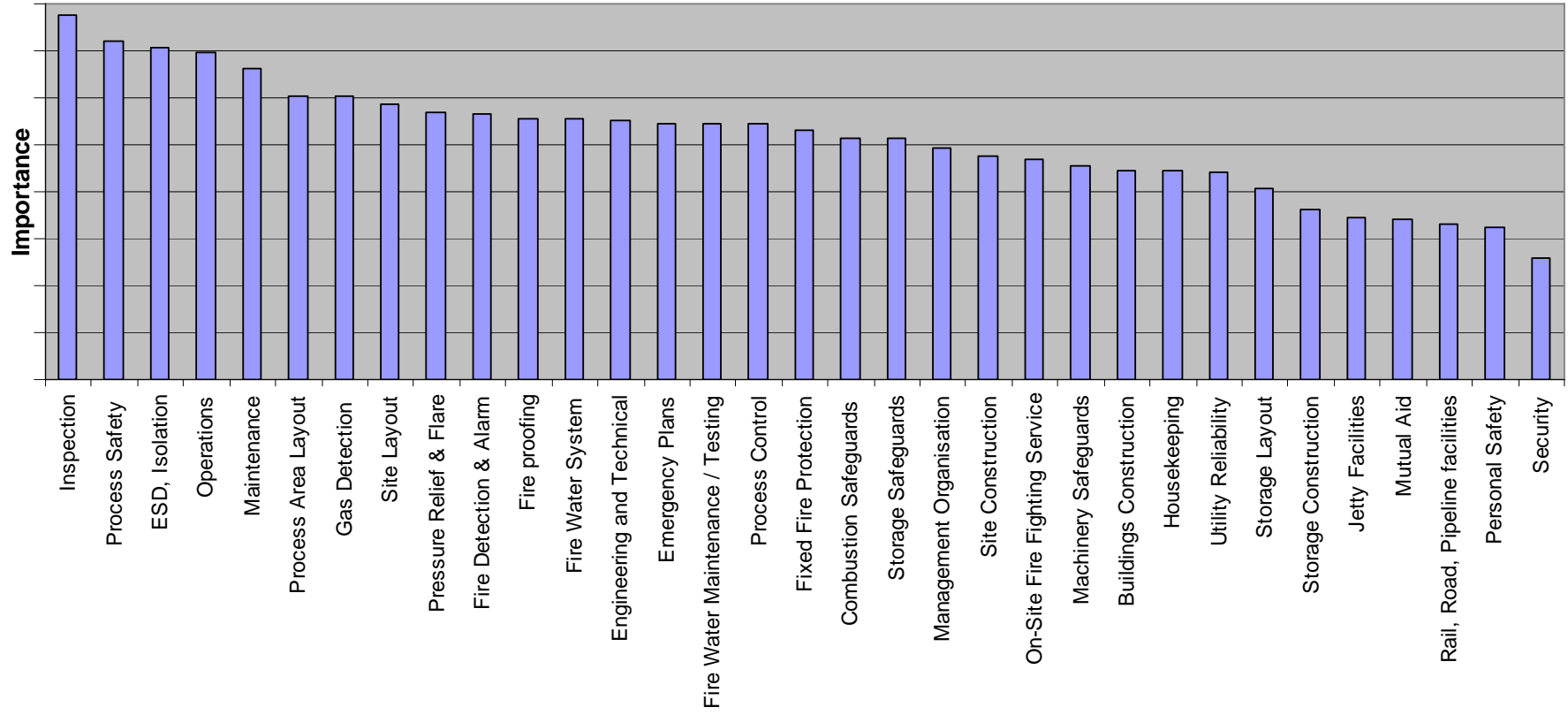
- E1: Gas Detection
- E2: Fire Detection and Alarm
- E3: Fixed Fire Protection
- E4: Fire Water System
- E5: On Board Fire Fighting Provision
- E6: Emergency Plans
- E7: Offshore Support
- E8: Maintenance / Testing



Risk Ranking



The Insurance Market Priority Order



Top ten areas of concern in rating risks

- Inspection
- Process Safety - including Performance Indicators
- ESD, Isolation, Depressurisation and Dumping
- Operations - including Manning, Training, Systems, Procedures
- Maintenance
- Process Area Layout
- Gas Detection
- Site Layout
- Pressure Relief & Flare
- Fire Detection & Alarm

The underwriter's problem

- Some risks tick all the boxes
 - good hardware
 - good management systems
 - good emergency control features
- BUT... some good risks still have major losses
- So what do we need to measure to better predict the likelihood of a big loss?
- For below average risks the underwriter could then either
 - charge a higher premium, or
 - impose a bigger deductible, or
 - avoid the risk completely

Asset integrity management systems – the requirements

- 1) A well structured and appropriate system/procedure for each control
- 2) Adequate resource to implement the control
- 3) Competent resource to implement the control
- 4) Actually *implement* the control

Insurance surveys have become quite skilled at assessing the first three needs

The thrust now is to evaluate better the level of implementation

This is in line with industry move towards leading KPI's

What KPI's to measure?

- No definitive list
- Difficulties in making directly comparable indicators across the industry
- Consensus seems to be to have each asset or business develop specific KPI's for own benefit
- An insurance driven approach?

An insurance driven approach to KPI's?

- Review 100 largest property insurance losses
- Identify the barriers which failed in each case
- Determine which KPI could have highlighted the failed barrier(s)
- Leads to a property damage driven set of KPI's
- A similar approach could be taken for fatal accidents



What issues would these KPI's likely address?

A personal view....

- Corrosion of piping
 - Control of safety system defeats
 - Implementation of work permits
 - Effectiveness of MOC
 - Operator training in process upsets
- and specifically for offshore
- Anchor drag on pipelines
 - Structural resilience against the wind

An insurer's favourite KPI ?

- Insurers' risk engineers often focus on
 - Issues which caused the last loss they paid out
 - Issues which caused big losses they paid out over last 20 years
- Learning from incidents





Date	1989
Country	USA
Duration	1
Fatalities	23
Injuries	314
Financial Loss (PD)	\$1,112m
Financial Loss (BI)	\$1,095m
Financial Loss (TPL)	\$486



Date	1998
Country	Australia
Duration	2
Interruption	90
Fatalities	2
Injuries	8
Evacuated	120
Financial Loss (PD)	\$596m



Date	2005
Country	USA
Fatalities	15
Injuries	105



Date	2008
Country	USA
Duration	1
Injuries	2
Loss (PD+BI)	\$385m

Learning from mistakes

- Losses occur in upstream and downstream sectors of oil industry
- Losses occur worldwide
- Losses occur in multi-nationals, NOC's and independents
- History suggests ... losses will continue to occur

Some questions

- Is each one of these incidents from a unique cause?
- Could some of these incidents have been prevented by learning from earlier mistakes?
- Why did we not learn all of these lessons?
- Will we repeat these mistakes in future?

Longford Royal Commission Report

“Those who were operating GP1 on 25 Sept 1998 **did not have *knowledge* of the dangers associated with loss of lean oil flow and did not take steps necessary to avert those dangers. Nor did those charged with supervision of the operations have the necessary knowledge and the steps taken by them were inappropriate**”.

Texas City enquiry report

Raffinate Splitter Startup Procedures and Application of Skills and Knowledge-

“Failure to follow the startup procedure contributed to the loss of process control. **Key individuals (management and operators) displayed lack of *applied skills and knowledge* and there was a lack of supervisory presence and oversight during this startup.**”

The insurance industry preferred KPI?

- Do you have a system for capturing lessons from incidents *across the industry worldwide*?
- Do you have a system for *deeply embedding* the lessons learned?
- Suggest development of an industry wide KPI for measuring effectiveness of this process

How Risk Engineering Drives Underwriting Decisions

- *Risk Quality assessment* – first step and most important key in underwriting process
- Evaluate and understand magnitude of exposures
- Estimate maximum loss potential (EML) to help establish capacity commitment
- Assist in portfolio management
- Industry loss trend and loss drivers
- Lessons learned
- Risk improvement through recommendations

Conclusions

- Risk Engineering and Underwriting goes hand in hand and risk selection is key to underwriting success
- Insurance industry has vast “library” of lessons learned from losses as well as best practices worldwide to share
- Insurance Risk Engineers are additional resources to help risk improvement and hence loss prevention
- Insurance can cover the tangible losses but not the intangible ones such as loss of reputation, loss of market share etc.
- We all have a common goal – to prevent losses and contribute to the success of our businesses!!

Marsh Global Energy Risk Engineering

Our approach

- Partner with client to achieve risk management objectives
- Ensure insurance markets obtain a balanced view of risk
- Only cost effective and risk based recommendations made..
- Strong focus on major accident hazards
- Liaise closely with broking colleagues
- Maintain professional integrity and independence





Company Registration Number: 197200396D