

Analysis of SCSR Problems

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Golden, CO

April 24, 2003



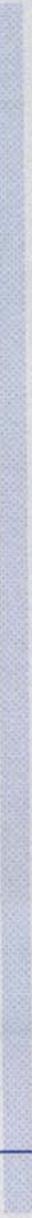
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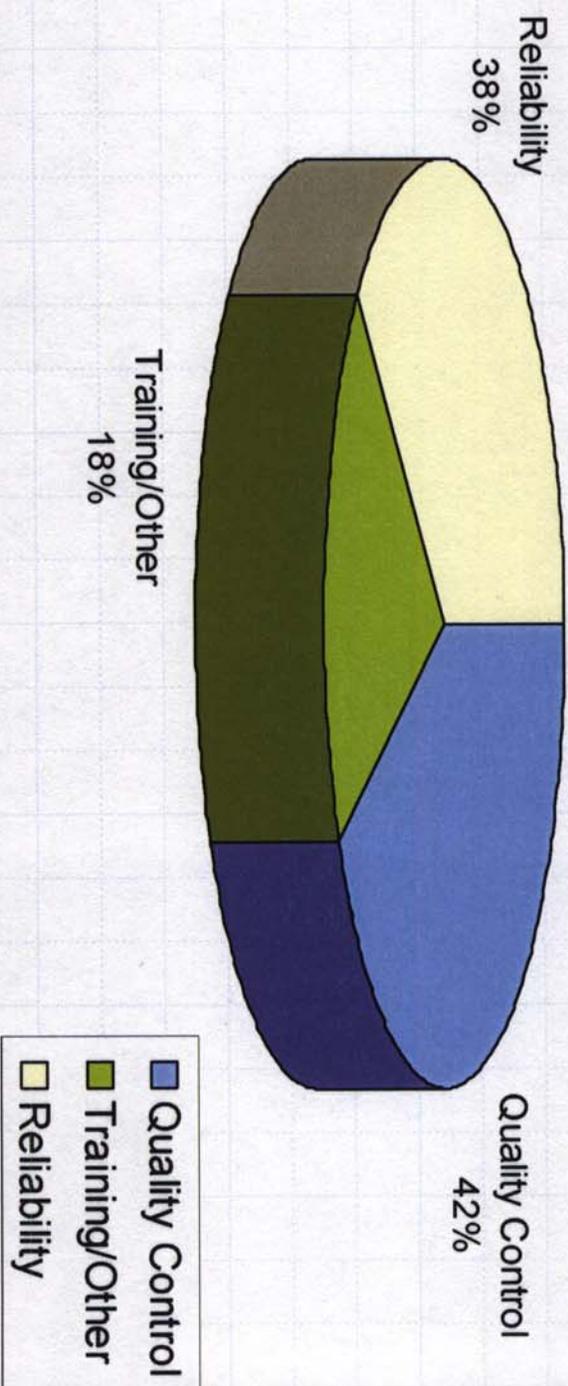


CDC

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NIOSH

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.



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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



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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



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



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Matrix for Quality

Nature of Problem	Cause	Simple Design		Shared Responsibility		Discovery and Response		Effective Reaction	
		Pre-Deployment		Deployment		Deployment			
		Approval	Manufacturing	Training	Training	Audits: Early Detection	LTTE		
		Ruggedness/ Hazard Testing	BMS Testing	QC Module	Training: Proper Handling	Training: Effective Use	Self-Reporting/ NDT	LTTE	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				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
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	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	X
Hole in breathing bag. Potential starting problem	Quality	X		X			X	X	X
Unapproved changes & manual does not match wording on instruction labels	Quality			X				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	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	X
Chemical dusting, volcannitter seal, & instruction manual discrepancies	Quality	X		X				X	X
Leakage at connection of breathing bag/canister (glue)	Quality	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
Small tear in hose by the canister	Quality	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



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Matrix for Reliability

Nature of Problem	Cause	Simple Design		Shared Responsibility		Discovery and Response				
		Pre-Deployment		Manufacturing	Training		Deployment	Self-Reporting	LTFE	Effective Reaction
		Approval	BMS Testing	QC Module	Training Proper Handling	Training Effective Use	Audits Early Detection	Self-Reporting/ NDI	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	X	
Chemical in bag, scratches and dents in case, other internal damage	Reliability	X			X		X	X	X	
Crimped breathing tube	Reliability	X			X		X	X	X	
Breathing tube deformed and inhalation of irritant material	Reliability	X			X		X	X	X	
High exhalation resistance	Reliability	X	X				X	X	X	
Exhalation check valve deteriorated (user rebreaths exhaled air)	Reliability	X	X				X	X	X	
Cracked demand valve and regulator housing	Reliability	X						X		
Failed to function during fire	Reliability		X		X					
Dusting of LiOH in breathing bag & oxygen cylinder leakage	Reliability						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	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	



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Matrix for Training/Other

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



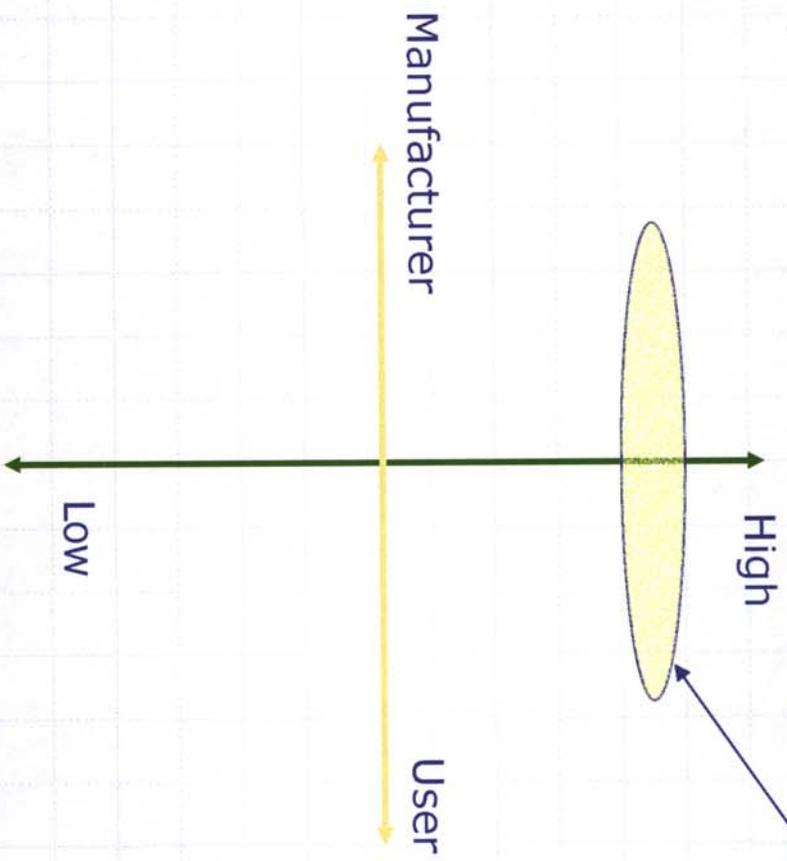
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Usefulness/Usability
Is my SCSR reliable?
Will it save my life?

New SCSR Standards

Accountability
Who is responsible for safe-keeping?
What does safe-keeping mean?



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