

PITTSBURGH MINING RESEARCH DIVISION



RA Partnership Overview

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Refuge Alternative Partnership

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Pittsburgh, PA



Refuge Alternative Research

Heat and humidity

Air delivery,
contaminated air
ingress, and purging

Critical
stopping/door
system
characteristics

Communications,
tracking and
intelligent
monitoring for RA's

Heat and Humidity

Task Description	Completion Date
In-mine heat & humidity testing for metal RA	9/1/2015
In-mine heat & humidity testing for BIP RA	9/30/2015
Demonstration of occupancy derating for tent-type RA	12/31/2015
Determine temperature and %RH that cause core temperature to rise using simulation	3/31/2016
Demonstration of occupancy derating for metal RA	6/1/2016
Collect mine air and mine strata temperature data at five coal mines across the country for a period of one year	8/31/2016
Develop thermal simulation software tool to predict mobile RA temperature and relative humidity (BAA contract w/ University of Nevada, Reno)	8/31/2016
Determine appropriate metabolic heat input for RAs considering miner size and activity level	9/30/2016
Re-examine occupancy derating with updated heat input, temperature, and %RH limits	Ongoing
Evaluate heat mitigation strategies for RAs	Ongoing

RA Heat Mitigation Strategies

Task Description	Completion Date
Test prototype cryogenic air supply in 23-person tent-type RA	12/31/2014
Test prototype cryogenic air supply in 30-person BIP RA	12/31/2015
Test Safe Air System w/air conditioning in 60-person BIP RA	12/31/2015
Test proof-of-concept battery-powered air conditioning system in 6-person metal RA	3/31/2016
Develop commercially available cryogenic air supply (BAA contract w/Cryo Life Support Systems)	Ongoing
Develop commercially available battery-powered air conditioning system (BAA contract w/DRS)	Ongoing

BIP RA Air Supply

Task Description	Projected End Date
Determine relief valve configurations for Safe Air System	9/1/2015
Determine if CO2 scrubbing systems are necessary for BIP RAs	5/31/2016
Determine ability of Safe Air System to meet 12.5 CFM/person requirements	9/1/2015
Examine protection methods for compressed air lines (BAA contract w/University of Kentucky)	8/31/2016

Task Description	Projected End Date
Develop guidelines for BIP RA ventilation system layouts to insure proper purging	Ongoing
Determine appropriate relief valve characteristics for BIP RAs	Ongoing
Develop guidelines for BIP RA air supplies	Ongoing
Demonstrate use of borehole air supplies for BIP RAs	Ongoing
Demonstrate use of protected compressed air lines for BIP RAs	Ongoing

BIP RA Stopping/Door Systems

Task Description	Completion Date
Conduct finite element analyses (FEA) on existing BIP RA stopping/door system designs	Ongoing
Develop BIP RA stopping/door system concepts and conduct FEA analyses	Ongoing
Perform static pressure, ballistic, and contamination ingress tests on BIP RA stopping/door systems	Ongoing

RA Communication Systems

Task Description	Completion Date
Investigate existing and emerging communication technologies suitable for RA applications	Ongoing
Develop intelligent RA monitoring system(s)	Ongoing

Time	Topic/Title	Presenter/Facilitator
7:15 AM – 8:00 AM	Arrival and sign in	
8:00 AM – 8:10 AM	Welcome and introductions	Dr. Jessica Kogel, NIOSH Mining Dr. RJ Matetic, NIOSH PMRD
8:10 AM – 8:30 AM	BIP contamination ingress & purging research	Dr. Jim Noll, NIOSH PMRD
8:30 AM – 8:45 AM	BIP stopping & door research	Dave Yantek, NIOSH PMRD
8:45 AM – 9:05 AM	Heat & humidity, mine air and mine strata temperature field data	Dave Yantek, NIOSH PMRD
9:05 AM – 9:20 AM	Break	
9:20 AM – 9:45 AM	Miner heat input for RA testing and simulation	Dr. Tom Bernard, University of South Florida
9:45 AM – 10:10 AM	Miner thermal response and max occupancy	Mark Klein, ThermoAnalytics
10:10 AM – 10:35 AM	Thermal simulation tool for RAs	Dr. George Danko, University of Nevada Reno
10:35 AM – 10:50 AM	Break	
10:50 AM – 11:15 AM	Break	
Time	MSHA Forum	Presenter/Facilitator
2:00 PM – 2:30 PM	Overview of 2018 RA structural component requirements	Brittany Wilson, MSHA
2:30 PM – 3:15 PM	Impacts of structural approvals – What these mean to the mine operator (refits of tent, derating, etc.)	Wesley Shumaker, Ben Gandy, MSHA
3:15 PM – 3:35 PM	Charting path forward	Mike Getto, MSHA
3:35 PM – 4:00 PM	Open discussion and questions/answers	
1:50 PM – 2:00 PM	Break	

Thank You

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Disclaimer: The findings and conclusions in this report are those of the author(s) and do not necessarily represent the views of the National Institute for Occupational Safety and Health. Mention of any company or product does not constitute endorsement by NIOSH.