

This presentation should not be considered a final statement of NIOSH policy or of any agency or individual who was involved. This information is intended for use in advancing knowledge needed to protect workers. Comments regarding this presentation may be submitted to the NIOSH Docket Office.

Analysis of SCSR Problems

Colorado School of Mines

Golden, CO

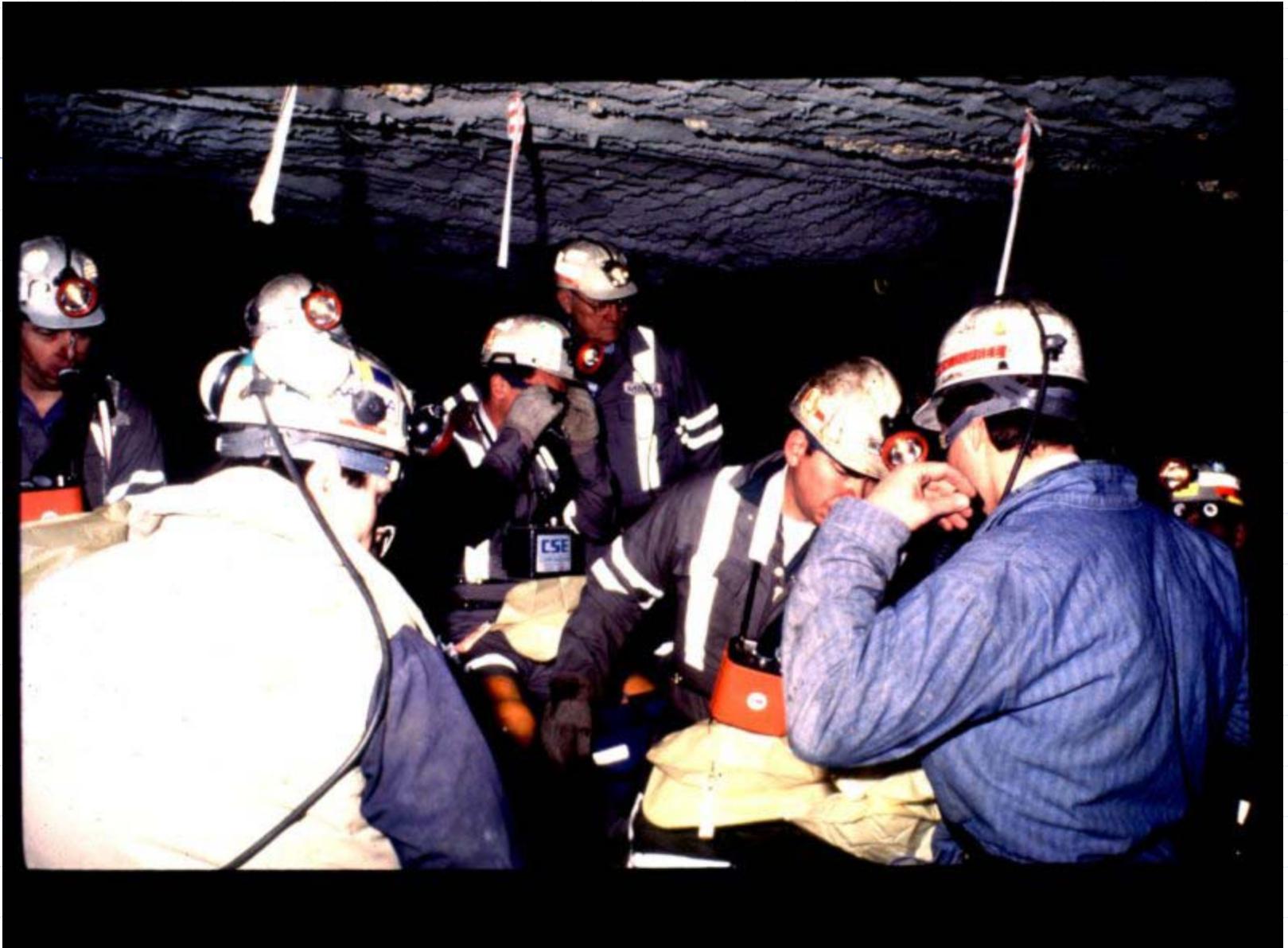
April 24, 2003



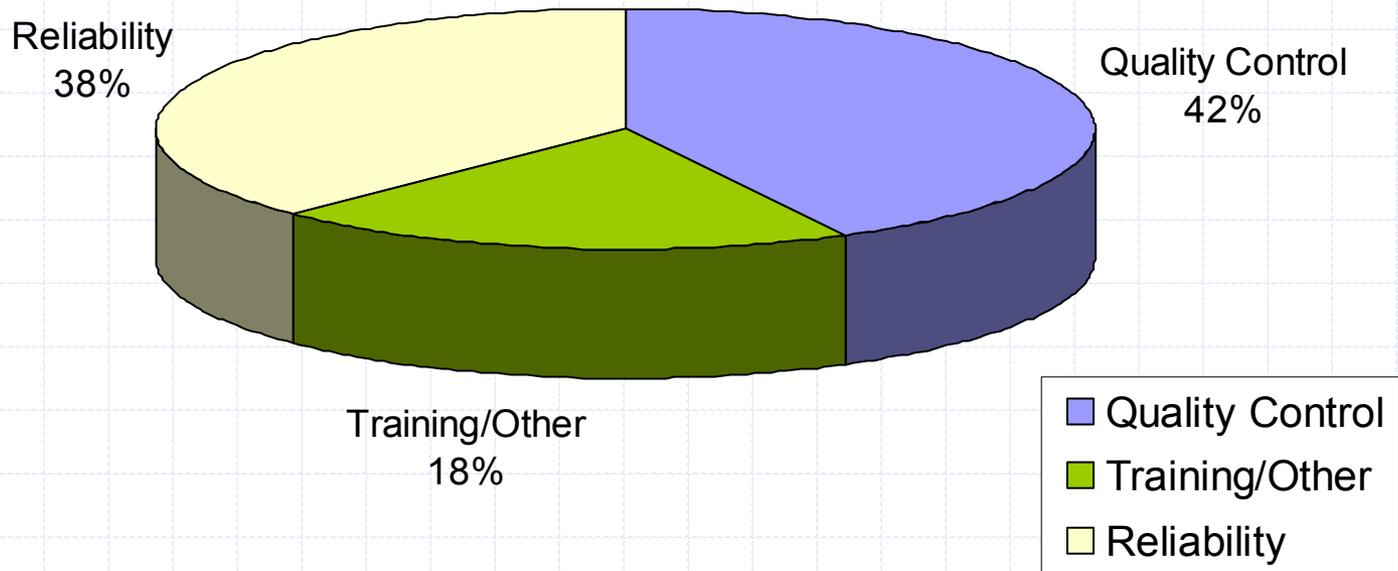
Workplace
Safety and Health







Causes of Problems (Since 1992)



Long term objectives

...to identify a comprehensive, effective strategy resulting in long-term improvements in SCSR performance and reliability through policy changes and rulemaking.

Philosophy

- ◆ We want to be able to approve the simplest of designs that meet appropriate performance requirements.
 - Scientific validity
 - Ease and confidence in use
 - Greater reliability
- ◆ Early problem discovery and effective reaction
 - Assure that any intervention confers a material benefit
 - Take into account human error by building-in redundancy

Solution: Shared Responsibility

- Quality Assurance Module
 - ◆ Manufacturing process
- SCSR Module
 - ◆ Ruggedness/ Hazards Evaluation
 - ◆ BMS Testing
 - ◆ Training
 - Effective Inspection
 - Expectations
 - ◆ Self Reporting SCSR's/ Non-Destructive Testing
 - ◆ Expanded Long Term Field Evaluation
 - MSHA Partnership
 - ◆ Registration

Shared Responsibility							
Simple Design			Discovery and Response				
Pre-Deployment			Deployment				
Approval		Manufacturing	Training		Audits: Early Detection		Effective Reaction
Ruggedness/ Hazard Testing	BMS Testing	QC Module	Training: Proper Handling	Training: Effective Use	Self-Reporting/ NDT	LTFE	Registration

Matrix for Quality

		Shared Responsibility							
		Simple Design			Discovery and Response				
		Pre-Deployment			Deployment				
		Approval		Manufacturing	Training		Audits: Early Detection		Effective Reaction
Nature of Problem	Cause	Ruggedness/ Hazard Testing	BMS Testing	QC Module	Training: Proper Handling	Training: Effective Use	Self-Reporting/ NDT	LTFE	Registration
Leakage thru cylinder burst disc assembly in cylinder	Quality			X			X	X	X
High leakage, low O2 flow, high resistance, low inhalation, vapor permeation	Quality		X	X			X	X	X
Seal at only one end of the case. Labels not documented.	Quality			X	X		X	X	X
Clamps at noseclip, breathing tube and breathing bag were broken	Quality	X		X					
Incorrect assembly of exhalation system. Increase breathing resistance	Quality		X	X				X	X
Clamps at noseclip, breathing tube and breathing bag were broken	Quality	X		X	X		X	X	X
Unit is difficult to remove from belt carrying case	Quality			X	X				X
High breathing resistance and missing part # (regulator)	Quality		X	X				X	X
Oxygen cylinder failed. Failed to dispense oxygen	Quality			X		X		X	X
Light chemical canister fill (unit lasted 20 minutes)	Quality		X	X				X	X
Short duration, cylinder valve not firing & breathing bag not inflating properly	Quality		X	X				X	X
Pouch fit problem	Quality			X	X				X
Hole in breathing bag. Potential starting problem	Quality	X	X	X			X	X	X
Unapproved changes & manual does not match wording on instruction labels	Quality			X					X
Rubber flashing blocked O2 outlet from chlorate candle	Quality			X				X	X
Part #'s listed on approval label not found on hardware	Quality			X					X
Exhalation breathing resistance was 2.20 inches	Quality		X	X				X	X
Chlorate candle will not fire due to manufacturing process problem	Quality			X		X		X	X
Shorten duration due to high constant flow rate of O2	Quality		X	X				X	X
Chemical dusting, voicemitter seal, & instruction manual discrepancies	Quality	X		X			X	X	X
Leakage at connection of breathing bag/canister (glue)	Quality	X	X	X				X	X
Improperly installed latch pin - hard to open	Quality			X				X	X
4mm slit in the breathing bag	Quality	X	X	X				X	X
Cracks in the dust covers	Quality	X		X	X		X	X	X
Small tear in hose by the canister	Quality	X	X	X				X	X
Inaccurate pressure gauge	Quality			X				X	X
High oxygen flow, low duration	Quality		X	X				X	X
Relief valve installed backwards	Quality			X				X	X
2 - small punctures in the breathing tube	Quality	X		X	X		X	X	X

Matrix for Reliability

		Shared Responsibility							
		Simple Design			Discovery and Response				
		Pre-Deployment			Deployment				
Nature of Problem	Cause	Approval		Manufacturing	Training		Audits: Early Detection		Effective Reaction
		Ruggedness/ Hazard Testing	BMS Testing	QC Module	Training: Proper Handling	Training: Effective Use	Self-Reporting/ NDT	LTFE	Registration
Dented cases, abraded bag, broken cyl. straps, loose valve connection, etc.	Reliability	X			X		X	X	X
Lithium hydroxide powder inhaled by wearer	Reliability	X			X		X	X	X
Primer cap fired but O2 candle did not deliver O2 to the breathing bag	Reliability	X	X	X		X		X	X
Wearer was ill from inhalation of chemical	Reliability	X			X		X	X	
Chemical in bag, scratches and dents in case, other internal damage	Reliability	X			X		X	X	
Crimped breathing tube	Reliability	X			X	X	X	X	X
Breathing tube deformed and inhalation of irritant material	Reliability	X			X	X	X	X	X
High exhalation resistance	Reliability		X					X	X
Exhalation check valve deteriorated (user rebreaths exhaled air)	Reliability	X	X		X		X	X	X
Cracked demand valve and regulator housing	Reliability	X						X	
Failed to function during fire	Reliability		X		X	X			
Dusting of LiOH in breathing bag & oxygen cylinder leakage	Reliability							X	X
High breathing resistance on tread mill tests	Reliability		X					X	X
White dust - breathing tube, crack case, leak in breathing circuit, serial #'s	Reliability	X			X		X	X	X
High CO2 in field deployed units	Reliability	X	X		X		X	X	X
High CO2 level - working to verify acoustical sound level test procedures	Reliability	X	X		X		X	X	X
High O2 flow rate due to external damage of the case	Reliability	X	X		X		X	X	
Brittle breathing tubes (deterioration)	Reliability	X			X		X	X	X
Hole in breathing tube, outer case damaged - hose clamp caused damage	Reliability	X			X		X	X	X
Lithium hydroxide dust in bag - low O2 concentration	Reliability	X			X		X	X	X
Chemical dust in mouthpiece and breathing tube.	Reliability	X			X		X	X	X
Visual indications of superoxide in mouthpiece and breathing bag	Reliability	X			X		X	X	X
Degraded breathing tube	Reliability	X			X		X	X	X
Crimped breathing hose	Reliability	X			X		X	X	X

Matrix for Training/Other

		Shared Responsibility							
		Simple Design			Discovery and Response				
		Pre-Deployment			Deployment				
Nature of Problem	Cause	Approval		Manufacturing	Training		Audits: Early Detection		Effective Reaction
		Ruggedness/ Hazard Testing	BMS Testing	QC Module	Training: Proper Handling	Training: Effective Use	Self-Reporting/ NDT	LTFE	Registration
Demand valve failure. Unit had not been refurbished	Training		X		X			X	X
Stuck end covers	Training	X		X	X			X	X
High breathing resistance and difficulty opening unit	Training	X		X	X			X	X
No instructions in case	Other			X					X
Explosive separation of regulator parts	Other				X			X	X
O2 candle did not fire. Started manually	Other					X			
Suspected ignition of KEL-F valve seat	Other	X	X					X	X
Loss of O2 from cylinder when unit was activated	Other		X			X		X	X
Loss of pressure in O2 cylinder. Case blew apart	Other	X			X			X	X
Retrofit due to changes being made to lower end cover and sealing gasket	Other	X			X				X
Smoke from chlorate candle contains barium salts & benzene	Other		X					X	X
Ignition due to destruction of SCSR	Other	X			X				
Possible refurbishment of EBA6.5 after they reach end of Service Life	Other						X	X	X

Usefulness/Usability

Is my SCSR reliable?

Will it save my life?

New SCSR Standards

High



Manufacturer

User



Accountability

Who is responsible for safe-keeping?

What does safe-keeping mean?

Low

