



Process Safety Management

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Decades of Learning, and Relearning . . .

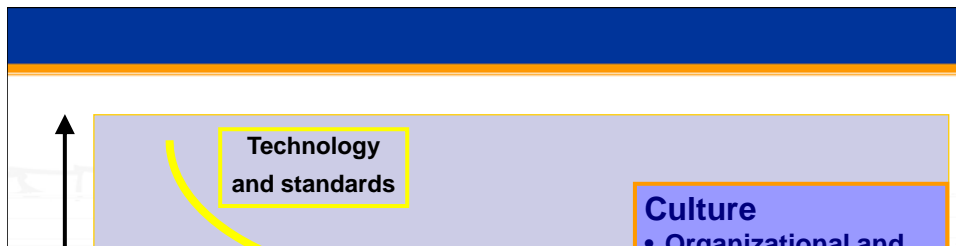
Year	Location/Event	Deaths	Injuries
1974	Flixborough, England / VCE	28	?
1976	Seveso, Italy / Runaway Reaction	?	?
1984	Mexico City, Mexico / LPG release	650	?
1984	Bhopal, India / MIC release	2,000+	?
1985	Institute, WV / MIC event	0	135
1987	Grangemouth, Scotland / VCE	1	0
1988	Henderson, NV / Explosion	2	350
1989	Prince William Sound / Grounding	0	9
1989	Pasadena, TX / VCE	24	132
1990	Channelview, TX / Tank explosion	17	0
1997	Martinez, CA / Runaway reaction	1	46
1998	Longford, Australia / VCE	2	8
2001	Toulouse, France / Explosion	31	2,400+
2005	Texas City, TX / VCE	15	170
2010	Gulf of Mexico / VCE	11	17



Even More Learning and Relearning . . .

Year	Location/Event	Deaths	Injuries
1979	Three Mile Island / Core damage	0	?
1979	Chicago, IL / Airplane crash	241	0
1981	Kansas City, MO / Walkway collapse	114	216
1986	Kennedy Space Center / Explosion	7	0
1986	Chernobyl, USSR / Meltdown	30+	?
2000	Paris, France / Airplane crash	113	6
2003	Skies over Texas / Reentry failure	7	0
2006	Upshur County, WV / Mine explosion	12	1
2008	Port Wentworth, GA / Dust cloud expl'n	14	?

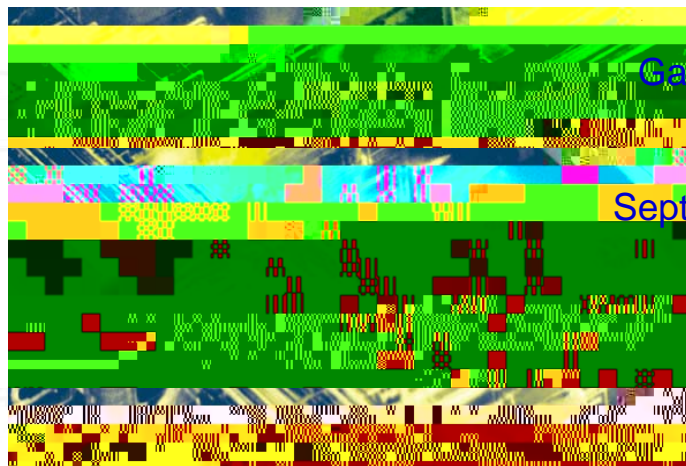
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ASME Sec. I
ASME B31.1

Employee Participation



Gas Explosion,
Longford,
Australia,
September 1998

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Process Safety Information



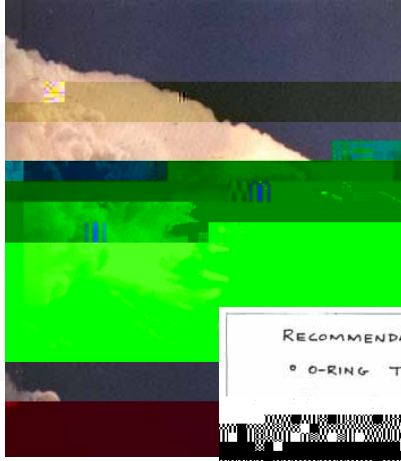
Runaway Reaction
Involving
Hydroxylamine
Hanover Township, PA,
February 1999

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Training



Pre-startup Safety Review



Initial Thiokol recommendation at second teleconference [on the evening before the launch]:

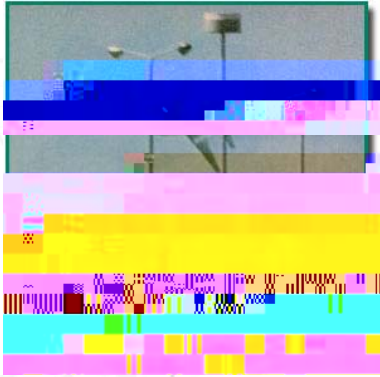
O-ring temp must be 53°F [~12°C] at launch

RECOMMENDATIONS :

° O-RING TEMP MUST BE \geq 53 °F AT LAUNCH

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Mechanical Integrity



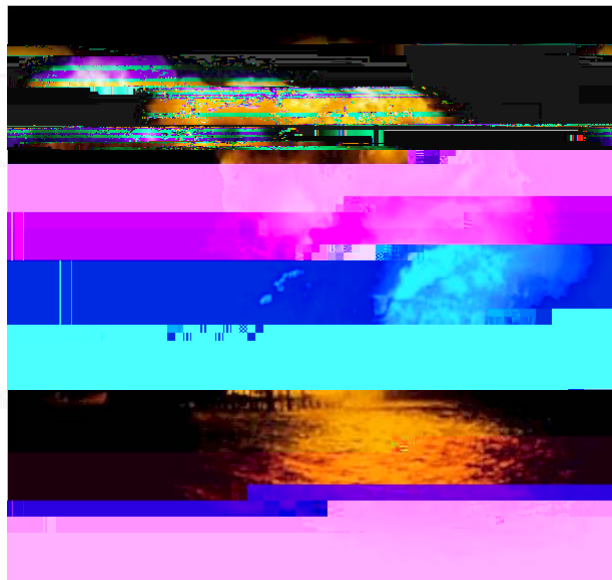
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Pipe Rupture Results in > 600 Offsite Fatalities



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Hot Work Permit (Safe Work Practices)



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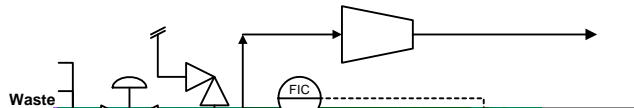
Incident Investigation



š Spec required no foam shedding

The Problem with PSM Regulations . . .

> Drives “in/o
approach
based on



The Case for the RBPS Approach

- › CCPS published its original 12 PSM elements in 1989 and followed it with 3 other management system books thru 1994
- › A lot of experience and lessons have been learned since then; CCPS wanted to update its PSM framework to be useful to industry as a thought and action leader for the next 15 years
- › RBPS came about for two reasons:
 - Ø Generate better results with fewer resources
 - Ø Provide an approach for companies of all “needs levels” to implement, correct, and improve PSM systems

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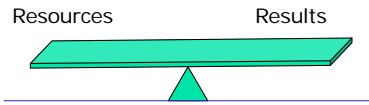
Premise of Risk Based Process Safety



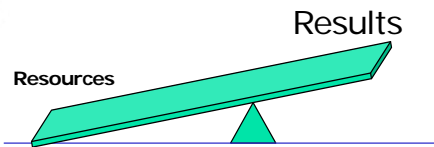
- › Management systems should be the simplest that they can be while still being fit-for-purpose
- › The following issues determine management system “rigor”
 - Ø complexity, hazard, and risk
 - Ø resource demands/availability
 - Ø culture and c

u

Balanced System



RBPS Helps You Move the Fulcrum



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Risk Based Process Safety Elements

Commit to Process Safety

1. Process Safety Culture
2. Compliance to Standards
3. Process Safety Competency

Manage Risk (cont.m0 mmpe7Tfa018 TD.0002 Tc-.0 43tfance to

Maintain a Sense of Vulnerability



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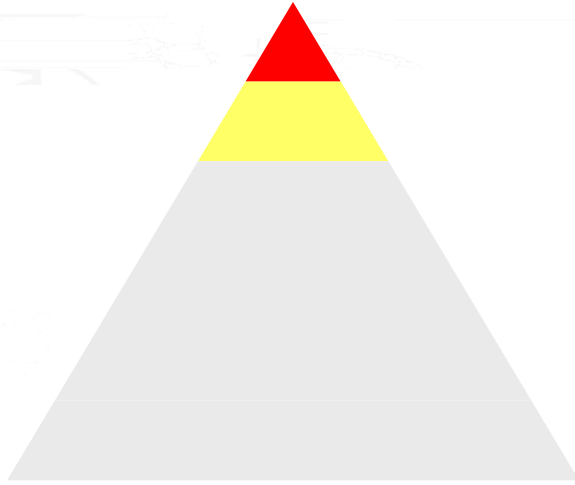
Empower Individuals

> To stop work

Defer to Expertise

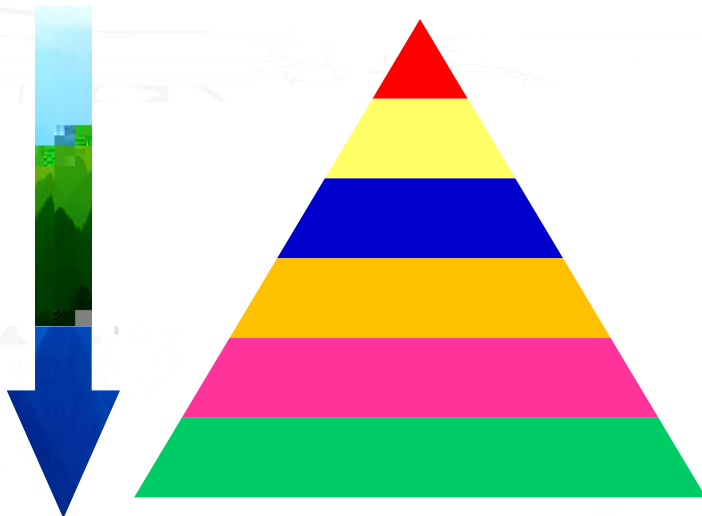


Foster Mutual Trust



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To Learn Lower on the Pyramid



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The Problem with Some Companies...

They Are Taught a Lot of Lessons, But They Never Seem to Sustain Learning





Conduct of Operations



Metrics and Management Review

- > Some activities must be monitored using leading indicators if they want to improve, not just by having accidents happen
- > Use a human health care analogy
 - ∅ Lagging indicator = an autopsy after a heart attack
 - ∅ Leading indicator = blood pressure, cholesterol, EKG
 - ∅ Culture indicator = proper diet/exercise
- > We must use I



