SCSR History

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No miner should be forced to rely upon an SCSR that might be unsafe for an escape. Just as important, a miner must have confidence that his SCSR will work in an emergency and have the hands-on knowledge of how to use it. Escape means taking miners on foot and under oxygen from the workplace to a point of safety.
SCSR History

- Pre-1981 miners rely on FSRs
- **1981 1st generation SCSRs**
  - Joint MSHA/NIOSH Approval (30 CFR 75.1714, 42 CFR 84)
  - Fewer than 40,000 SCSRs in deployment
  - 1 SCSRs/miner
  - Service life: 3 yr worn, 5 yr stored
- **1983 LTFE begins (50 SCSRs/year)**
  - Non-random sample to discover field problems
- **1989 2nd generation SCSRs**
  - Smaller, lighter weight
- **2000 SCSR reliability**
  - MSHA durability study
  - LTFE expands – 200 SCSRs/yr
  - Service life 10 yr
- **2006 MINER ACT**
  - Extra SCSRs deployed
  - MSHA SCSR Inventory
- **2007 Revised LTFE**
  - Random Sample based on MSHA SCSR Inventory
  - 400 SCSRs/year
- **2009 SCSR deployment reaches 187,000**
  - Redundancy = 3 to 4 SCSRs/miner
Lessons Learned From The 25 Year History Of SCSRs

• Escape under oxygen is the primary survival strategy.
• In some cases more than 1 SCSR per miner is needed for escape.
  – 1 hr SCSR does not mean 1 hr for every miner under every circumstance
  – Actual duration depends upon
    – Miner – body weight, age, physical fitness
    – Difficulty of the escape – distance, escapeway factors
    – Miner’s confidence
• Miner’s confidence in SCSRs depends on:
  – SCSR reliability
  – Hands-on training
Partnerships

• Stakeholders
  – BCOA
  – NMA
  – UMWA
  – USWA
  – SCSR manufacturers: CSE, Draeger, MSA, and Ocenco

• MSHA is co-approver
MSHA/NIOSH Approved SCSRs

Draeger OXY-K Plus

Ocenco EBA 6.5

CSE SR-100

MSA Life Saver 60

Ocenco M-20
The SCSR Inventory is required by MSHA’s Evacuation Rule which was put in place after the MINER Act.

An accounting of all SCSR’s deployed in US underground coal mines

- Tracks individual SCSR: Model, Serial Number, Date of Manufacture, Deployment status (In-Service, Out-of Service), Location (Mine ID)

Mines supply information, which MSHA later enters by hand into the inventory database.

To date, MSHA SCSR Inventory accounts for:

- In-Service: 187,111
- Out-of-Service: 39,597
- Total: 226,690
SCSR Distribution: 2010

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SCSR Average Age: 2010

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SCSR Components

- Breathing Bag
- Mouthpiece
- Goggles
- Oxygen Storage
- Breathing Hose
- Nose Clip
- Goggles
- Breathing Bag
How An SCSR Works

**Chemical Oxygen**

**Compressed Oxygen**
New Technology

Innovative and creative technology for:

- Oxygen generation
- Carbon dioxide removal
- Carbon monoxide elimination
- Materials for respirator components
- Materials for storing chemicals and high pressure gasses
- Test technology
- Training methods and materials
- Service and maintenance
Hybrid Self Rescuers

Hybrid Self Rescuer (HSR): Combination SCSR and FSR Respirator

- SCSR
  - O₂ Supply & CO₂ Removal
  - KO₂, Chlorate or Compressed Gas

- FSR
  - Traditional Technology → Hopcalite
  - New Technology → CO Oxidation Catalysts

- Advantages
  - Extended Protective Capacity

- Challenges
  - Sensing CO & O₂
  - Switching → Mode of Operation
Dockable SCSR

Dockable Short & Long Duration SCSR

- Additional Canisters Coupled to an SCSR
  - Eliminates Multiple Donning
  - Extended Protective Capacity
  - Allows for Smaller, Lighter Carried SCSR

- Prototype Dockable SCSR Developed 30 Years Ago

- This type of unit is allowable under interpretations of current MSHA regulations (30 CFR Part 75.1714) which permits a 10/60 SCSR
Schematic Dockable SCSR

SHORT DURATION SCSR

COUPLED SHORT AND LONG DURATION SCSR
Self Contained Self-Rescuer (SCSR) Plus

- Technical Products, Inc.
- O2 Pendulum Rebreather
- O2 flow demand regulated automatically
- LiOH CO2 Scrubber
- When rebreather is spent SCSR ‘docks’ to any other breathing air supply
- 1-hr breathing unit
- Weighs 5.7-lb.
Docking Device

Allows user to change or exchange air supplies without breaking seal

• Allows selection of air supply in real time

• Multiple mechanical safeties
  – Can’t ‘select’ to vent to atmosphere
  – Can’t detach ‘live’ air supply
Engineered Materials / Systems Design

• Sealed Foil Pack
  – Hermetically Sealed Chemicals
  – Exchangeable Packs
• Superoxide Treatments
  – Catalytic Coatings
  – Pelletizing
• Pressure Vessels — Carbon Cylinders
• User Interface Concepts — Hoods
• Packaging