



# Mining for Expertise

*There's a desperate need for technical talent in the mining industry as the amount of mining in the U.S. increases and more aging workers are set to retire. At the same time, the number of mining engineering graduates has slowed to a trickle.*

**BY DANIELLE BOYKIN**



**T**ales of hope and eventual heart-break have been splashed across the front pages of newspapers around the nation as tragedy after tragedy has struck the U.S. mining industry. Events at Sago Mine in Sago, West Virginia, Darby Mine No. 1 in Harlan County, Kentucky, and Crandall Canyon Mine in Huntington, Utah, are reminders that the need for energy and precious mineral resources can sometimes come at a heavy price.

While the mining industry is making improvements in safety and health, it has one of the highest fatality rates of any U.S. industry. And while engineers are essential to safety and life-saving actions in the mining industry, enrollments in mining engineering programs remain low and retirements are set to skyrocket. At a time when expertise is needed more than ever, there are major questions about whether the mining engineering discipline can be sustained.

Today, coal is still considered the workhorse of the electric power industry, and there are no signs that will change any time soon. Coal production in the U.S. is predicted to increase from the current 1.1 billion tons to 1.8 billion tons per year by 2030. This increase in production will affect the demand for new mining technologies, but increased demand can also mean new hazards for workers.

Raja Ramani, P.E., Ph.D., believes that mining safety has many dimensions, but it begins with sound engineering. "From the time that the mine is a sparkle in the eyes of the owner to the time that it starts

producing and throughout the production process, engineering is the best mechanism for improving safety," says Ramani, the Emeritus Professor of Mining and Geoenvironmental Engineering in Pennsylvania State University's energy and mineral engineering program.

Further, he believes the engineering design process should be based on education and training in technology, procedures, health and safety, and enforcement of laws and regulations. "You need a mine designed in the safest manner possible, you need a knowledgeable workforce, and finally, you need management that ensures the laws and regulations are obeyed," Ramani says.

One of those laws was signed by President Bush in June 2006. The Mine Improvement and New Emergency Response Act of 2006, also known as the MINER Act, amended the Mine Safety and Health Act of 1977. The new law contains a number of provisions aimed at improving safety and health in America's mines. In June 2007, new regulations were proposed in draft federal legislation to reduce coal dust exposure, increase whistle-blower protection for miners, and establish a national emergency coal center.

Ramani recently chaired a National Academies committee that reviewed the National Institute for Occupational Safety and Health's mining program. The committee, which released its report in May, made several recommendations, including that the program should make better use of surveillance data on mining related incidents, injuries, and illnesses



and work to make the programs more robust. The committee also recommended improved training programs and technology transfer as well as efforts to prepare for the retirement of older employees.

According to the Mine Safety and Health Administration, several safety milestones have been met, particularly those for coal mines. Since 1970, coal production has increased by 83% while fatal injuries have decreased by 92%. Injuries in mines have fallen by two-thirds in the last 15 years, and more than half of U.S. coal mines operate annually without a single lost work time injury.

Increasing health and safety in the mining industry is the prime focus of NSPE member John Seiler, P.E. Seiler serves as a manager in the physical and toxic agents division of the Pittsburgh Safety and Health Technology Center, a branch of MSHA. This center provides assistance nationally to mining industry inspection personnel to help reduce exposure to harmful physical and toxic agents in the mining environment: noise, vibration, heat stress, and toxic liquids, vapors, or gases.

After last year's accident at Sago Mine, Seiler's division sprang into action by deploying a mobile analytical laboratory. The unit collected and analyzed gas samples, then provided the results to other engineers who could determine conditions in the mine and if it was safe enough for rescue teams. In August, Seiler's division had three employees set up for gas chromatography at the site of the Crandall Canyon Mine collapse, along with others from the center's ventilation division, roof control division, and mine emergency operations.

The center benefits from engineers with expertise in various disciplines, including mining and civil backgrounds. Out of approximately 100 employees, roughly 65 have engineering positions and 33 are either EIs or PEs, says Seiler, who supervises 17 employees. The center's engineers

identify hazards, analyze data, and recommend the engineering controls for mines. They also carry out forensic engineering when incidents occur.

Seiler was drawn to the mining industry around 1970, at a time when the job market was unpredictable for some engineers. He took his first job in 1971 with the Bureau of Mines, which was dissolved in 1996. "Many engineers were being hired by the industry and government because of the upswing in energy and the Federal Coal Mine Safety and Health Act of 1969," Seiler says.

Like most experienced engineers in this industry, Seiler foresees a retirement boom in the next 5 to 10 years. "In 1971, a lot of us came in as new, young engineers, and now we're the old, gray-hair or no-hair engineers, and we are looking at retirement," Seiler says. "A lot of the institutional memory is going out of the door."

To prepare for future retirements,

**"In 1971, a lot of us came in as new, young engineers, and now we're the old, gray-hair or no-hair engineers, and we are looking at retirement," Seiler says. "A lot of the institutional memory is going out of the door."**

Seiler's agency established a leadership development succession program. "They are training journeymen and engineers in supervisory management competencies and trying to provide them with the attributes necessary to become first and second line managers," he says.

### **Dwindling Enrollment**

NSPE member Dan Rovig, P.E., is convinced that the appreciation for the mining industry and its affect on the U.S. economy has significantly dwindled since he entered the field in the 1960s. "It was a time of opportunity, and I entered the industry with a lot of enthusiasm," says the Montana native and member of the American Mining Hall of Fame.

However, Rovig believes that more emphasis needs to be placed on boosting the U.S. economy through mining natural resources. In the U.S., "a lot of people have forgotten the fundamental need for wealth-creating industries," says Rovig, who serves on the board of directors for Goldcorp Inc. and is former president and CEO of Glamis Gold Ltd. "I certainly see the mining industry, whether it's sand and gravel, or gold and silver, lead and zinc, or copper, as all fundamental industries."

Over the years, U.S. mining engineering programs have produced fewer and fewer graduates. In the 1970s, when the U.S. was striving for energy independence, there were more than 20 programs that were producing approximately 700 graduates. Currently, there are 13 accredited mining engineering programs, according to ABET, and the number of graduates has dropped significantly.

In 1999, 173 students received mining engineering degrees, and the interest reached its lowest point in 2004, with only 85 bachelor's degrees awarded. During the 2005–06 school year, 120 students received bachelor's degrees in mining engineering and 48 received master's degrees, according to the American Society for Engineering Education. In comparison, during the 2005–06

school year, 909 received bachelor's degrees in metallurgical and materials engineering.

The downturn in industry hiring in the recent past has been a turnoff for students. "High school students see that no new mines have opened and people in existing mines lose jobs," Ramani says. "This doesn't make students look at mining as a prosperous career, but that is a very short-term view. A mining graduate today has many offers, and the demand for mining engineers could only grow."

Thomas Novak, P.E., Ph.D, understands the challenges faced by his colleagues at other universities because everyone is focusing on increasing enrollments. He is optimistic about an industry comeback, beginning with the students who enroll in the

mining and minerals engineering program that he heads at Virginia Tech. Over the years, Virginia Tech has had one of the few accredited programs to experience a steady increase in graduates. The curriculum focuses on mining engineering and includes mineral exploration, evaluation, development, extraction, processing, and conservation.

When students graduate from Virginia Tech's program, companies are lined up and waiting for them, he says. "The good students get multiple offers."

Rovig believes that industry can share some of the blame for not encouraging young people to go into the field. "Industry hasn't maintained a strong interest in developing people to sustain the mining industry," he says.

Career opportunities within mining have potential to take off again for new graduates. The Bureau of Labor Statistics reports that mining and geological engineers can expect favorable employment opportunities.

At Goldcorp Inc., Rovig has been involved with recruiting efforts. "It's not easy to find new graduates and even more difficult to find experienced people because everybody is looking for them," he says. "It can become a real poaching exercise if you identify someone, but times couldn't be better for engineers with drive, ambition, and some experience."

### Investing in R&D

One of the factors that is negatively affecting the mining industry and engineering education is the downward spiral in research funding. Novak is greatly concerned that a crisis is looming. In March 2006, he told the Senate Committee on Health, Education, Labor and Pensions that research funding from the government had dropped from \$140 million in 1979 to \$30 million in 1999. Novak's department is the site of two research centers, the Virginia Center for Coal and Energy Research and the Center for Advanced Separation Technologies, which includes projects focusing on systems simulation, rock mechanics and ground control, and the environment.

According to a report released by the National Academies in June on coal to support U.S. energy policy, the coal mining industry has a critical need for research and development investment. The report notes that areas such as processing and productivity,

worker safety, and environmental issues could benefit from more R&D investment.

The report also acknowledges that declining funding for academic research in mining and mineral engineering has contributed to the decline in accredited programs, resulting in a shortage of technically trained professionals. This shortage, says the report, will be magnified by increases in coal production.

Ramani says that Pennsylvania State University feels the pain of inadequate research funding when it comes to replacing retiring faculty members. In 2001, three senior faculty members retired, and the university lost a combined 120 years of experience. Programs across the nation are in intense competition for talent. "The shortage of research funds over the last 10 to 15 years has decimated the availability of Ph.D.s for faculty positions in American universities, let alone for research personnel for government agencies and industry," he says.

Rovig agrees that the U.S. needs to re-examine priorities when it comes to funding research. "The United States terminated practically all federal funding

for academic research and a whole host of other things such as mining methods when the U.S. Bureau of Mines was shut down," he says. "I think we've lost a lot because we lost the country's mandate to put smart-thinking people into the arena of mining and processing in all disciplines."

Rovig's company and others in industry have had to step up to support university programs through capital campaigns and recruitment of both faculty members and students. "I think the future looks wonderful for younger people wishing to come into the industry," says Rovig, who attributes this to the current high demand of precious metals and favorable prices.

Despite the challenges faced by the mining industry and mining engineering educators, human needs for mined materials will more than likely dictate the future of the industry. "The mining industry," Ramani says, "will continue to exist as long as human beings are here on earth because we need tremendous amounts of new mined materials, of the order of 25 tons for every person in the United States, for our living." ■