

Comments on Effective Safety and Health Management Systems

R. Larry Grayson

George H. Jr. & Anne B. Deike Chair in
Mining Engineering and Professor of Energy
& Mineral Engineering
The Pennsylvania State University

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Outline of Presentation

- My background
- How we worked it in the 'old' days
- Formal definition of elements of mine safety & health management systems
- U.S. examples
- What I believe will work in the U.S.

My Background

- Underground coal (9 years): UMWA laborer, surveyor, engineer (PE in PA, WV), production foreman (mine foreman, mine examiner), chief mining engineer, superintendent
- Academia (24 years): WVU, UMR, Penn State as Assistant, Associate, and full Professor; mining engineering department chair; college dean; endowed chair
- Government (3 years): Associate Director, Office of Mine Safety and Health Research
- Commission, committees, research panels

How we worked in the 'old' days

- Context: UMWA mine; steel company
- Operational aspects:
 - ❖ Production and safety important
 - ❖ Corporate safety inspections
 - ❖ Safety Committee inspections
 - ❖ UMWA-Management safety meetings
 - ❖ State and federal inspections intense

How we worked in the 'old' days

- Important features (1975-1981):
 - ❖ Superintendent allowed to make safety commitment
 - ❖ Good communication at all levels
 - ❖ Monitored production, cost, and safety performances
 - ❖ Gave regular feedback; accountability
 - ❖ Had enough employees to do job

How we worked in the 'old' days

- Transition: 1982-1984:
 - ❖ Recession hit hard
 - ❖ Steel industry devastated
 - ❖ Reduced workforce by 50%
 - ❖ Cost-cutting measures intense
 - ❖ Did more (productivity) with less (1/2 of workforce), but not better (all other non-production work suffered)

How we worked in the 'old' days

- Transition results:
 - ❖ Much higher productivity (tons/shift)
 - ❖ Reduced cost/ton dramatically
 - ❖ Large percentage of miners worked a lot of overtime (caught up on support work)
 - ❖ Fought for economic survival

Formal Definition of
Elements of Mine
Safety & Health
Management Systems

- Different but similar standards:

- ❖ ANSI/AIHA Z10-2005
- ❖ ISO 9001: 2008(E)
- ❖ OHSAS 18001: 2007
- ❖ ILO-OSH 2001
- ❖ AS/NZS 4804: 2001

In UK, AUS, S. Africa: must do it.

- Common elements (ILO):

- ❖ Policy aspects

- ❖ Worker participation

- ❖ Responsibility and accountability

- ❖ Competence and training

- ❖ Documentation

- ❖ Communication and information

- ❖ Initial review

- Common elements (ILO):
 - ❖ System planning, development and implementation
 - ❖ H&S objectives
 - ❖ Hazard identification and risk assessment; preventive and protective measures
 - ❖ Performance monitoring and measurement

- Common elements (ILO):
 - ❖ Investigation of work-related injuries, ill health, diseases and incidents, and their impact on H&S performance
 - ❖ Audit
 - ❖ Management review
 - ❖ Preventive and corrective action
 - ❖ Continual improvement

Associated with the Mine
Safety and Health Management
System is the **Mine Safety
Management Plan**

Ref: NSW Guidance Note GNM-003,
version 4.1 in February 2008

- Elements of Mine Safety

Management Plan:

- ❖ Management structure
- ❖ How risks are to be managed
- ❖ Arrangements for the safe use of mine/plant and electricity
- ❖ Contractor management plan
- ❖ Emergency plan

Australia has had excellent results in its fatality rate improvement since implementation in 1997 and 1998, as shown in the following slide.

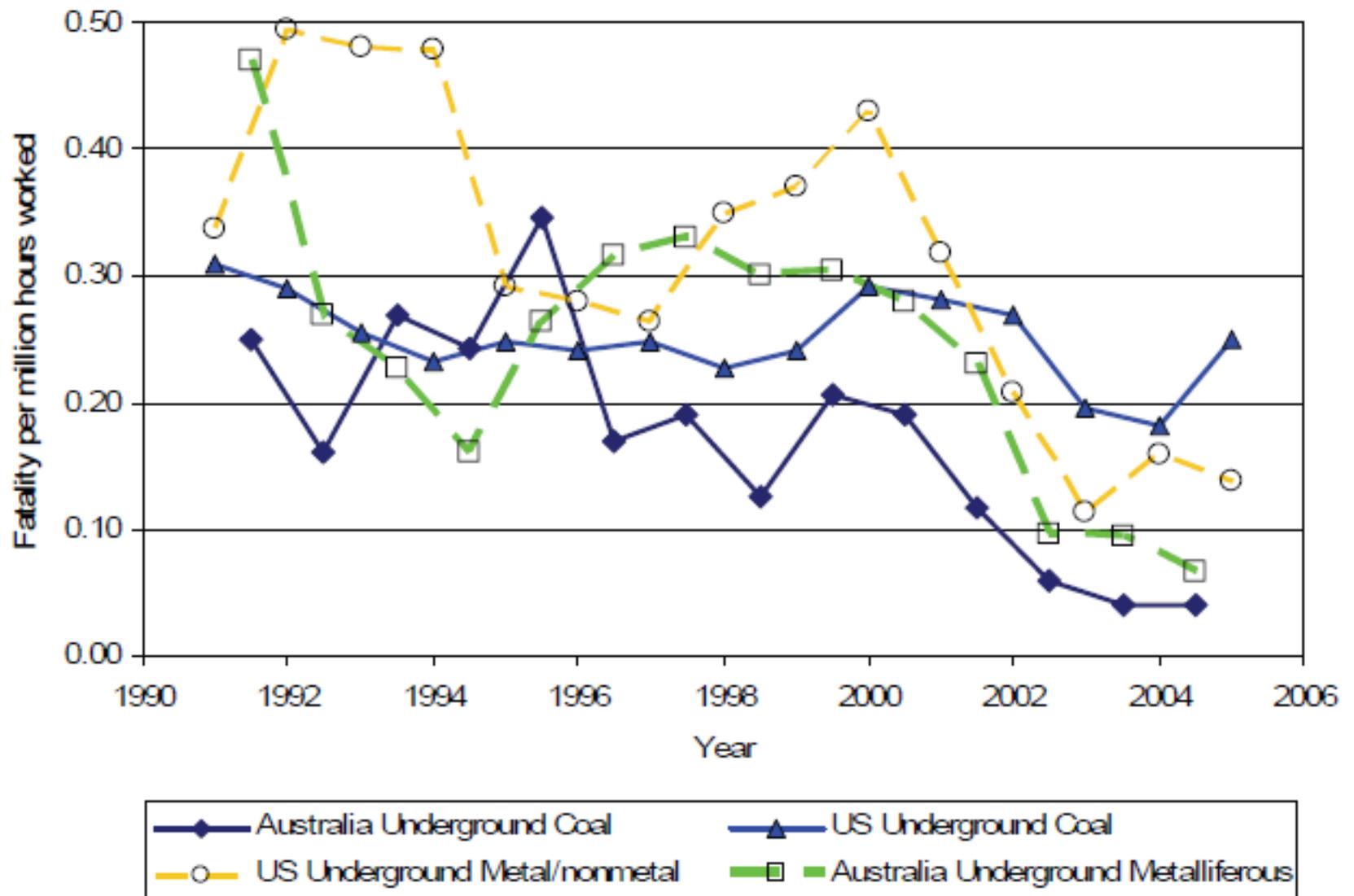


Figure 3 - The running three-year underground mine fatality rates for Australia and the US.

NIOSH major hazard risk assessment study (Iannacchione,

- The Mine Safety and Health Management System and the Mine Safety Management Plan are very formal and require significant documentation
- To be effective they require commitment from the top of the company all the way to the front-line supervisors and miners

- The Australian industry uses very formal systems that require a high level of documentation
- The regulatory provisions place a “duty of care” obligation on all companies, and require the use of these formal systems
- They also have required comprehensive audits of H&S performances

- Although likely not as formal as the Australian approach, several companies in the U.S. have similar results
- They have also used formal methods to create a supportive safety culture, hinged on prevention of injuries and high-risk conditions
- Among these companies are Arch Coal, BHP Billiton, CONSOL Energy, Peabody Energy, and Rio Tinto

- The well-managed companies have dramatically reduced their lost-time accidents, fatalities and disabilities, and withdrawal and imminent danger orders
- In general, their approaches to safety and health management are much more systematic and well-documented than the majority of other operations
- They are also large corporate entities

- The problems to be overcome in making a rule requiring the use of Mine Safety and Health Management Systems in the U.S. follow:
 - ❖ Unlike in Australia, 85% to 95% of our mines are small mines (50 or fewer employees), depending on the sector
 - ❖ The Australian coal industry is mostly comprised of large mines (70%-75%)

- Other problems to overcome are:
 - ❖ U.S. operations are ‘battling’ hard, in their minds, to simply comply with regulations now, and they have developed a combative mindset in many instances
 - ❖ This mindset precludes cultivation of best practices and good relations with MSHA because they believe they are being punished unfairly

- Other problems to overcome are:
 - ❖ They resort to litigation (due process) to defend their performances, which they believe have been unfairly penalized by MSHA
 - ❖ Their workforces are kept busy in abating the citations that MSHA issues, which they believe prevents them from being able to be proactive in compliance

The Way Forward in the U.S. (Grayson)

- Since the emphasis in the U.S. is on compliance with a myriad of complex regulations, we need to consider this burden when addressing Mine Safety and Health Management Systems
- This translates into a somewhat less formal, paperwork-based system which focuses on efforts to build not just a culture of safety but a safety culture of prevention

MINE SAFETY TECHNOLOGY & TRAINING COMMISSION - NMA



“The commission recommends that a comprehensive approach, founded on the establishment of a **culture of prevention**, be used to focus employees on the prevention of all accidents and injuries.”

MINE SAFETY TECHNOLOGY & TRAINING COMMISSION - NMA



“The commission recommends that every mine should employ a **sound risk-analysis process**, should conduct a risk analysis, and should develop a management plan to address the **significant hazards** identified by the analysis.”

MINE SAFETY TECHNOLOGY & TRAINING COMMISSION - NMA



“Simple regulatory compliance alone may **not be sufficient** to mitigate significant risks.”

The Way Forward in the U.S. (Grayson)

- The Mine Safety and Health Management System **process** must **first** commit to building a corporate-wide safety culture of prevention
- I give as an example the CONSOL Energy process of building the safety culture of prevention (Path to Zero)
- I could just as easily give the Arch Coal process, which I have also studied

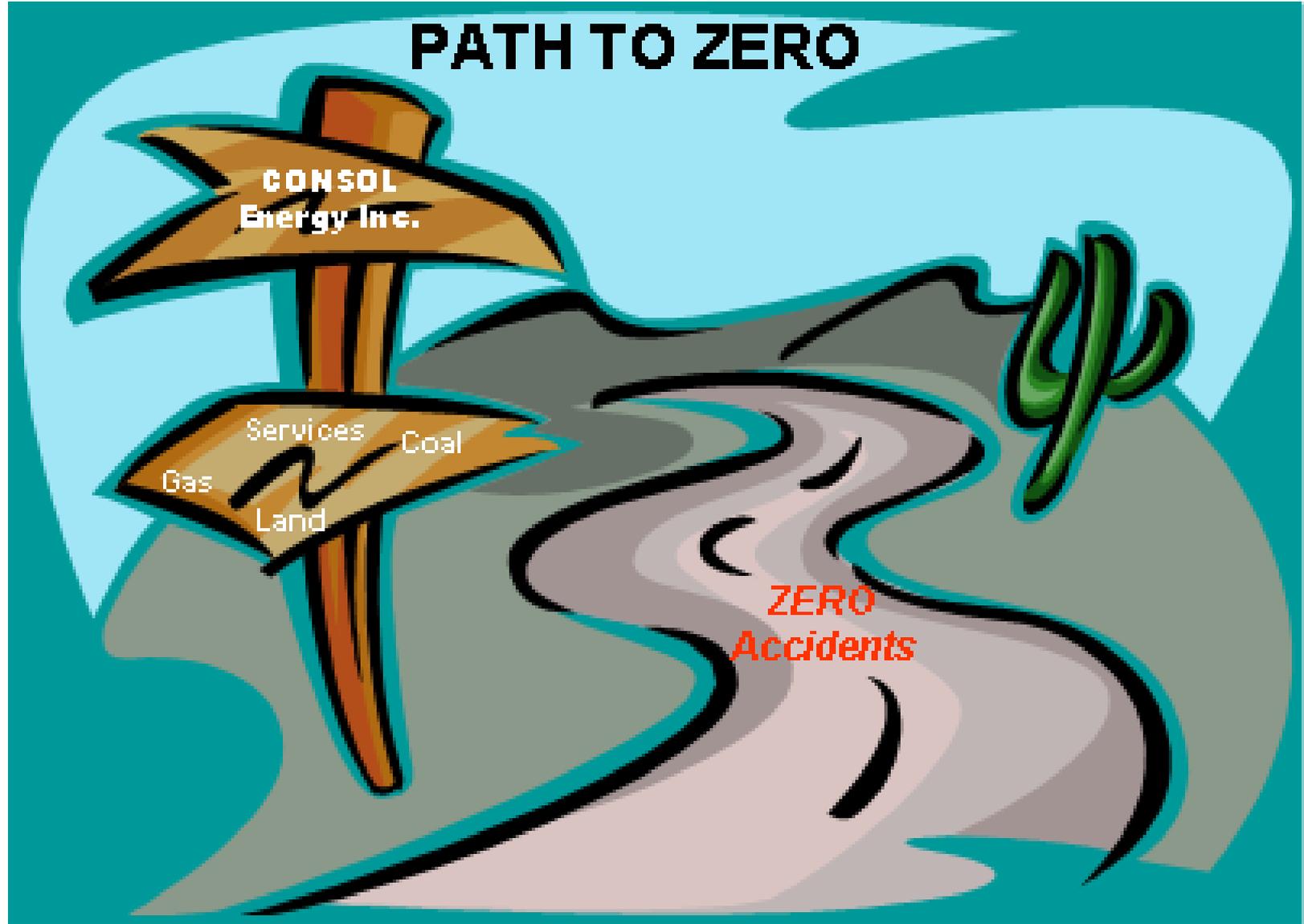


PATH TO ZERO

**CONSOL
Energy Inc.**

Services Coal
Gas Land

**ZERO
Accidents**



THE CONSOL ENERGY EXAMPLE

“We are in the process of instituting a **new approach** to safety awareness and training that we believe will accelerate our drive to zero accidents throughout the company. We will start with the premise that our **normal state of operation is no accidents**. An accident is an abnormality that is unacceptable. Accidents are an exception to our core values.”

J. Brett Harvey

CEO, CONSOL Energy

CONSOL ... IGNITED CONTAGIOUS COMMITMENT

38 Executive Interviews



9 Focus Groups



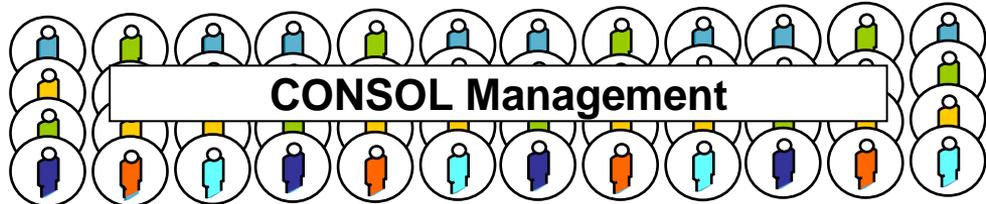
Understanding
CONSOL Culture

2 Day Gameboard
Session



Culture Change
Strategy

8 One Day
Alignment
Sessions



Commitment of
341 Leaders

Launched 4
Initiative
Teams



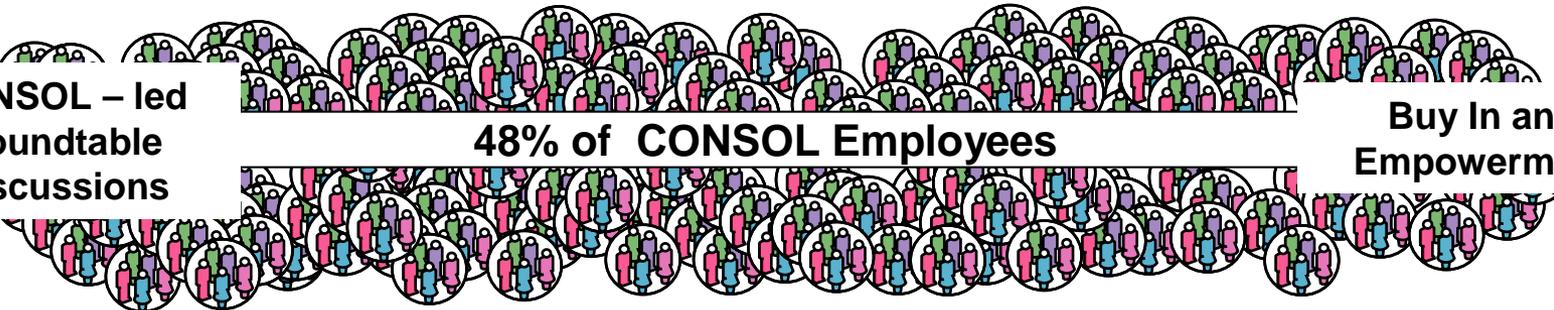
Charged 40
Team
Members

“Train the Trainer”
Program



Charged 45
Change Agents

CONSOL – led
Roundtable
Discussions



48% of CONSOL Employees

Buy In and
Empowerment

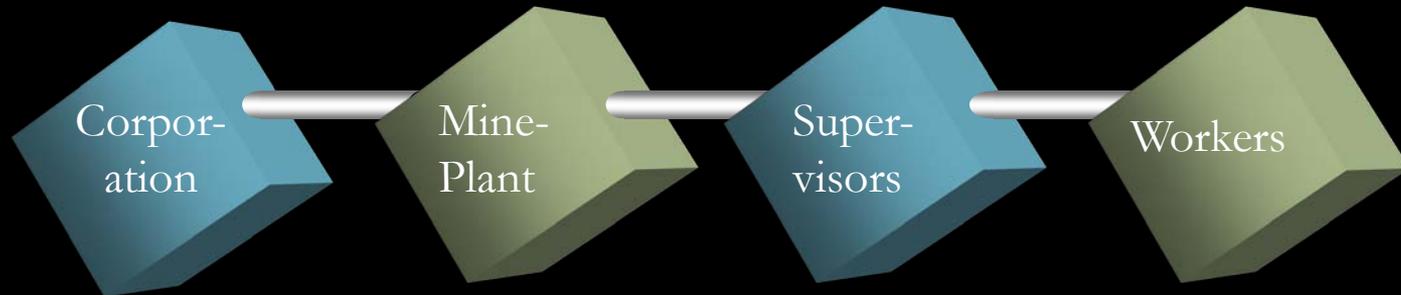
The Way Forward in the U.S. (Grayson)

- Second, each operation's management must **specify, adopt and implement** the techniques it believes will attain high-level safety goals and objectives, e.g., zero lost-time accidents, no withdrawal and imminent danger orders, less than 10% S&S citations, reduce near misses by 25% next year, etc.
- This means that a **Mine Safety Management Plan** is needed, but it doesn't have to be as voluminous as in Australia

Risk Management's Role in a Safety Culture of Prevention

- At least some appropriate method for identifying hazards; assessing the related risk; and then developing and implementing a plan to manage them is necessary.
- Some approaches to managing risks are not so formal

RISK MANAGEMENT THROUGHOUT THE COMPANY



- Clear policy
- Consider risks
- Enable people
- Reinforcement

- Endorse policy
- Consider risks
- Enable people
- Reinforcement

- Commit to policy
- Consider risks
- Enable people
- Communication

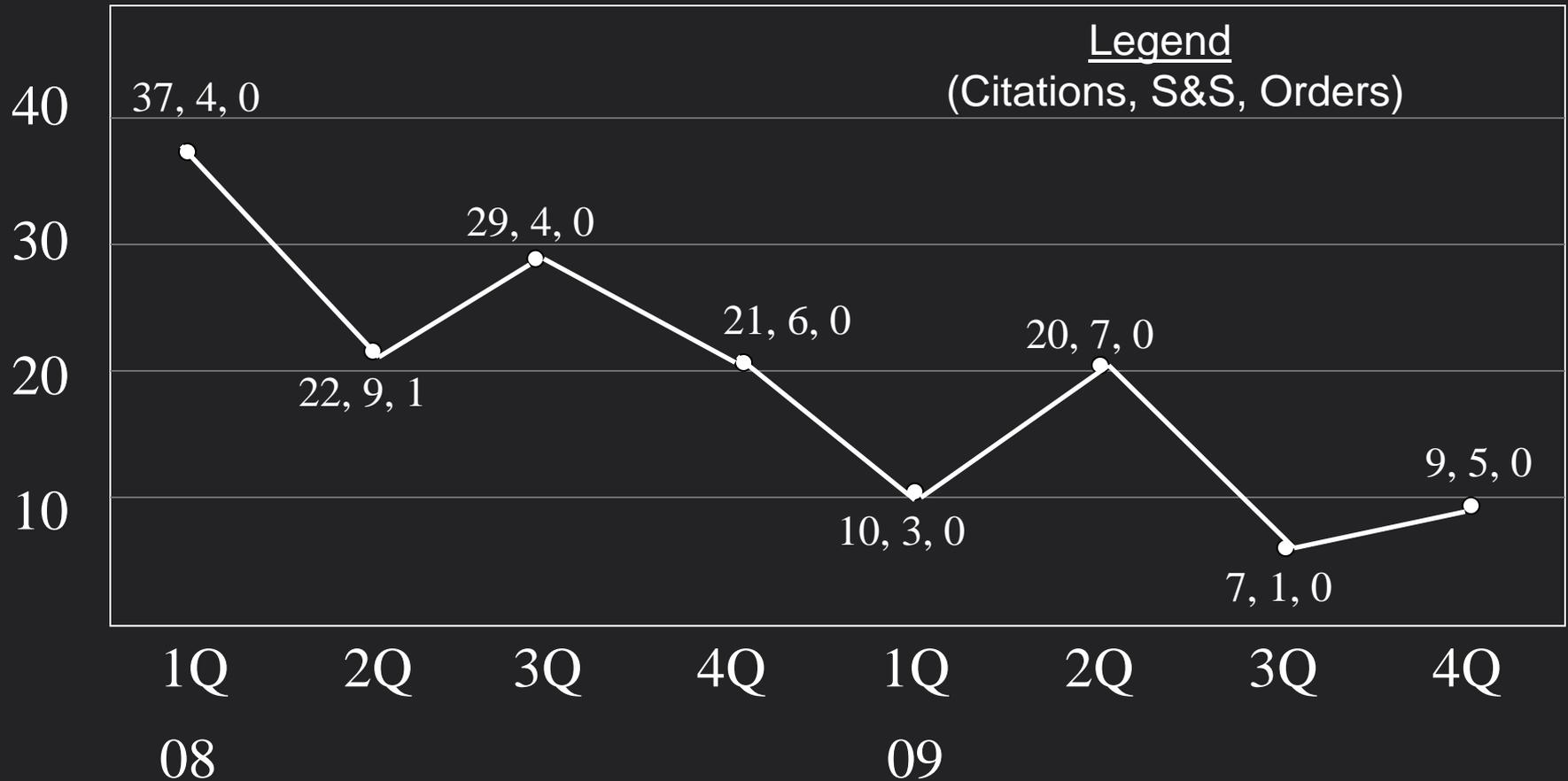
- Follow policy
- Understand & treat risks
- Faithful task execution
- Communication

DIFFERENT WAYS TO ASSESS RISK

- Plots of incidents (violations, injuries, best-practice critical-task compliance, near misses, specific standards violated, etc. (see trends))
- Using tabled data of safety measures and prioritize action plans to address
- Prioritizing multiple risks from a matrix plot (major hazards, injury causes, violations)
- Quantitative risk analysis

Risk Analysis

Serious Violations Are Exceptions to Plan



Quarterly Plot: Number of 75.370(a)(1) Citations for LW Mine 25.

Risk Assessment Matrix

One Case Study

Prob. of Occurr.	Hazard Severity			
	Cat.	Crit.	Marg.	Negl.
Freq.	Combustible Materials			
Prob.		Fire Protection	Guarding	
Occ.				
Impr.				
Remote				

Lost-Time Accident Record

One Case Study

<u>Accident Class</u>	<u>Number</u>
Material Handling	52
Handtool	23
Slip/Fall	20
Machinery	17
Ignition/Explosion	9

Represents
79.1% of total
reportable
accidents.

Lost-Time Accident Record

One Case Study

<u>Accident Class</u>	<u>Days Lost</u>
Material Handling	2,213
Machinery	913
Slip/Fall	681
Powered Haulage	510
Handtool	336

Represents
92.8% of
total lost
time.

Quantitative Example – Case Study

(MSHA accident database)

- 54 NFDL accidents occurred in a year
- Miners worked 711,830 hours
- Total lost+restricted days = 1,964 days
- Total miners employed = 312

Quantitative Example – Case Study (MSHA accident database)

Probability (P) of NFDL acc/miner/yr:

$$\begin{aligned} P &= (54)(200,000)/711,830/100 \\ &= 0.1517 \text{ or } 15.17\% \end{aligned}$$

This is the chance of a miner incurring a lost-time injury during the year.

Note the NFDL IR is 15.17 (per 100 miners) for the underground mine in that year.

Quantitative Example – Case Study (MSHA accident database)

Risk (in dollars), based on estimated \$20,000 average cost per lost-time accident:

$$\begin{aligned} \text{Risk} &= .1517 \text{ for LT accident/miner} \\ &\quad \times \$20,000/\text{LT accident} \\ &= \$3,034 \text{ per miner} \end{aligned}$$

Quantitative Example – Case Study (MSHA accident database)

Risk (in dollars), based on \$20,000 average cost per lost-time accident:

For 312 miners working at mine in a year, the total cost estimate is:

$$\begin{aligned} \$3,034 \times 312 &= \$20,000 \times 312 \times .1517 \\ &= \mathbf{\$946,608} \end{aligned}$$

Quantitative Example – Case Study (MSHA accident database)

Risk could be analyzed based on days lost, too,
as follows for the year:

$$\begin{aligned} \text{Average days lost} &= 1,964 \text{ days lost divided} \\ \text{per miner} &\qquad\qquad\qquad \text{by 312 miners} \\ &= 6.30 \text{ days lost/miner} \end{aligned}$$

In Managing Risk: Each Person's Role is Critical

Each person plays a role in safe, efficient, cost-effective production – whether a corporate or division manager, the mine/plant manager, a supervisor in production or maintenance, a technical staff person, or a worker.

In Managing Risk: Management's Role is Critical

Corporate or division leaders set the stage, give commitment, and then play a **critical role** in challenging everyone else to seek accident-free, safety compliant performances, insisting on building a safety culture of prevention.

In Managing Risks: The Mine Manager's Role is Critical

Serious transfer of **accountability** then must permeate downward to the next level of responsibility.

Here the mine/plant manager plays a **critical role** in challenging supervisors to seek accident-free, safety compliant performances, which further builds the safety culture of prevention.

In Managing Risks:

Supervisors' and Worker's Roles are Critical

At the work sites supervisors play a **critical role** in transferring accountability for accident-free, safety compliant performances to the workers.

Ultimately, each worker plays a **critical role** in changing the culture permanently by 1) executing tasks faithfully according to best practice, 2) not taking shortcuts, 3) examining the work place well, 4) performing proper pre-op checks, and 5) using good judgment.

Day-In and Day-Out

Commitment to the process to achieve a safety culture of prevention, and **executing it systematically**, reaps the following paybacks:

Majority of excursions from plan are eliminated:

- Lost-time accidents,
- Elevated citations for violations of the Act,
- Avoidable downtime,
- Untimely progress on projects,
- Avoidable costs,
- Problems with contractors.

Day-In and Day-Out

And ... we strive in all we do for **continuous improvement** as excellent performers – always looking for better and safer ways of doing our work and sustaining our business.