



The Power of Partnerships:

What NIOSH Can Do For You

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Outline

- UA – ARPA-AMA-State Mine Inspector partnerships
- What NIOSH brings to the partnership





IMR, ARPA, AMA, State Mine Inspector



- Student recruiting, mining engineering jobs and internships
- IMR Board of Directors
- Education Outreach
- Technical Advisory Committee (TAC) for Center for Environmentally Sustainable Mining (CESM)
 - Strategic directions for environmental research
 - Facilitate state-wide road mapping session for research and dissemination priorities
 - Letters of support for research proposals
 - Dust study – PM10
 - Wind and dust prediction models
- Health and Safety projects
 - Serious gaming software
 - Mining Institute for Supervisor Leadership (MISL)
 - Health and Safety TAC
 - Numerous health and safety research projects – letters of support, company participation
- Facilitating industry connections and Mining Day at Capitol
- Input to Global Mining Law Center curriculum and activities
- ABOR participation in hearings and meetings
- Collaboration contributed to ~\$10M in mining research funding in 8 years





And Even More....



- Help with commercialized technology – TechLaunch Arizona
- Global Mining Law Center annual workshop – 2016 – Collaborative Solutions to Mined Land Reclamation
 - Led to National Academies workshop on same topic
 - Publication in Environmental Law Review
- 2017 – Building Capacity with Indigenous Communities: A two-way street October 20
 - ARPA partners should contact John Lacy at jlacy@dmyl.com to join the organizing committee, participate in workshop
- Advisory committees: environment, health/safety, mining, geology
- Consortium research projects
- Guest lectures, field trips, internships, K12 outreach, public outreach



The NIOSH Mining Program is a scientific (nonregulatory) office within NIOSH



Mining Program Strategic Direction

To eliminate mining fatalities, injuries, and illnesses through relevant research and impactful solutions



1. Reduce mine workers' risk of occupational illness



2. Reduce mine workers' risk of traumatic injuries and fatalities

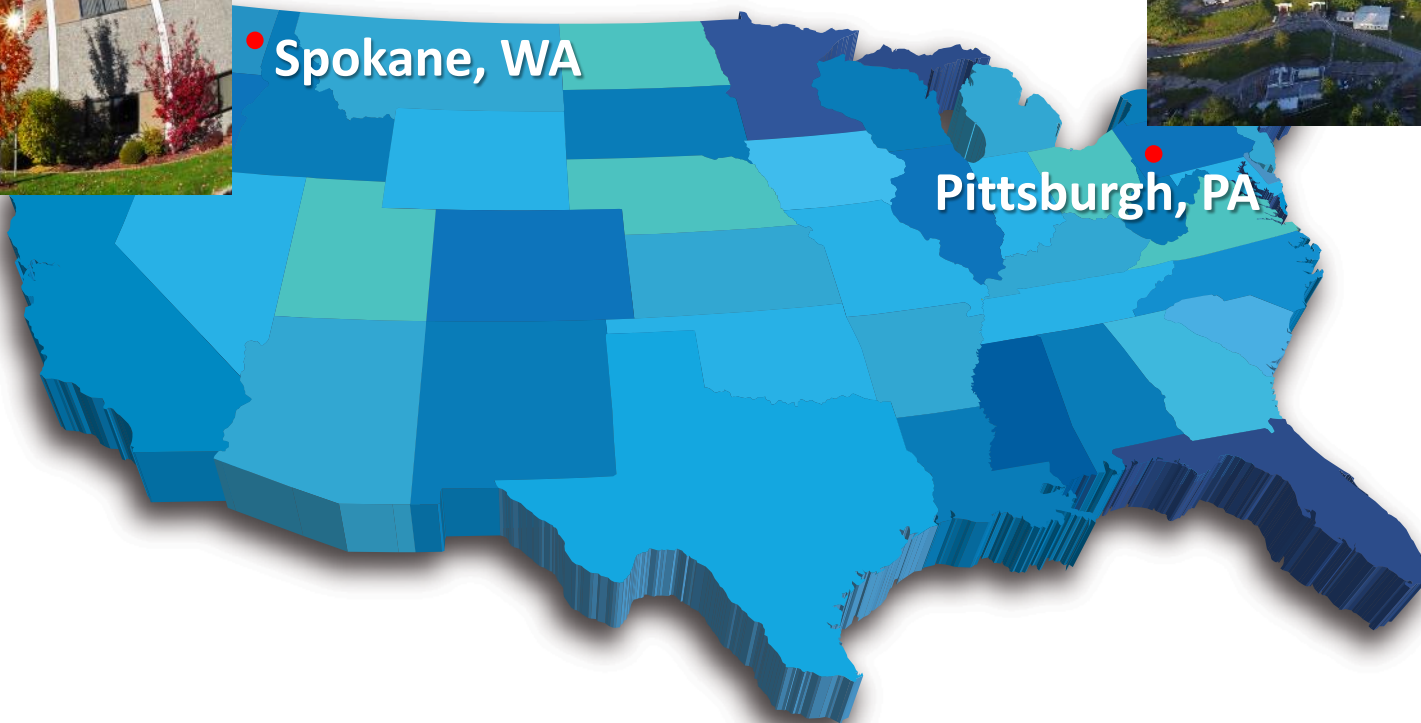


3. Reduce the risk of mine disasters and improve survivability of mine workers

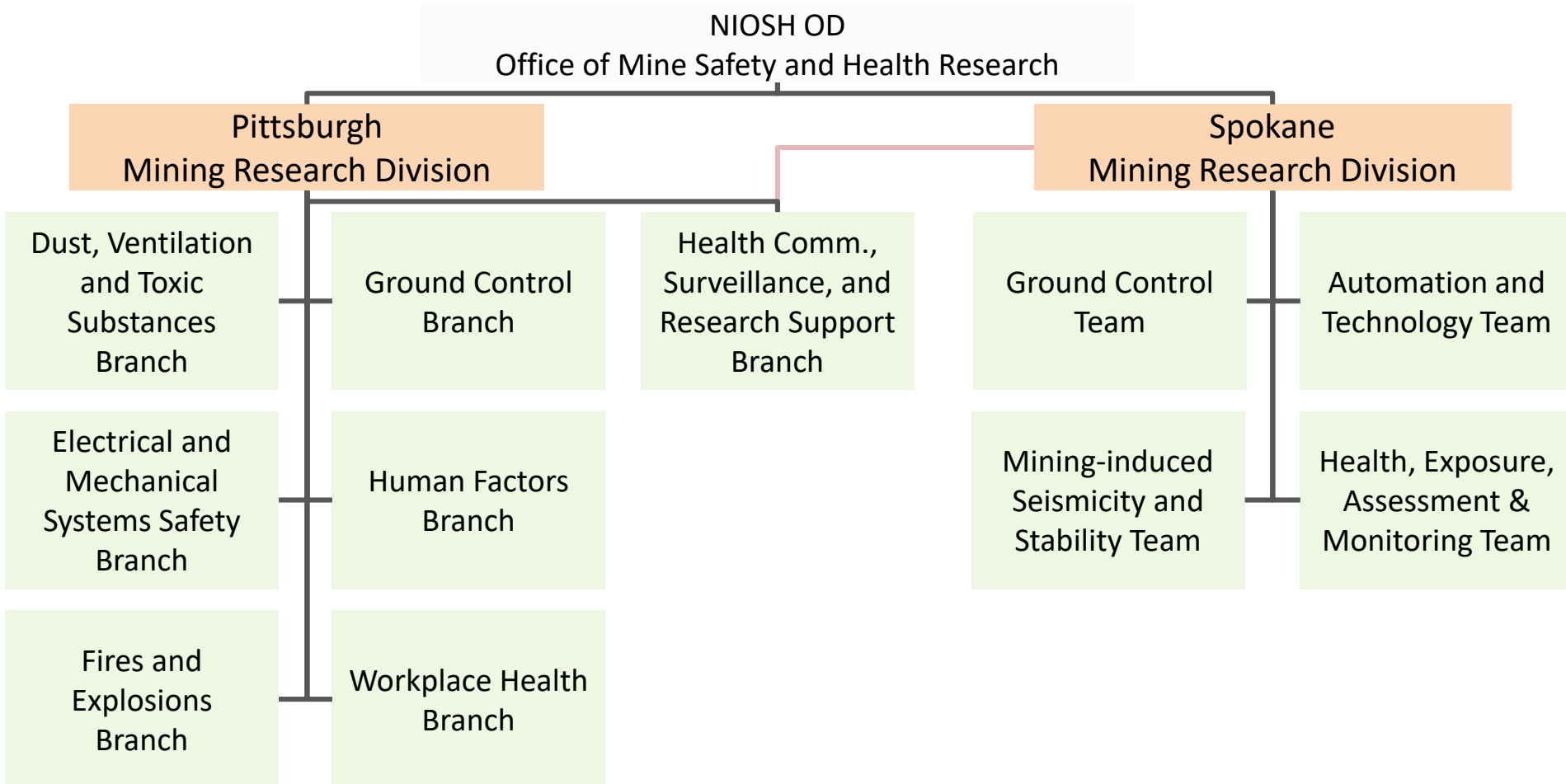
Driven by: Burden-Need-Impact



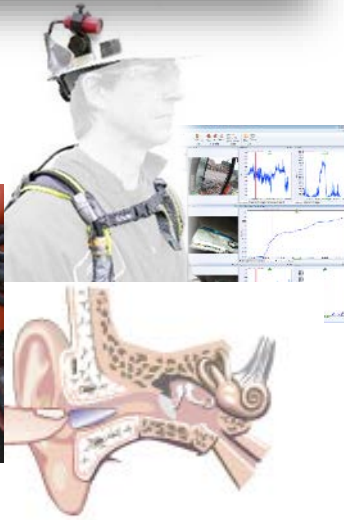
NIOSH Mining Research Divisions



How the NIOSH Mining Program is organized



Solutions Available Now for the Mining Industry



Dust control recommendations

Electrical safety

Helmet-CAM and EVADE 2.0 software

Diesel particulate matter monitor (DPM)

Cab filtration

Continuous personal dust monitor (CPDM)

Hearing loss simulator and noise training items

Ergonomics awareness

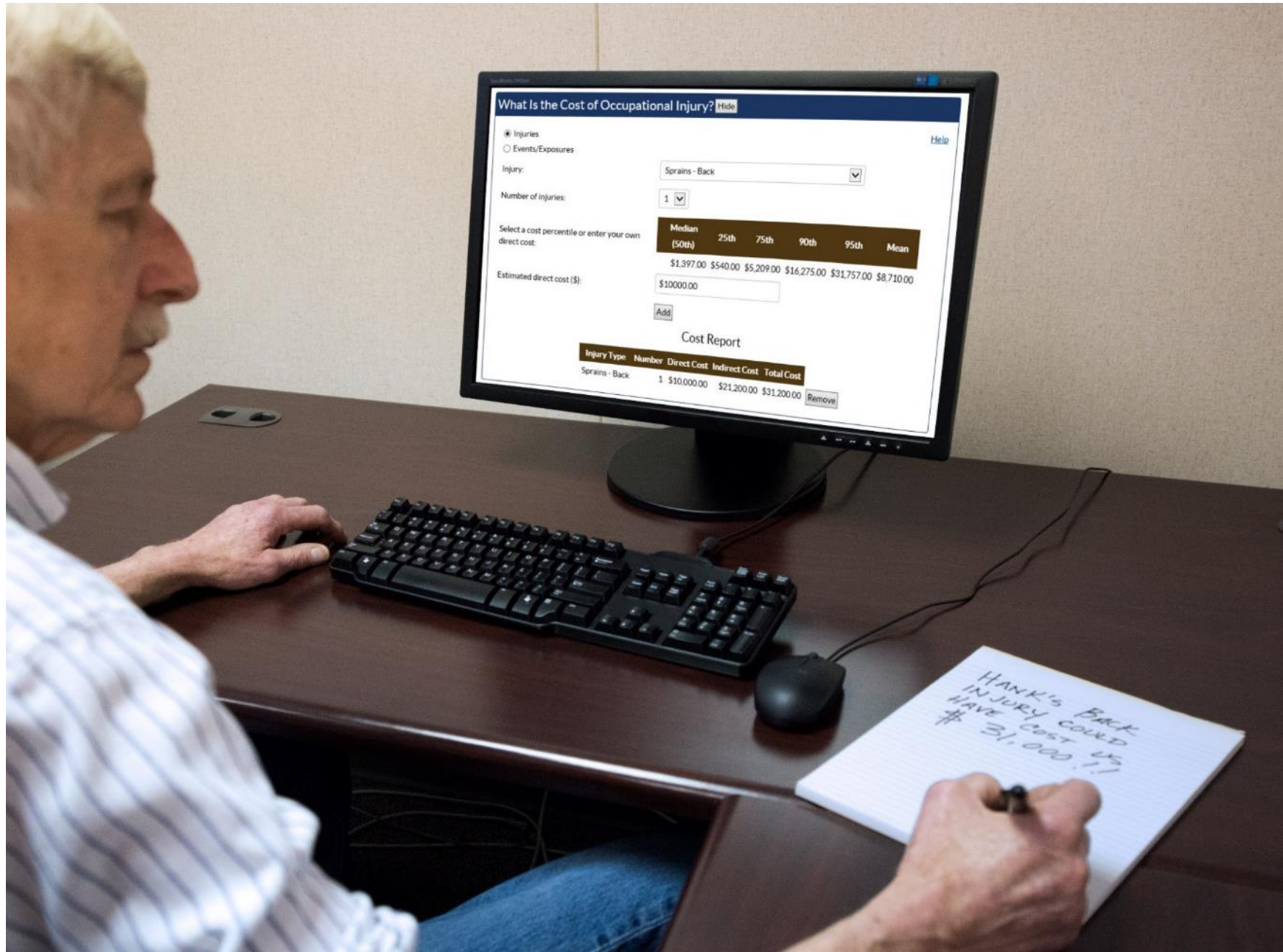
Intelligent lock out tag out

Heat stress fact sheets

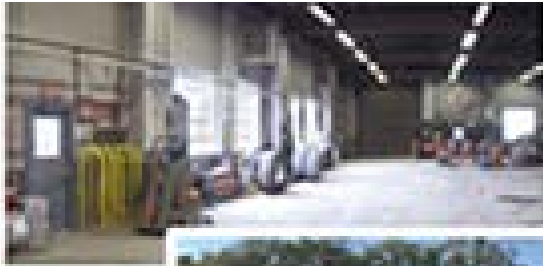
Age awareness



Safety Pays web app delivers cost estimates for mining injuries



Hazard Recognition Challenge



<https://www.cdc.gov/niosh/mining/works/coversheet2013.html>

102 top hazards in mine, plant, shop, roads

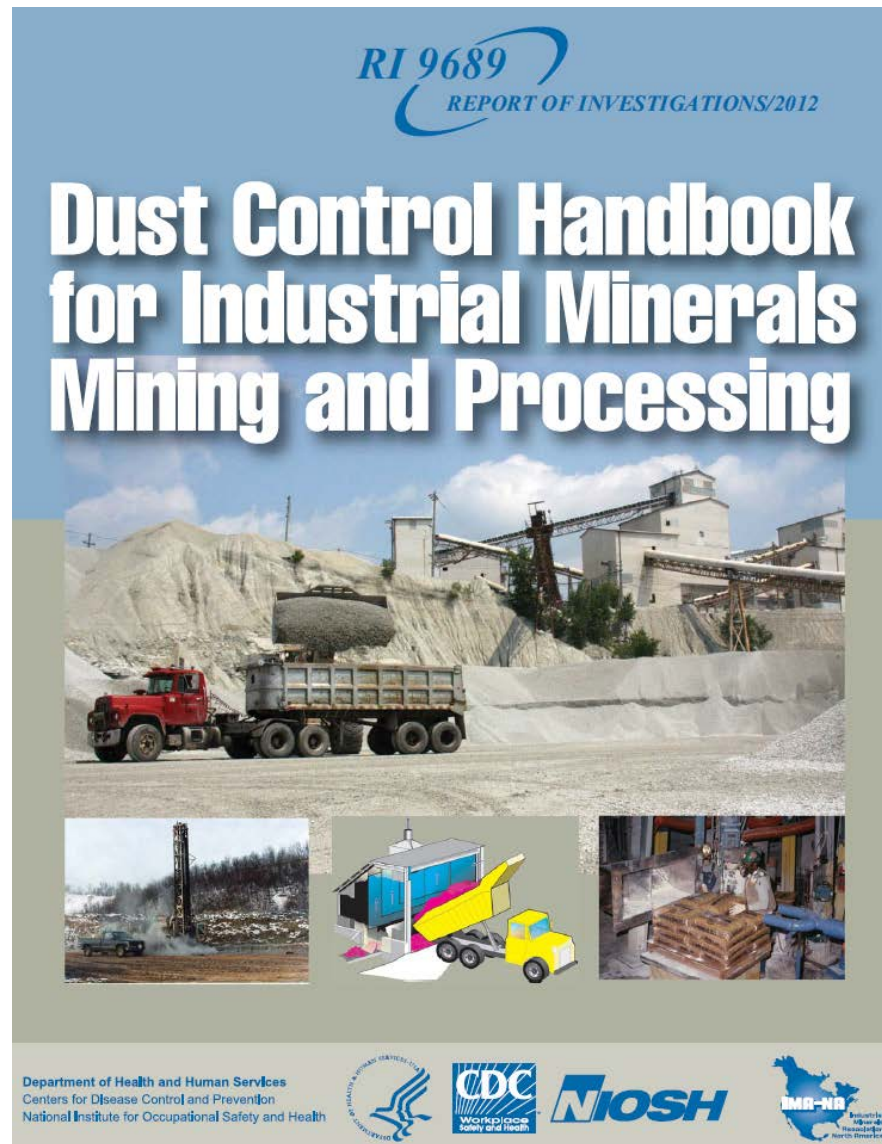
Downloadable app

In future load your own pictures into the app

Haz Rec Challenge



Dust control handbook





Cab filtration to reduce dust exposure



Continuous personal dust monitor (CPDM)

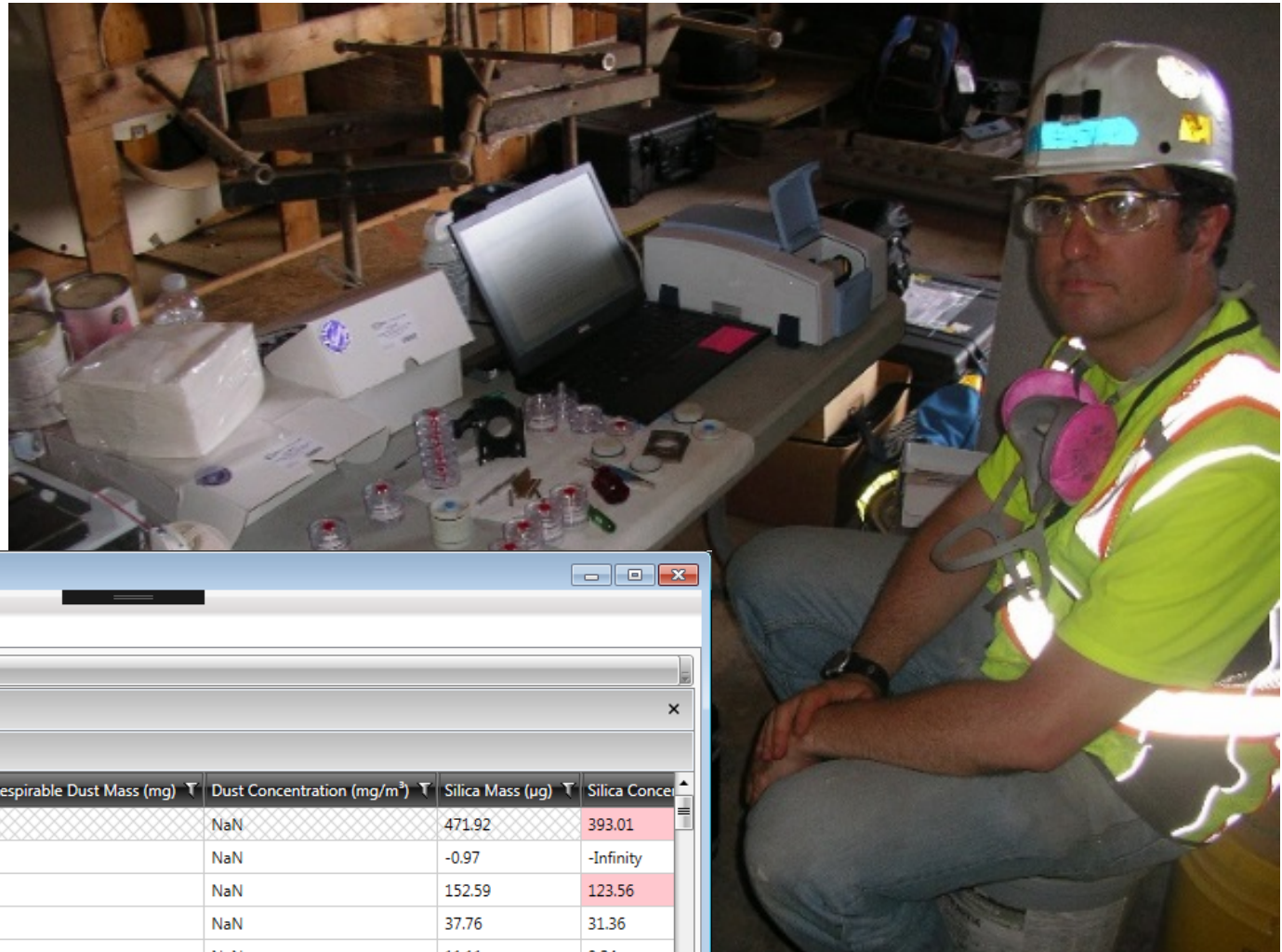


Clothes cleaning system removes hazardous dust from work clothing





End-of-shift silica monitoring system has reached beta test stage



Silica Monitoring

File Data Help

Events Samples

Delete Restore Export samples

Full Text Search

Drag a column header and drop it here to group by that column

	Sample ID	Sample Location	Worker	Respirable Dust Mass (mg)	Dust Concentration (mg/m ³)	Silica Mass (μg)	Silica Concentration (μg/m ³)
>	T1134-171.0				NaN	471.92	393.01
	T1134-167.0				NaN	-0.97	-Infinity
	T1134-166.0				NaN	152.59	123.56
	T1134-162.0				NaN	37.76	31.36
	T1134-161.0				NaN	11.11	9.24
	T1134-158.0				NaN	-5.74	-Infinity
	T1134-1577.0				NaN	8.00	6.64
	T1134-156.0				NaN	69.34	56.92
	T1134-153.0				NaN	290.78	234.41

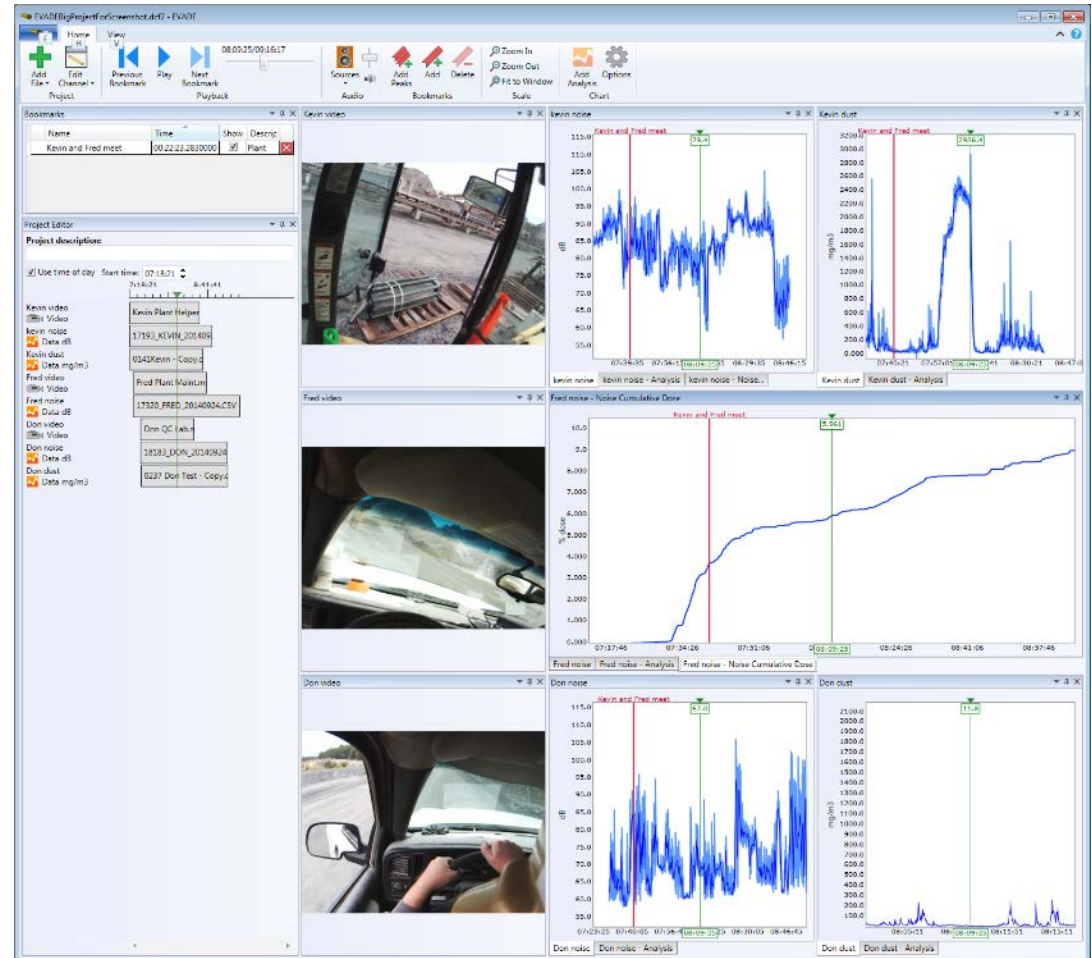


End-of-shift silica monitoring was effective in mini-baghouse case study



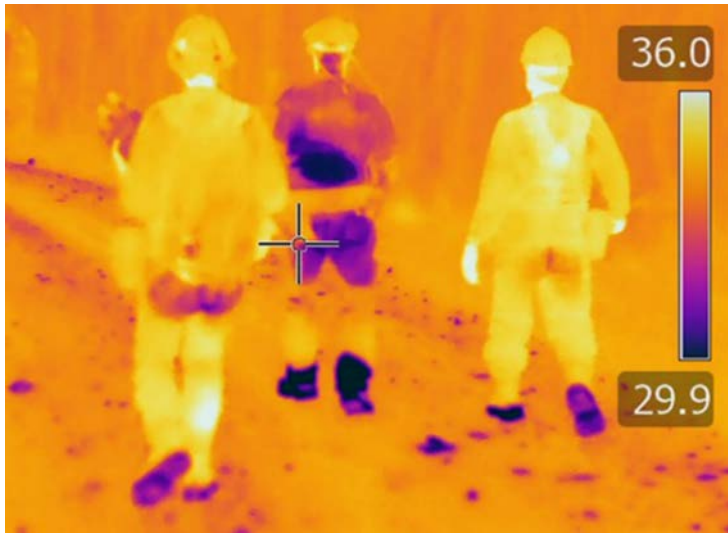


Helmet-CAM and EVADE for use with samplers for dust, noise, and other hazards (Enhanced Video Analysis for Dust Exposure)



Developed with Unimin as partner

Preventing heat illness



- Heat stress fact sheets available from NIOSH
- Heat illness prevention training





NIOSH fact sheets on heat strain: An educational tool for miners

Overview of heat strain

First aid

Risk factors

Acclimatization

Work/rest schedules

Hydration

Mining

Site Browser

Safety and Health Topics

Data & Statistics

Tools & Publications

Tools You Can Use

Publications

Mining Product: Heat Stress: A Series of Fact Sheets for Promoting Safe Work in Hot Mining Settings

News & Articles

Research Program

Mining Links

About Us

NIOSH Homepage

NIOSH A-Z

Workplace Safety & Health

CDC > NIOSH > Mining > Tools & Publications

Mining Product: Heat Stress: A Series of Fact Sheets for Promoting Safe Work in Hot Mining Settings

Keywords: Heat stress

Original creation date: September 2016

NIOSH Mining has developed fact sheets on heat stress that offer practical information about working in hot mining conditions. They cover these key areas:

- [Overview](#)
- [Acclimatization](#)
- [First Aid for Heat Illness](#)
- [Hydration](#)
- [Risk Factors](#)
- [Work/Rest Schedules](#)

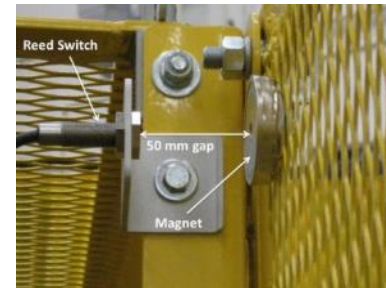
Reference - September 2016

Spokane Mining Research Division, Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health



HTML

Internet-enabled maintenance monitoring and reporting



- Effective for monitoring personnel access, machine guarding, and status of maintenance activities
- Digital LOTO next step
- Leverages IoT, RFID, and sensor technology to improve hazard recognition

Developed with OldCastle Materials as partner



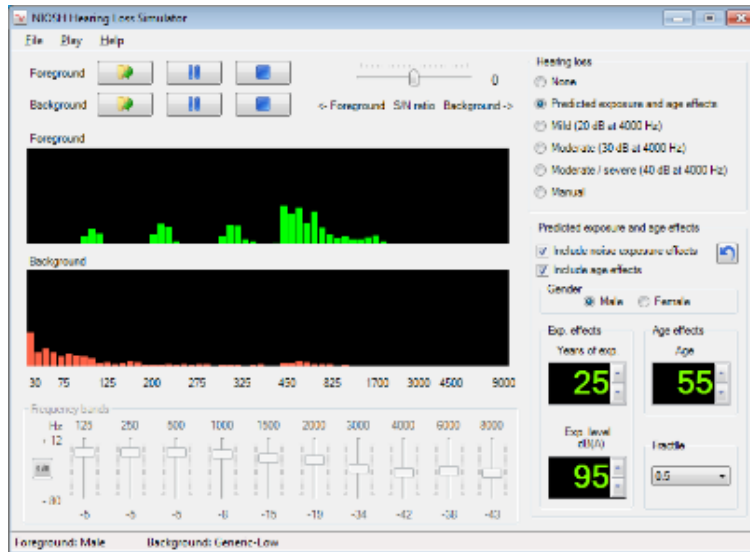
Arc Flash Awareness Video: Information and Discussion Topics for Electrical Workers





Hearing loss training and communication solutions

NIOSH Hearing Loss Simulator



Roll-pull-hold earplug technique



1. Roll



2. Pull

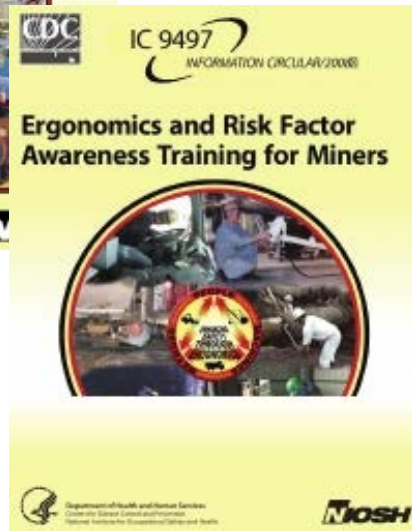
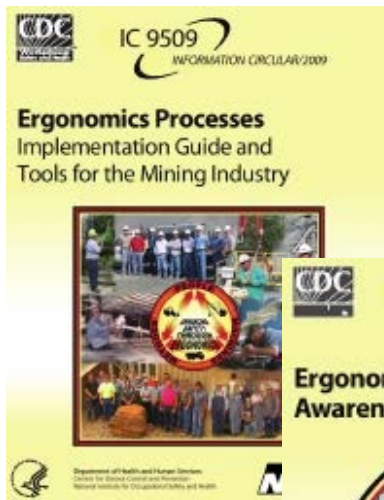


3. Hold

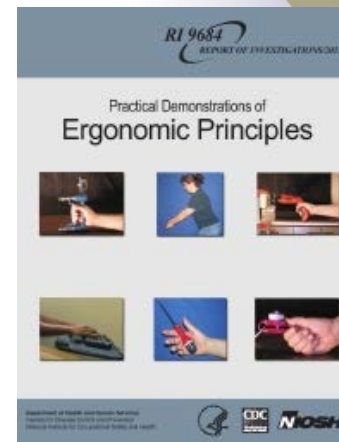


Ergonomics Education

customizable training modules, demonstrations and process implementation



Improving Safety at Minerals Processing Plants Through Engineering Controls Based on Ergonomic Principles



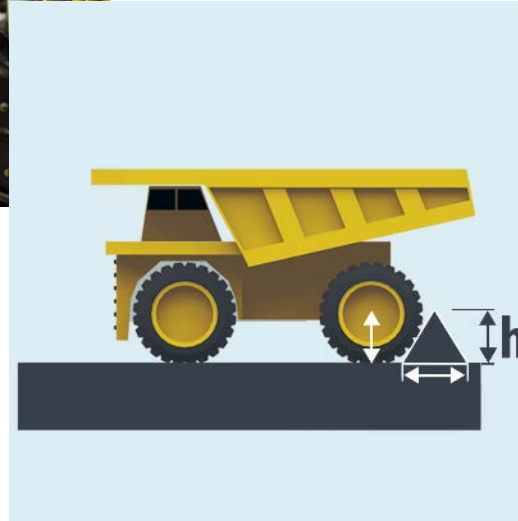
Proactively target risk factors to reduce or eliminate MSDs and unsafe worksite design



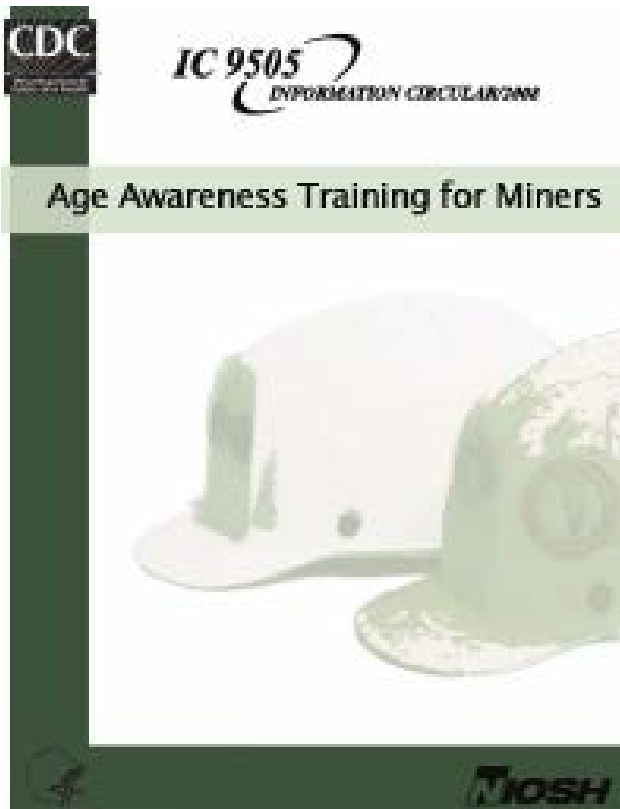
ErgoMine mobile ergonomics audit tool



ErgoMine
Mining Ergonomics Audit



Age awareness education



Designing work to slow down the aging process



Slip, trip, and fall prevention app under development



NIOSH Mining Partnerships

Labor



Government



Industry



Academia



MontanaTech



How to Get More Power Out of NIOSH For Your Company



National Occupational Research Agenda
(NORA) Mining Council

NIOSH has 10 industry sector councils

Mining is most active

Meets Wednesday afternoon at SME
annual meeting (Denver 2018)

Teleconferences

Document that describes H&S needs of
the mining industry

Helps drive the work that gets done

Contact David Snyder: fwx4@cdc.gov

What's Coming

- Personalized/continuous safety training
 - Adult education/active learning focused (UA/NIOSH)
 - Based on personality/learning style/experience (Predictive Index)
 - Competency/Capability framework (UA/Custos Fratrīs)
 - Serious games (Desert Saber)
 - Learning Management Systems (Marine Learning Systems/Mining Learning Systems)
 - Track outcomes of interventions in real-time (NIOSH/Industry partners)
- Wearable Sensors
 - Total worker health – correlate home and work (UA)
 - Ergonomics (Human Condition Safety)
 - Heat stress/sweat sensors (UA, GuiaCorp, and others)
 - Location (ubiquitous GPS)
 - Fitness/Activity (Fitbit and others)
 - Fatigue (SmartCap and others)



What's Coming

- 4D Autonomous Monitoring of Site Environment
 - Measure, Assess, Predict, Act
 - Water quality, quantity
 - Structure stability
 - Air emissions/quality
 - Real-time, streamed to protected website, machine learning to predict outcomes and recommend actions (Sub Rosa LLC, NOAH LLC and others)
- Mobile Monitoring of Site Environment
 - Drones for site assessment and volumetrics (many companies)
 - Multi-spectral imaging (near – thermal infrared)
 - Augmented reality for hazard recognition, record access (GuiaCorp, Desert Saber, Red Hammer)
 - IoT – smart lock out/tag out/ guarding etc (NIOSH)
 - Machine learning to assess patterns and make predictions/recommendations




What's Coming

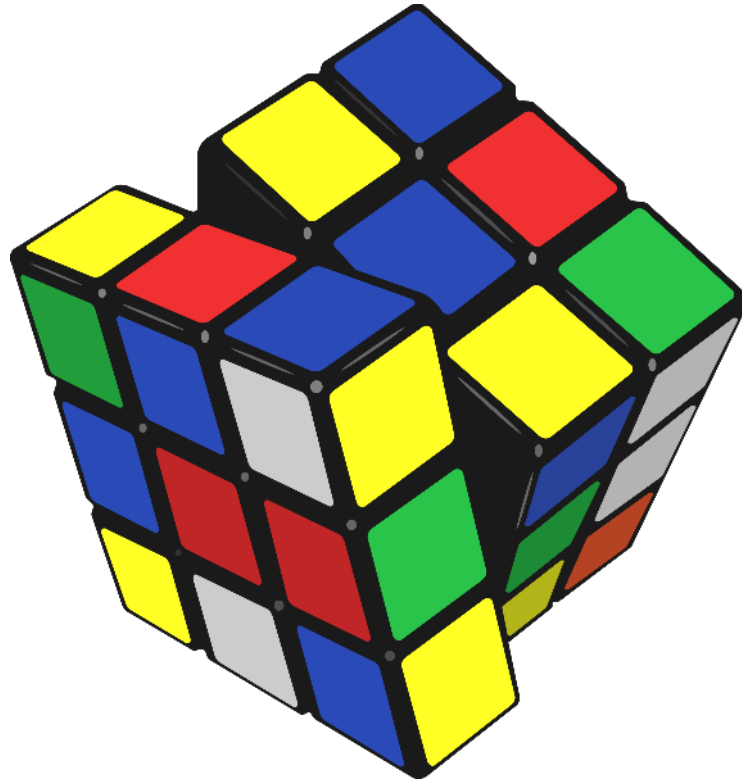
- Autonomous Vehicles
 - Operator assist is more likely
 - Collision avoidance
 - Fatigue avoidance
- Robots
 - Exoskeletons for lifting more likely
 - Augmented reality for assisting with technical details
 - Ubiquitous speech recognition
- Smart Systems, AI, Machine Learning
 - Will be built into everything
 - Cyber security will always be an issue but will get better
 - Interoperability of data systems – must have some standards for systems to talk to each other – Global Mining Standards group in SME
 - Business advantage will be intelligence not communications and database protocols



Conclusions

- Innovation requires partnerships
 - Approach innovation as a cube – must maneuver all faces and planes
 - Have the range of people involved – starters and finishers
 - Commit to systematic adaptation and adoption
 - Balance societal push and financial pull
 - What appears as rapid change and innovation has a generation of hard scientific research behind it
- 

The New Face of Mining is Partnerships for Innovation



Thank You for being great partners!

