



Link Line



an update from **WSN** on **YOUR** Mine Rescue program

Issue #11 May 2010

Turning down heat stress

▶ Thanks to Ontario mine rescuers, researchers have made significant strides in developing strategies to reduce the risk of heat stress disorders in mining, and maybe mine rescue operations.

An experiment almost two years ago had Dr. Stephen Hardcastle and researchers from the University of Ottawa under the direction of Dr. Glen Kenny put two volunteer mine rescue teams through their paces at Vale Inco's Garson Mine. The research team monitored their work level, their internal body temperatures and the environment in which the volunteers performed simulated rescue work.

The final results made interesting reading, said Hardcastle of CANMET Mining and Mineral Sciences Laboratories, who manages and works with the researchers on the project for



It's hot out there and that won't change, but research is developing strategies to help miners and mine rescuers reduce the risk of heat stress disorders.

the Deep Mining Research Consortium and its partners, which includes Workplace Safety North and Ontario Mine Rescue.

"Though the environment was cool they (the mine rescuers) really weren't benefiting from the environment," he said. "We were somewhat surprised that some of the volunteers were starting to experience the effects of heat stress. They basically weren't cooling off fast enough for the strenuous task they were performing."

Heat stress occurs when the body's cooling system, principally the evaporation of sweat, is overloaded such as during intense physical effort in hot, humid conditions, causing a rise in the body's core temperature and leading to a series of disorders ranging in severity from simple heat rash to potentially fatal heat stroke.

See "Sweaty" Pg. 2

District MR Champions

Timmins District

Goldcorp Canada,
Porcupine Gold Mine

Kirkland Lake District

Kirkland Lake Gold Inc.

Thunder Bay/Algoma District

Barrick Gold Inc.,
Hemlo

Onaping District

Xstrata Nickel

Southern District

Sifto Canada Corp.,
Compass Minerals

Red Lake District

Goldcorp Canada,
Musselwhite Mine

See "Mining" Pg. 4

Mine Rescue mourns Eveson

Former Ontario Mine Rescue manager Ron Eveson passed away Saturday, May 29, at age 87 in the Sault Area Hospital. Eveson worked for Ontario Mine Rescue from 1953 to 1987, serving



Ron Eveson

as the Mine Rescue Officer in Kirkland Lake and Elliot Lake before becoming Senior Mine Rescue Officer in 1977.

We need you!

If you have comments about the newsletter, or suggestions for future articles, please contact Susan Haldane at WSN, (705) 474-7233 ext. 261, or susanhaldane@workplacesafetynorth.ca



P.O. Box 2050, Stn. Main
690 McKeown Ave.

North Bay, Ont. P1B 9P1

PH: (705) 474-7233

FAX: (705) 472-5800

www.workplacesafetynorth.ca

Sweaty results give researchers leads

New work focuses on clothing, work regimes, cooling techniques

Continued from page 1

This scenario can be further confounded by the insulative effects of clothing, ranging from coveralls to semi-permeable or impermeable and fire retardant protective clothing, worn by miners and mine rescue personnel.

The tests results led the team to focus in more specific areas, Hardcastle said. “That’s why we’ve being doing more research on the clothing, to help the body sweat more effectively and prevent the body overheating.”

The researchers have performed experiments in a human calorimeter, which accurately measures the effects of wearing a range of clothing from just underwear to two-layer combinations with full PPE, on the body’s ability to dissipate heat during work.

The latest research, according to Dr. Kenny, showed that during a 60-minute moderate workout, wearing regular polyester cotton mine coveralls increases the amount of heat stored in the body by as much as 60 per cent compared to performing the same task in shorts only. The coveralls significantly restrict heat loss, preventing the body from cooling as quickly as possible.

Hardcastle and Kenny are now trying to determine the best clothing to promote heat loss while working underground in heat stress conditions.

They suspect “the best clothing regime in high temperatures would be a sports type t-shirt with wicking capability” and regular polyester cotton workpants, a combination that increases body heat storage only 20 per cent compared to wearing just shorts.

“The biggest and best surface where you get most sweating, and hence cooling, is your torso,” the back, chest and abdomen. So wearing a t-shirt that allows sweating and evaporation will permit cooling in these prime areas that the coveralls limit, Hardcastle explained.

But they caution even if that is the case, miners won’t

necessarily be giving up their coveralls just yet. There are other workwear factors, durability and protection from other hazards for example, that need to be considered first.

For mine rescuers that means a change in clothing is likely further away, since they must wear garments that will provide some protection against fire and extreme heat. Other research, however, on how to cool off will be more applicable to mine rescuers.

Researchers also want to use the one-of-a-kind human calorimeter to review the ACGIH (American Conference of Governmental Industrial Hygienists) guidelines on work/recovery times to help determine the best regime to reduce heat stress for different work conditions.



The psychologically and physically demanding nature of mine rescue work in hot, often humid and poorly ventilated environments places mine rescuers at risk for heat stress.

The current guidelines attempt to balance work and recovery times in hot and humid work conditions, but there needs to be more research to support those guidelines or find a better balance, he said.

The greatest cooling can occur in the first 10 to 15 minutes of a rest break, Hardcastle said. So when the guideline suggests a 15-minute work and 45-minute recovery regime, the researchers want to know if that work period following by a continuous recovery is a good balance, or whether both work and recovery broken up into smaller segments might be better.

And “a brand new area (of our research) is trying to work out what is best” in assisting the body to cool itself, Hardcastle

said. Just sitting during a rest period doesn’t promote effective cooling, he said, because it doesn’t encourage the blood to circulate and transfer heat.

“Lying on your back with your legs raised” would increase blood circulation to the heart, allowing heat to be transferred to the skin surface, he said, but that is not practical, especially for mine rescuers. Standing on the spot while gently contracting one’s leg muscles or very light exercise, however, can keep blood gently circulating without adding to body heat. There may even be devices that will promote circulation without the body needing to do work.

“We need to know when you’re in recovery, what’s the best thing to do to assist cooling,” Hardcastle said. Finding alternative recovery techniques that enhance heat dissipation will be particularly important to mine rescuers who usually work under important time constraints.

See Related Story Pg. 3

Education critical to controlling heat stress

There will be no magic bullet to solve the issue of heat stress for mine rescuers.

“There are so many variables, there will never be a magic bullet,” said Dr. Stephen Hardcastle, of CANMET Mining and Mineral Sciences Laboratories, who is directing research into heat stress in mining.

The nature of mine rescue – psychologically and physically challenging work in hot, often humid, and poorly ventilated environments – places mine rescuers at greater risk of suffering a heat stress disorder.

Though research is making progress on measures to reduce the risk, Hardcastle said, such factors as chronic disease, age, fitness, weight, health, medications, level of hydration, clothing, type of work, environment and other factors affecting heat loss make a single solution impossible.

Because of this, “understanding the complexity and education becomes critical,” he said.

“Mine rescuers need to be aware of the symptoms of heat stress and not be shy to admit to them. The individual is the best person to know if they are stressed.” They need to learn how to listen to their body, and recognize the symptoms of their team members, Hardcastle said.

Symptoms for severe disorders, heat exhaustion and heat stroke, may include heavy sweating, faintness or light headedness, rapid and/or weak pulse, blurred vision, reduced mental capacity, fatigue, and confusion.

That education also comes with the foresight to be “adequately hydrated ahead of time,” he said. Hydration maintains the blood volume, the body’s coolant. Waiting until one reaches the mine, may be too late.

Other precautions include being rested, fit and healthy, frequent breaks, resting long enough to cool off, and watching out for each other.



The MineARC portable refuge station used at Xstrata’s Kidd Mine.

Planning, not luck, key to emergency response

Good fortune isn’t part of an emergency response plan.

Especially at the 9,500 level of Xstrata Copper’s Kidd Mine in Timmins where there is only one long way in and one long way out.

Xstrata’s Dave Dewar said the hazards of having only one exit point are self-evident, and in a situation compounded with the challenge of being so far underground, additional urgency is placed on having suitable refuge stations.

“Nobody else mines at our depth and with our distance,” he said.

“You can’t leave things to luck,” said Dewar, and that’s why the mine purchased two portable refuge chambers manufactured by MineARC for use at the lowest levels where permanent refuge stations had yet to be developed.

“It’s a steel shell that holds 15 people, and is equipped with three oxygen bottles along with a scrubber that filters out CO₂ and CO.”

The portable stations are also equipped with a battery backup system in the event of a power outage, an oxygen candle to generate oxygen, phone lines to the surface, air conditioning, water, a toilet, and other minor amenities that ease the difficulty of being confined within during an emergency.

“The manual tells us we’d have no problem keeping 15 people in there for a minimum of 36 hours,” Dewar said, but “if we ever get into that situation, they

would be our priority.”

Even without power and relying on the MineARC’s batteries, the chamber’s life support and electrical systems are designed to last more than 36 hours.

That situation hasn’t occurred, but the stations have been used for short periods during stench drills and passed muster with the miners. So much so, that for a time the stations were used as a cooling station for relief from the heat.

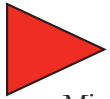
That practice has stopped, as “we don’t want people going in there (in an emergency) and it being full of garbage,” said Dewar. “It is pretty well accepted that this is for emergencies only.”

Originally the stations were placed at the 9,500 and 9,600 levels, but a permanent refuge station has been established at the lower level, so one portable is available for when development has proceeded to a point when a station is advisable but establishing a permanent one may not be practicable.

“We move the whole thing as a unit sitting on two skids using a forklift or towing it,” said Dewar, first along the ramp at the higher levels and then in the cage down the shaft to reach the lowest levels.

Maintenance is minimal, Dewar says. It’s checked daily, with more thorough maintenance monthly. Its gas monitor is recalibrated every six months, and the refuge station is recertified once a year.

Mining gold helmets in the Hollinger Mine



There's still gold in the famous Hollinger Gold Mine – gold helmets.

The Hollinger Mine, now the Timmins Underground Mine Tour, was the site of the disaster that led to the creation of Ontario Mine Rescue more than 80 years ago and is the site of the sixtieth annual provincial mine rescue competition.

But only one of six mine rescue teams, winners of this month's district mine rescue competitions, will come out of the Timmins mine next month with the helmets earned by the winners of the provincial competition.

The event will be held Friday and Saturday, June 11 and 12, at the former working mine, next to the Shania Twain Centre. While much of the activity will be held underground, guests at the competition will be able to watch the event live above ground via a monitor with video feed.

The mine, which opened in 1909, claimed 39 lives in a fire in 1928 that required the assistance of mine rescuers from the U.S. Bureau of Mines in Pittsburgh to extinguish. The disaster led to the creation of Ontario Mine Rescue in 1929.

VR used to create real MR competition

Competitors at this year's International Mines Rescue Competition in Australia will face a new level in simulated emergencies.

The New South Wales Mines Rescue Service, host to the seventh international competition this November in Wollongong, approximately 80 kilometres south of Sydney, will use a mines rescue station equipped with virtual reality technology as one of the sites for the event.

The technology used to train mine rescuers and in Australian competitions, includes: a four-metre high hemispherical dome to immerse participants visually in a variety of situations such as machine operation and navigating through a mine environment; a 160-degree wrap around screen (four metres high by 10 metres wide); and a

360-degree Advanced Visualisation and Interaction Environment (AVIE) (four metres high and 10 metres in diameter) that allows total immersion in a simulated mine environment.

The competition, the first international event to include virtual reality technology, will also involve a three-hour exercise under oxygen at a nearby coal mine.

The winners of the 2008 Ontario competition, Xstrata Nickel Fraser/TL Mine finished fifth overall in the sixth international competition in Reno, Nevada that year, won by Australia. Ten countries competed, as well as mine rescuers from Saskatchewan. It was the first time an Ontario team competed in the event.

More information is available at the International Mine Rescue Body website -- www.minerescue.org/competitions.htm.

Who's where at WSN Mine Rescue

Mine Rescue

Officers/Consultants

- **Walter Adler, Sudbury**
Phone: (705) 670-5707 ext. 331
- **Wayne Baker, Kirkland Lake**
Phone: (705) 567-4606
- **Emanuel (Manny) Cabral, Sudbury**
Phone: (705) 670-5707 ext. 323
- **Duane Crowell, Thunder Bay**
Phone: (807) 344-8211
- **Pat Gauthier, Manitowadge**
Phone: (807) 238-1155
- **Ernie Gulliver, Timmins**
Phone: (705) 235-4861
- **John Hagan, Onaping**
Phone: (705) 670-5707 ext. 334
- **Bruce Hall, Sudbury**
Phone: (705) 670-5707 ext. 335
- **Shawn Kirwan, Sudbury**
Phone: (705) 670-5707 ext. 322
- **Grant Saunders, Red Lake**
Phone: (807) 735-2331
- **Tim Taylor, Delaware**
Phone: (519) 652-9809

Head Office Staff (Sudbury)

- **Charlie Burton,**
Mine Rescue Program Supervisor
(705) 670-5707 ext. 329
- **Isabella Caron,**
Administration
(705) 670-5707 ext. 321
- **Alex Gryska,**
Ontario Mine Rescue Manager
(705) 670-5707 ext. 330

Communications Staff (North Bay)

- **Susan Haldane,**
Supervisor/Editor
(705) 474-7233 ext. 261
- **Ken Sitter,**
Technical Writer
(705) 474-7233 ext. 234



About the Mine Rescue Newsletter

MR newsletter is published three times per year by Workplace Safety North (WSN). WSN is funded by workplaces in the province, through the Workplace Safety and Insurance Board.

The information in this publication is accurate to the best of our knowledge. However, the association assumes no responsibility or liability for the accuracy or sufficiency of this information, nor does it endorse any product mentioned herein with the exception of those produced by Workplace Safety North.



P.O. Box 2050, Stn. Main
690 McKeown Ave.
North Bay, Ont. P1B 9P1
PH: (705) 474-7233
FAX: (705) 472-5800
www.workplacesafetynorth.ca