Drones improve Mine Measurement & Safety

The Technology Issue

Also Inside:

Tracking Wildlife • Managing Heat Stress and Fatigue
Education Report • TMRA Annual Meeting
Sine Die Rocks Out the Session
FALL 2017

ON THE COVER
Luminant’s unmanned aerial vehicles (drones) have contributed substantially to improvements in surveillance and safety at its Texas mines. Read more about this and other mine technologies starting on page 9. Source: Luminant

TECHNOLOGY CLOSELY MONITORS THE HOUSTON TOAD

The innovative use of audio recorders at mining operations to monitor wildlife – including the Houston toad – has revolutionized habitat detection and monitoring. For more on how this technology is being used by Luminant, please see page 12. Source: Blanton & Associates, Inc.

9 Luminant Drones Revolutionize Mine Surveying
10 Tracking Wildlife at Marshall Mine
12 Acoustics Technology Listens for Houston Toad
14 Cool New Technology Manages Heat Stress
16 Using Technology to Combat Fatigue
17 From Slide Rules to GPS at the Uranium Mine
18 Special Education Report
19 Meet Teacher Cheryl Ann Allison
20 Get Set for TMRA’s 2017 Annual Meeting
21 Sine Die Event Closed out the 85th Legislative Session

This year, TMRA added a social media component to its Teacher Workshop program. As shared on Facebook, science teachers visited the Texas Advanced Computing Center in Austin during its June 19-23 Industrial Minerals workshop. See page 18 for more on the program. Source: Charitie Wright

Contents > Departments
4 Chairman’s Letter
6 Executive Director’s Message
8 New Members
22 Member News
24 News Brief
24 Meetings & Events
26 TMRA Board of Directors, Officers and Committees
It’s been a very busy summer for the TMRA Team!

The TMRA Sine Die event was once again the exclamation point to a successful 85th Regular Session of the Texas Legislature. Thanks to all who sponsored, partnered and volunteered their time to acknowledge the hard work and service of Texas legislators and their staffs.

We also just completed another successful year of TMRA Teacher Workshops. Through the generous contributions of the TMRA membership, the workshops provide an all-expenses-paid source of continuing education requirements for Texas educators.

This important outreach effort provides teachers with the science-based information and educational learning materials that highlight our industry’s responsible development of natural resources and mined land reclamation programs.

The workshops began in 1991 and, since then, our message has reached more than one million Texas schoolchildren. Thanks to Francye Hutchins and the TMRA team for another job well done. Let’s shoot for another 25 years of workshops!

Cathy Pierce is putting the finishing touches on the upcoming TMRA Annual Meeting, which will be held at the Hyatt Regency Lost Pines Resort & Spa from Sunday, Oct. 29 through Tuesday, Oct. 31. We hope you will make plans to attend to make it another record-setting event! The full agenda of events and speakers, along with the registration packet, is available at www.tmra.com.

The fall edition of TXMining magazine focuses on technology and how it benefits mining. Advancements in mining safety, equipment efficiency, operations and maintenance monitoring systems and engineering and environmental tools are truly amazing.

For example, in lieu of traditional surveying equipment, cost-effective drone technology and software is now used to produce high-accuracy mapping and aerial photography. Fatigue monitoring and other PPE systems now provide real-time feedback to the miner to help prevent unsafe events. Through advancements in analytical software, including audio and video technology, we can now monitor and mitigate impacts to wetlands and other protected wildlife habitats.

These advances in technology are just a few of the many tools that are necessary to support the mining industry’s efforts to be competitive, ensure the safety of the miner and be good environmental stewards.

In closing, I’d like you to join me in saying ‘thank you’ to TMRA Executive Director Ches Blevins and his team, the TMRA Board of Directors and the TMRA Executive Committee, for their dedication to our industry. Recent times have been challenging, but their contributions and teamwork have helped keep our message strong and relevant.

It has been a pleasure to serve with you and this great organization, and I have benefitted greatly from your leadership and fellowship. I hope to see you all at the TMRA Annual Meeting at the end of the month.

Stay Safe.
—Brett
EXPERT CRANE SERVICES SINCE 1985

30 YEARS OF SAFETY, EXPERIENCE, AND RELIABILITY.

Joyce Crane works to achieve new heights of superior customer service and job safety in heavy duty lifting and rigging throughout Texas, Louisiana and Arkansas.

Joyce Crane offers three decades of heavy duty lifting and rigging experience and is committed to working tirelessly to meet and exceed your needs and earn your trust. Depend on Joyce Crane’s expert staff to engineer and develop an efficient and cost-effective lift strategy that ensures project safety and protects your investment.

At Joyce Crane, we’re ready to do your heavy lifting.
EXECUTIVE DIRECTOR’S MESSAGE

Congratulations everyone! We’ve completed a very successful 85th Regular Session of the Texas Legislature, topped off, once again, by an outstanding TMRA Sine Die event. That is all thanks to the incredible support from our TMRA Members and others wanting to say “thanks” to our legislators, other government agency officials and staff for their work on behalf of all Texans.

TMRA is even more successful in educating and working with our legislators and others, such as the Railroad Commission of Texas and the Texas Commission on Environmental Quality, to let them know not just our positions on issues critical to operations, employees and communities, but also our absolute commitment and success in protecting – and enhancing – our environment and natural resources.

Through all our efforts, TMRA is also given opportunities to highlight our work with Texas teachers and students to educate in an open, honest way about mining and power generation in Texas.

Our theme for this issue is “Technology in Mining.” Whether a TMRA Owner/Operator of one of our industry mines or a TMRA Support Member serving our mining industry, not a month, not even a week, goes by without technology playing an important role.

In fact, the use of technology is a part of our operations literally from start to finish, from delineating where reserves are located and in what quality and quantity to assuring that our reclamation efforts meet and/or have exceeded all permitting and environmental standards.

Technology assists in every phase of our being able to safely, effectively and efficiently recover and utilize our state’s valuable natural resources.

Merriam-Webster defines “technology” as “the use of science in industry, engineering, etc., to invent useful things or to solve problems: a machine, piece of equipment, method, etc....”

I invite you to look on the corner of your desk (I’m sure it’s still there!) for our TXMining Fall 2015 magazine titled “Innovation in Mining.”

Read it again. A very similar theme to the one before us now. Innovation and technology go hand in hand.

As you’ll see in this issue, our members seek out and utilize the latest technologies in innovative ways. We should all be proud.

From the mining of industrial minerals, coal and lignite to the in-situ recovery of uranium, there are always challenges. The development and use of technology enhances opportunities to recover and use our resources effectively, efficiently and in ways that are protective of people and our environment – even in the face of changes in the economy and the political landscape.

Our TMRA TEAM of Members will continue our efforts on all fronts so that Texas citizens, businesses, communities AND the environment ALL benefit!

—Ches

Advertise on the TMRA Website

As a TMRA Member, you now have a new benefit. TMRA is offering the opportunity to advertise digitally on its website.

Visit http://www.tmra.com/content.asp?contentid=152 to view a rate card or contact Lance Lawhon at lance@solafidei.com or 512.832.1889.
Products you can depend on.
A dealer you can rely on.
Our commitment to service.

Mining Sales & Rentals
(903) 736-9001

Mining Parts & Service
(903) 758-5576

www.romco.com

Romco Equipment Co.
Texas Rubber Supply

Established in 1952, Texas Rubber Supply (TRS) remains one of the top industrial products distributors in north Texas. Located in Arlington, we proudly serve the Dallas/Fort Worth area and the rest of Texas. We offer a complete line of industrial and contractor-related supplies, providing local support, local inventory and fast delivery. TRS has in-house fabrication capabilities to support our hose, conveyor belt and gasket product lines.

Services include custom hose fabrication, onsite testing, in-house die-cut gaskets and field vulcanization for conveyor belts, just to name a few. With more than 65 years in business, our vast experience, quality products and passion for excellence continue to set us apart from our competition.

Contact:
Derek Lewis
General Manager
Texas Rubber Supply
1210 Avenue H East
Arlington, TX 76011
214-631-3143
derek-lewis@texasrubbersupply.com
www.texasrubbersupply.com

North American Mining

A subsidiary of the more than 100-year-old North American Coal Corporation, North American Mining is a specialist in contract mining services. Whether extracting limestone, sand, phosphate or any other mined material (other than coal), North American Mining has the experience, expertise and equipment to provide the most cost-effective mining services possible.

With a strong focus on safety and the environment, our services are comprehensive – including everything from reserve evaluation, permitting, mine planning, operation and final reclamation. This includes the dragline, truck shovel and surface miner machine operations that ensure maximum efficiency at your operations. Able to operate in all 50 states and internationally, we pride ourselves on being your solution-based partner for contract mining services.

Contact:
Chris Taylor
Business Development/Engineering Manager
North American Mining
11700 NW 101 Rd., Suite 19
Medley, FL 33178
903-472-1369
chris.taylor@nacoal.com
www.nacoal.com

MAIN Geo-Construction Sources LLC

MAIN GEO-Construction Sources LLC provides premiere design-build services for the erosion control and earth retention industry. Customer satisfaction is one of our greatest passions. Whether your project requires channel lining, rockfall protection, soil improvement, soil nailing or any of our specialized walls – including shotcrete walls, crusher wall or green walls – bring it to our world-class team of engineers and professionals. Count on us for quality engineering and professional construction services ALL IN ONE working under the same umbrella. In addition to being material experts in the geo-construction industry, we only partner with individuals who have stellar backgrounds in geo-technical, erosion control, structural, mining and tunneling.

The successful delivery of well-rounded projects has top builders and public and private owners seeking our services to help launch their projects and keep them on schedule and under budget. MAIN GEO’s all-inclusive services are designed specifically for seasoned project managers who know our knowledge keeps their project moving forward.

Minutes can cost millions. Call MAIN GEO for a cost-effective, successful and timely result from the beginning.

Contact:
Marco Invernizzi
President
MAIN GEO-Construction Sources LLC
1202 Woodfield Dr., Ste. A
Austin, TX 78758
512-915-3355
marco.invernizzi@main-gcs.com
www.main-gcs.com
From its earliest days, the power and mining industry has relied on efficient management practices to produce safe, reliable and affordable fuel and electricity. In fact, these practices are reaching new heights – literally – with the use of unmanned aerial vehicles (UAVs), or drones, for surveying Luminant’s fuel stockpiles and mines.

Over the years, Luminant engineering teams used an evolving series of surveying technology, including total stations, GPS topography and terrestrial-based Lidar, for measuring fuel inventory, active operations and reclamation activities. New technology, such as UAVs and photogrammetry, are significantly improving the time, expense and accuracy of surveying and mapping activities.

The science of photogrammetry has been well established for decades to create topographic and other maps from aerial photos. It is a form of aerial surveying utilizing conventional aircraft and manual tools, such as a stereo plotter, which dates to the 1930s. The increased power of computers in the past 10 years has allowed for photogrammetry processes to be automated and useful on a commercially-available computer. Computer software will take hundreds or thousands of photos and compare them to create detailed 3D information.

The improvement and automation in photogrammetry, along with the utility of UAVs, has created a whole new era of accurate measurement and surveying. Using photogrammetry, UAVs can produce work products of point clouds, orthomosaics, topography contours and 3D surfaces. This data is then used to run a volumetric analysis on fuel stockpiles and active mining operations.

Safety has also improved, since surveyors are no longer required to take measurements on stockpiles, greatly reducing the amount of stockpile finish work. With the latest advancements, even a rough pile can be accurately and completely measured. To be sure, utilizing UAVs and associated technology is a significant step forward in the management of fuel inventory at power and mining facilities.
Marshall Mine, LLC (MM) is using innovative new technology to help update and improve its fish and wildlife protection plan. From 2014 to 2016, MM collected fish and wildlife data on a 590-acre expansion area adjacent to its active Marshall Mine in Panola and Harrison Counties. To reduce costs and improve efficiency, MM utilized new survey methods and technology to collect valuable site-specific data.

One example was the use of acoustic recording technology and newly developed software to determine the presence/absence of bat species. Several bat species are known inhabitants of the piney woods of east Texas, including the Rafinesque big-eared bat (*Corynorhinus rafinesquii*), which is listed as threatened by the Texas Parks & Wildlife Department (TPWD), and the south-eastern myotis bat (*Myotis austroriparius*), which is considered by TPWD as a species of the greatest conservation need.

In the past, mist-netting surveys and the manual recording of bat calls were common practice in surveying for bats. While mist-netting is still used at times, it is very labor-intensive and requires the physical capture and handling of bats. To obtain reliable onsite data while avoiding the handling of bats, MM deployed automated acoustic recorders (the Wildlife Acoustics SM3BAT Song Meter). These highly sensitive recorders were pre-programmed to collect information from dusk until dawn, which negated the handling of bats or the need for an onsite team of biologists.

Once collected, an acoustic data analysis was performed using Kaleidoscope Pro 4 Analysis Software, which has been approved by the U.S. Fish & Wildlife Service for use in detecting and identifying bats. The software has an integrated suite of bat acoustic analysis tools designed to help biologists quickly convert files, sort and categorize bat data by species, verify the findings and visualize the call signatures. Kaleidoscope identified 1,161 bat calls to the species level with high probabilities in the identification of five different bat species.

MM also used a live-trapping method to gather information on large snakes to determine presence/absence of timber/canebrake rattlesnake (*Crotalus horridus*). The canebrake is listed as a threatened species by TPWD and is known to occur throughout east Texas, where it is most commonly observed in bottomland habitats. Typical surveys for large terrestrial snakes...
involve intense pedestrian or road-cruise efforts, which require numerous survey man-hours. For the canebrake, pedestrian surveys have a low success rate due to several factors, including its cryptic camouflage, limited movement through most of active season and relatively docile nature, which rarely prompts the species to use its rattle. Pedestrian surveys for canebrakes also involve a level of danger when searching suitable habitat, such as coarse woody debris, hollowed stumps, animal burrows, low-growing cover and leaf litter.

To minimize survey man-hours, increase safety and more effectively detect canebrakes, MM utilized live traps developed by research ecologists working in east Texas and western Louisiana. These traps, which were transported into the study area using UTVs, are comprised of a specially designed wood-framed box and four, 50-foot drift fences. Each trap was placed in suitable habitat, where adequate canopy cover would prevent the over-heating of captured snakes.

Once installed, MM environmental specialist Brad Griffin conducted weekly trap checks to document and release the captured snakes. By the survey’s conclusion, MM had amassed 2,260 trap nights, documenting 60 individual snakes of 12 species. The mine also confirmed the presence of the canebrake, with the capture of two adult and one first-year snake. This approach allowed for cost savings in survey man-hours, while obtaining valuable data for MM and TPWD for the update of the mine’s Fish and Wildlife Protection Plan.
Detecting the presence of a rare animal is by its very nature a difficult task. Add to that the fact that the elusive animal is best detected by its unique mating call, which it does infrequently and only for brief periods in the spring, at night and under specific, often inclement, weather conditions. Now the task becomes particularly challenging.

Over the past three years, that is exactly what Blanton & Associates, Inc. (B&A) sought to achieve at several mines owned and operated by Luminant, where B&A conducted presence/absence surveys for the federally and state-listed endangered Houston toad (*Bufo houstonensis*). The innovative use of audio recorders provided a novel solution for improving survey efficacy, while simultaneously reducing labor costs.

With a drastic decline in their numbers since the 1980s, Houston toads have gone undetected at numerous sites where they were previously known. Found only in Texas, the toad’s range spans only to nine counties – Leon, Robertson, Milam, Burleson, Lee, Bastrop, Austin, Colorado and Lavaca – but historically included Harris, Liberty and Fort Bend Counties. Declines are mainly due to habitat loss and alteration. Houston toads are year-round inhabitants of the Post Oak Savannah, where they are inextricably linked to deep loose sands – which they require to burrow for shelter from heat and cold – vegetated by native bunchgrass communities in upland loblolly pine or oak forests. Nearby breeding habitat is necessary and requires shallow waterbodies that persist for at least 60 days during the breeding season for egg-laying and tadpole development. Breeding habitats may include ephemeral rain pools, flooded fields, blocked stream drainages, seeps or springs or more permanent ponds with shallow fringes.

According to U.S. Fish & Wildlife Service (USFWS) survey protocol, presence/absence surveys for the Houston toad within areas of potentially suitable habitat must be spread over the peak of the breeding season for the species (generally early February to late April) when the mating call of the Houston toad is recognizable. The protocol requires a permitted surveyor to visit a “listening station” (i.e., potential breeding site) at night under suitable weather conditions (e.g., temperature ≥ 57°F and wind speed <15 mph), preferably under conditions known to promote chorusing (e.g., humidity greater than 70 percent, rainfall or recent rain within 24 hours, and cloud cover present or moon not full), and silently listen for five minutes to detect Houston toad calling. If not detected, a recording of the call may be played to elicit a response; subsequently, the aquatic feature may be searched with a light to visually identify Houston toads, their eggs or tadpoles. USFWS protocol recommends attainment of 12 survey nights per listening station; however, B&A targeted 20 survey nights between Feb. 1 and May 30 to ensure acceptable results.

Given the sheer size of lignite-mining operations in central Texas, the abundance of forested
areas on deep sandy soils and the commonality of aquatic features, habitat suitability mapping often results in the identification of an overwhelming number of potential survey sites in a survey area. Surveying each of the survey sites during the short breeding period, especially on nights meeting conditions, becomes an arduous if not impossible task, requiring deployment of extensive staffing and investment in labor to safely traverse the mine sites and reach all listening stations.

Fortunately, protocol modifications are allowed (if accepted by the USFWS) to address logistical challenges (e.g., surveying large areas such as mines). B&A worked with USFWS and Railroad Commission of Texas personnel to incorporate the use of technological innovations, in addition to active listening by surveyors to increase efficiency and reduce the cost of the surveys.

Specifically, automated electronic call recorders were deployed at select potential breeding sites (e.g., ponds) prior to the Houston toad breeding season (January or February) and collected afterwards (in early June). Programmed to activate every evening after sunset, recordings were collected for 10 minutes at the beginning of every hour between dusk and dawn. Instead of requiring site visitation and active listening by a surveyor on appropriate nights, recorders gathered and stored audio data each night, with labor needed only to intermittently check the status of the recorder (e.g., programming and batteries), maintain the recorder and download data, all completed during the daytime throughout the survey season. Wildlife Acoustics, Inc. Song Meter units were found to be the preferred type of automatic anuran recording technology. The recorders are equipped with external microphones shrouded by individual windscreens, are housed in weatherproof cases, and operate with standard alkaline batteries and SD memory cards.

Back at the office, Song Scope Bioacoustics Software (Wildlife Acoustics, Inc.) was used to analyze the recorded data. B&A input several known Houston toad recordings to develop a recognizer that would identify potential Houston toad calls and automate the process of scanning recordings. Implementing batch processing, the software analyzed all recordings and generated tabular output that summarized information on extracted recording segments, such as the duration of the recording and how well the recording matched the recognizer. Ultimately, a human operator must listen to the portions of the recordings that most closely matched the recognizer and determine whether the sound is in fact a Houston toad call. No Houston toad calls have been detected during surveys conducted to date by B&A on mine sites.

Use of the recording equipment enabled the collection of hundreds to thousands of hours of audio data throughout the entire breeding season for each survey year. Implementing this innovative technology increased the level of confidence in the survey results by providing considerably more data than could reasonably be collected in a single breeding season by human surveyors. Employing the audio recorders as a passive sampling method allowed for full coverage of the project sites using fewer active listening stations, and thereby reduced the cost of the surveys without reducing efficiency or sacrificing data quality or quantity.

The innovative use of audio recorders has proved a novel and innovative solution to improving survey efficacy of wildlife at mine sites, as well as reducing labor costs. Source: Blanton & Associates, Inc.

“Use of the recording equipment enabled the collection of hundreds to thousands of hours of audio data throughout the entire breeding season.”
In the U.S., more than 9,000 fatalities were attributed to heat from 1979 through 2013.* Hot conditions put your body under a lot of stress. Physical activity stresses the body even more.

When heat is combined with physical activity, loss of fluids, fatigue and other conditions, it can lead to various heat-related illnesses and injuries; death is even possible. There is now new technology to help combat this problem.

Heat stress is commonly associated with warm weather, and while it is true that warm weather increases the number of heat-stress injuries and illnesses, warm weather isn’t the only cause of heat stress. It can occur any time the surrounding temperature is elevated. Even if the weather is cool, you may work in warm areas, indoors or out.

The body tries to maintain a constant internal temperature. When the internal temperature rises, the body attempts to get rid of excess heat by perspiration, which increases blood flow to the skin surface to cool down.

There are several ways to reduce heat stress in work environments, including, but not limited to, gradual acclimatization; reducing temperature by active cooling; increasing air flow; reducing clothing requirements; increasing employee rotations out of hot environments; increasing water intake; using water-cooled vests and air-cooled headgear; setting up portable shades; and scheduling work during cooler parts of the day.

New Technologies Tackle the Problem

Another way to prevent heat-related illness is to use a Heat Stress Tracker. This device aids in monitoring people in hot, humid conditions, both indoors or out. Once set, the Heat Stress Tracker will alert you of any dangerous situations where action is needed. The device is easy to use and very effective in many environments. When properly used, this device can reduce any heat-related issues by which people may be affected.

Even with new technology, no single heat-stress prevention method should be undertaken by itself. The environment and each person will determine which methods are most practical.

* Source: CDC & BLS

**Cool New Technology Manages Heat Stress**

By Jason Myers, TMRA Safety Committee Chairman

What does heat stress look like? Clusters of red bumps on the skin, often appearing on the neck, upper chest and folds of skin, are one sign of possible heat stress, which is a common problem in hot work environments. Try to work in a cooler, less humid environment when possible. If you do show signs of heat stress, keep the affected area dry. Additional signs are muscle spasms or pain (usually in abdomen, arms or legs). These can be the first signs of worsening heat-related illness. Resting in a shady, cool area and drinking water can alleviate symptoms. If symptoms do not go away, please seek further attention following standard site procedures.

Heat exhaustion is a serious complication of heat stress. Signs and symptoms of heat exhaustion include, but are not limited to, heavy sweating; weakness; cold, pale or clammy skin; nausea or vomiting; headache, dizziness and lightheadedness. If you experience any of these signs or symptoms, move to a cooler location, lie down and loosen clothing, apply cool, wet cloths to as much of the body as possible, sip water, and notify someone for further medical treatment.

Heat stroke is the most serious heat-related illness. Signs and symptoms of heat stroke include, but are not limited to, very high body temperature (above 103°F); hot, red, dry or moist skin; rapid and strong pulse and possible fainting, confusion or seizures. If you or someone else experience any of these symptoms, GET HELP IMMEDIATELY. This is a MEDICAL EMERGENCY; please follow emergency action plans and while you are waiting for emergency personnel, move the person to a cooler environment; have the person sip on water and reduce the person’s body temperature with cool cloths or even a bath.

Remember: It is everyone’s responsibility for safety and to watch over each other. The use of some prescription drugs, energy drinks, alcohol and lifestyles can and will affect a person’s hydration.
and effective. Look out for one another. If you notice someone not feeling well, stop and get help. If work is to be performed during high heat, discuss a detailed plan for moving forward during the heat, when and how often breaks will be scheduled, if fans or other cooling devices are needed, and if all people involved are feeling their best. Heat-stress awareness is not just for on the job. Everything you do before work affects your ability to work. Being prepared will reduce the chance of heat illnesses when used along with ongoing safe-work practices. Drink plenty of water throughout the work day. Adjust your pace and expectations on how much work can be done during periods of high heat.

Heat Stress Tracker technology allows mine operators to track employees’ heat-stress levels throughout the day to ensure their safety and efficiency. Source: Jason Myers
Turning to a more advanced way of detecting and preventing fatigue, Guardvant’s OpGuard Operator Condition Detection solution, is helping to improve the safety of mining operations. OpGuard is installed on numerous haul trucks across Texas.

The OpGuard solution uses a non-intrusive infrared camera to monitor the operator’s eye closure and head movements for signs of fatigue and distraction. When the OpGuard algorithm detects a fatigue- or distracted-driving event, the system provides an alert to the operator via a speaker and seat vibration. Onboard events and data are then sent via cellular modems to a cloud-based server, making the need for mine communication infrastructure obsolete. Once on the server, mining facilities can utilize Guardvant’s 24/7 Operations Center to review and analyze all fatigue events that occur onsite.

With the installation of the OpGuard Operator Fatigue Detection solution, mining facilities are experiencing a decrease in safety incidents and an increase in fatigue awareness among their operators.

“Following the installation of the OpGuard systems, we have been able to successfully combat one of the most common safety issues present at mines: operator fatigue,” said Ryan Hawes, Guardvant’s VP of business development. “We expect the OpGuard system to help educate mining employees across Texas on potential fatigue issues to reduce the occurrence of onsite fatigue incidences.”

Guardvant can also customize OpGuard based on site-specific safety goals, performance metrics and operations, helping to develop programs that aid in the decrease of fatigue incidences.

Caterpillar Offers a Defense Against Fatigue

Studies have shown that more than 40 percent of employees who work non-daytime hours report nodding off several times per week – or even per shift. Fatigue is considered a leading contributor to 35-40 percent of all incidents.

Caterpillar’s Fatigue Risk Management System (FRMS) incorporates technology to predict, measure and mitigate fatigue events, providing operators with the tools and knowledge to improve alertness.

With Seeing Machines, Cat offers its Driver Safety System (DSS) as part of the program. “People can’t just go out and stay up all night and plan on the system waking them up,” says Tod Dawson, senior consultant to Cat’s Safety Services Division. “That’s not the intent. That’s why we consider this technology a part of a broader system where people are making good choices away from work. The technology is a last line of defense within the cab.”
In the last edition of TXMining, we interviewed Harry Anthony – along with five other distinguished mining industry leaders – about the state of the industry. We saved what Harry had to say about technology for this issue.

Q. How have uranium technology changes enhanced environmental protection?

A. Times have changed! In pre-calculator days, I actually used a slide rule. Since then, computer and satellite technology have greatly enhanced what can be analyzed, designed and controlled to advance the environment of mining. Transitioning from the analog era to the digital age has made most anything possible.

Computers have allowed the mass calculations of information that was previously impossible to do by hand and do it automatically and accurately. Digital process control is now widely used in all new facilities, providing second-by-second controls on tank levels, pH, pump flow, temperature and much more. Designing well locations for a new well field can now be computer-modeled before implementation to analyze if the placement will generate efficiencies of flowlines between wells.

Other innovations to improve the environment over the decades include:

- Utilizing reverse osmosis technologies early in the infancy of the industry (1970s), which aided in enhancing restoration of mine water consistent with baseline chemistry levels;
- Utilization of Global Positioning Satellite (GPS) technology, coupled with gamma ray sensors, to map out baseline and post-mining soil gamma profiles;
- Low temperature vacuum drying of uranium ensures zero emissions, eliminating the need of double-lined surface ponds that frequently leak with larger above-ground storage vessels; and
- Computerization of wellfield flow and plant processes.

Another innovation is collecting raw hydrological data (water well draw-down and recovery levels) that was once collected using a float, long drop wire and a recording drum to measure the draw-down effects on a number of randomly spaced observation wells caused by the pumping from a single well at a constant flow rate.

This data was then plotted to calculate hydrological coefficients, storage and transmissivity values for the host aquifer. Today, this raw data is measured and recorded with sondes – waterproof electronics – that are capable of recording and storing mass amounts of infinitesimal water pressure changes much more accurately, easily and rapidly.
It was another great year for TMRA’s education and outreach programs, with a primary focus on the TMRA Teacher Workshops. Throughout the summer, TMRA conducted six workshops, four of which were conducted on coal, including:

- North American Coal Sabine Mine, with a tour of the mine, reclamation areas and the AEP SWEPCO Pirkey Power Plant; 18 teachers attended;
- Kiewit Walnut Creek Mine, with a tour of the mine, reclamation areas and the OptimEnergy Twin Oaks Power Station; 17 teachers attended;
- Luminant Three Oaks Mine, with a tour of the mine, reclamation areas and the Sandow Steam Electric Station; 15 teachers attended; and
- The fourth workshop was a partnership with a Texas Regional Science Collaborative in connection with the Texas State Aquarium, with a tour of the coal mine, reclamation areas and the power plant at San Miguel Electric Cooperative; 35 teachers attended.

The TMRA Industrial Minerals Teachers Workshop was attended by 24 teachers, who spent a day at the Bureau of Economic Geology viewing the state core repository and learning about the value of Texas’ natural resources. They also toured Lhoist’s Marble Falls aggregate pit, mined by Old Castle. While there, Lhoist’s Chris Sumner demonstrated the use of drone technology in modern aggregate mining.

The TMRA Uranium Teachers Workshop, based in Corpus Christi, was attended by 20 teachers, who learned how uranium is mined in Texas and then used to create electricity. Teachers toured Energy Fuel Resources’ Alta Mesa Uranium Mine and processing plant.

Through these workshops and field trips, TMRA told the story to approximately 158 teachers of our industry and commitment to the environment. These teachers will carry our story forward to an estimated 24,000 students during this school year.

This year, we also added a social media component to the workshops, with teacher facilitators posting on Facebook, Twitter and YouTube and encouraging participating teachers to share the content on their own social channels. We gained many new followers and established a reputation as a fun, informative and fact-based source of mining facts.

According to the teacher evaluations, our workshops are the best offering for educators in the state, valued for their hands-on labs and a curriculum that participants can use in the classroom. Science teachers get to see mining up close and observe the reclamation process. Over the last three years, there has been an increase in the number of teachers attending our workshops that specialize in “environmental systems.” Before they attended, very few of them were aware of Texas mining and reclamation. We are really making a difference!
Q. Why did you enter the teaching profession?
A. While attending college, we would form cooperative study groups, and I frequently found myself teaching the group. My family and friends said I would make a great teacher. This caused me to reflect upon time spent with former teachers, including my biology teacher Dr. Timothy Roye. I also wanted to become a passionate teacher, so I transferred from the Biological Sciences Department to Education, even though it deferred my graduation by a year.

Q. What motivates you to teach?
A. I love learning about science. It bothers me when people mention how much they hate science. I want to give students and teachers a wonderful experience to change their minds about science and to remind them that it is all around us.

Q. What is your favorite thing about teaching?
A. Sharing my passion about science with others. I love lab opportunities that give learners that “aha” moment.

Q. What role do you play in the TMRA Teacher Workshop program?
A. I attended coal camp at North American Coal’s Sabine Mine in Hallsville, Texas and uranium camp at the Energy Fuels uranium facility near Corpus Christi. I have maintained a relationship for the past nine years with Francye Hutchins, who recently provided a professional development opportunity for teachers of Region 8 ESC at our facility in the Mount Pleasant/Pittsburg area.

Q. Did you know much about mining in the U.S. before the workshops?
A. I had gaps in my knowledge concerning mining. I had the misconception that “all coal mining takes place underground” and that “mining companies just dig big holes in the ground.” Boy was I wrong! I had no idea about the thought and planning that goes into the reclamation of the land.

Q. What is the most important thing teachers need in the classroom to be able to teach science and mining?
A. Teachers need content knowledge and easy-to-duplicate, relatively inexpensive, hands-on, minds-on activities. Science department budgets are underfunded and most, if not all, lab opportunities are paid for by the science teachers themselves.

   This was the case at the small, rural school where I taught. There wasn’t much money for consumable materials. TMRA provides amazing lab activities that are tied to science and mining content.

Q. What is the value of hands-on learning?
A. Hands-on learning is REAL learning. Studies show that learning by doing leads to greater achievement. Hands-on learning keeps students engaged. Engaged students are more likely to retain content knowledge. Hands-on learning encourages failure. Studies show that we are raising a generation of students who can’t handle failure. This robs students of the opportunity to understand the basis of good science. Scientists learn from their failures, which is why it’s called experimentation. Failure is part of the process.

   Hands-on learning lets students become teachers who work cooperatively with others. The “teaching” step strengthens student understanding.

Q. What are your fondest moments of the TMRA Teacher Workshop program?
A. TMRA and the mines “roll out the red carpet” for teachers and treat them with the utmost respect. I also appreciate the content-building opportunities, collaboration with other teachers, hands-on activities, field trips to the mining sites and power plants, and working with industry experts. All of this is PRICELESS!
Come join TMRA’s 32nd Annual Meeting

**SUNDAY**
**OCT. 29**
- Continuing Education
- Board of Director’s Meeting
- Welcome Reception

**MONDAY**
**OCT. 30**
- Golf
- Fishing
- Fun Night!
  - Legislative Recognition
  - New Member Recognition

**TUESDAY**
**OCT. 31**
- General Meeting
  - Confirmed Speakers
    - Bill Joseph, OSM
    - Comm. Wayne Christian, RCT
  - Legal Panel
    - Ty Embrey, Lloyd Gosselink
    - Mike Nasi, Jackson Walker
- New Member Presentations
- NEW: Support Member Breakout Session from 2-4 p.m.
- Education Dinner & Auction
  - Come and join in (or just watch) as companies and individuals go head-to-head over priceless items! Have something you want in the auction? Contact Cathy Wright at cathy.wright@tmra.com.

**2017 TMRA ANNUAL MEETING**
Oct. 29-31, 2017
Hyatt Regency Lost Pines Resort & Spa
Bastrop, Texas

Bill Joseph
Wayne Christian
Ty Embrey
Mike Nasi
TMRAs 2017 Sine Die event was no less exciting than any other year to close out a successful Texas legislative session. Held at the Long Center in Austin and co-sponsored by TMRA Members Engineering Resources, Flex-Source and Russell & Sons, the event was an opportunity for TMRA to thank Texas legislators and staff for all their hard work during the 85th legislative session. The Nightowls and the Spazmatics provided the entertainment. Governmental Affairs Chairman Mance Zachary chaired this year’s event, which was held on May 29.
Please Help Us Tell the TRUE Story of Mining!

This is a reminder to all TMRA Members that you can Sponsor-A-Teacher any time during the year. This Sponsor-A-Teacher program gives all TMRA Members Companies an opportunity to support our successful TMRA Teacher Workshop program.

A contribution of $1,500 will sponsor one teacher for a workshop that covers teaching materials, meals, lodging, etc. This is your chance to promote our industry by sponsoring a teacher. If you wish to sponsor a teacher, please email Krissy the below information and send to her at krissy@tmra.com. She will create an invoice for the amount you wish to sponsor and email you for payment.

**Sponsor-A-Teacher**

Name ________________________________________________________________

Company Name___________________________________________________________________________

I wish to sponsor ______ teachers at $1,500 each                  Total Contribution $________________________

Please send invoice to the following address:

____________________________________________________________________________________________________

__________________________________________________________________________________________________

Customer Preferred.

7 out of 10 HydroSeeders® purchased today are FINN. Count on FINN for quality equipment, reliable performance and exceptional support.

Visit your authorized dealer and find out why the best contractors count on FINN.

Serving Texas
903.758-5576
800.227-6626
www.romco.com

www.intermountainlabs.com  (307) 672-9945
Built for the future of mining

The Komatsu Group has brought together four of the most respected innovators in the mining industry under one powerful new banner: Komatsu Mining Corp. In total, the P&H, Joy, Montabert and Komatsu brands have more than four centuries of experience partnering directly with mines around the world to make them safer and more productive.

We’re proud of our rich past and together we are ready to take the mining industry where we’ve always been headed: FORWARD.
Domestic Coal Edges Out Natural Gas as Coal Exports Surge

Coal is the top source for U.S. power generation in 2017, according to the U.S. Energy Information Administration’s (EIA) monthly Short-Term Energy Outlook released in September.

EIA (https://www.eia.gov/outlooks/steo/report/coal.cfm) expects the share of U.S. total utility-scale electricity generation from natural gas to fall from an average of 34 percent in 2016 to about 31 percent in 2017 as a result of higher natural gas prices and increased generation from renewables and coal. Coal’s forecast generation share rises from 30 percent last year to 31 percent in 2017. The projected generation shares for natural gas and coal in 2018 average 31 percent and 32 percent, respectively.

“This report is a very positive sign for coal,” says Ches Blevins, executive director of the Texas Mining and Reclamation Association. “It shows that coal continues to be one of the most dependable electrical power sources in the country.”

Coal exports for the first six months of 2017 were 55 percent higher than exports over the same period last year. EIA expects growth in coal exports to slow in the coming months, with exports for all of 2017 forecast at 73 MMst, 21 percent higher than the 2016 level.

Coal production for August 2017 is estimated to have been 74 million short tons (MMst), 6 MMst (8%) higher than last August. August is also the first month that had production higher than 70 MMst since October 2015. Production for the first eight months of 2017 is estimated to have been 528 MMst, 64 MMst (14%) higher than production for the same period in 2016. Production is expected to increase by 8 percent in 2017 and by 2 percent in 2018.

Putting Mining on the Map

Ever wonder what the economic output of mining is in Texas, and indeed in any other state? Check out this handy National Mining Association (NMA) web page, which shows the state-by-state contribution of the mining industry to jobs and the economy. In Texas, there are 122,147 jobs (direct and indirect) attributed to the industry, with 35,151 of those direct. That translates to more than $7.7 million dollars in labor income (direct and indirect). For more on Texas – or on any other state – visit http://nma.org/map/.

Getting the Mining Message Out!

Telling your stakeholders what mining means to Texas is now easier than ever with TMRA’s message center, now available online. There you’ll find things such as the TMRA industry PowerPoint presentation, key message points and the one-pager What Mining Means to Texas – all available for your use. The documents include messages that will help to spread the word about the importance of Texas’ coal, uranium and industrial mineral industries. For access, please visit the member portal of tmra.com and click on “Member Resources.”
Past issues of TXMining are available as a pdf on the TMRA website so you can always check back for stories and information important to the association and the industry.

Here's a sneak peek at what you can expect to see in TXMining the rest of the year.

**Winter 2017: Year in Review (Digital)**
TMRA Committee Chairs will recap the year and take a look ahead. This is a digital report only that will be posted online in December.

**EDITORIAL CALENDAR**

**MEETINGS AND EVENTS**

**TMRA Annual Meeting**
Oct. 29-31 Hyatt Regency Lost Pines Resort & Spa, Bastrop, TX
Oct. 31 Support Member Conference

**TMRA 2017 QUARTERLY MEETING**
Dec. 6-7

**SUPPORT MEMBER CONFERENCE**
April 25-27, 2018 Hide-A-Way Lake Club, Hideaway, TX
Check www.tmra.com for a full schedule.

**TXMINING ADVERTISING**

Contact: Lance Lawhon,
TMRA advertising manager
512-832-1889 • lance@solafidei.com
Website and print advertising rates available.
TMRA LEADERSHIP

Executive Committee
Chairman: Brett Wilson, Luminant
Vice Chairwoman: Nellie Frisbee, North American Coal - CRF
Treasurer: Josh Holland, Uranium Resources, Inc.
Secretary: Matt Hallmark, Trinity Construction Materials, Inc.
Past Chairman: Chris Sumner, Lhoist North America
Lignite Committee Chairman: Nathaniel Huckabay, Luminant
Industrial Minerals Committee Chairman: Matt Hallmark,
Trinity Construction Materials, Inc.
Uranium Committee Chairman: Craig Wall, Uranium Energy Corporation
Member: Jeff Mason, Luminant
Executive Director: Ches Blevins, Texas Mining and Reclamation Association

Committees

Industry
Lignite Committee Chairman: Nathaniel Huckabay, Luminant
Industrial Minerals Committee Chairman: Matt Hallmark,
Trinity Construction Materials, Inc
Uranium Committee Chairman: Craig Wall, Uranium Energy Corporation

Functional
Communications and Public Awareness: Christian Goff, Pure Energy PR
Education: Robert Gentry, All State Fire Equipment
Environmental: Josh McAfee, North American Coal - Sabine Mine
Governmental Affairs: Mance Zachary, Vistra Energy
Legal: Ches Blevins, Texas Mining and Reclamation Association
Membership: Frank Pagura, WPI
Nominating: Chris Sumner, Lhoist North America
Planning: Cathy Pierce, Texas Mining and Reclamation Association
Safety: Jason Myers, Luminant

TMRA Board of Directors
Mike Altavilla, Texas Westmoreland Coal Company
Harry Anthony, Uranium Energy Corporation
Steve Eckert, Capitol Aggregates, Ltd.
Dave Burris, San Miguel Electric Cooperative, Inc.
Brett Wilson, Luminant
Andy Hawbaker, North American Coal - Sabine Mine
Jan Horbaczewski, Texas Municipal Power Agency
Nicholas Samford, NRG Energy
Peter Luthiger, EFR Alta Mesa
Jason Buenemann, Kiewit Mining Group
Jerry McCallip, Trinity Construction Materials, Inc.
Dain McCoig, Uranium Resources, Inc.
Mike Nasi, Jackson Walker LLP
Kevin Raabe, Rio Grande Resources
Martin Ballesteros Regalado, Dos Republicas Coal Partnership
Mark Russell, Russell & Sons Construction
Greg Shurbet, American Electric Power
Brad Griffin, North American Coal - Caddo Creek
Chris Sumner, Lhoist North America
Keith Wheeler, Pastor, Behling & Wheeler, LLC

INTRODUCING
IRONPRO
Your Profit Protection Solution
STARTING AT $2,195
ON NEW EQUIPMENT PURCHASES
Skid Steer Loader, Compact Track Loader,
Mini-Hydraulic Excavator
(1'3,450 Backhoe Loader)
Includes: Two (2) 500 Hour and
One (1) 1,000 Hour Interval Scheduled
Maintenance Services, plus IronPro Connect. 1

Go to HoltCat.com/ironpro to learn more
Ask your sales rep or call 833.IRONPRO
(833.476.6776)

HoltCat.com
IronPro: Assurance Plans by Holt

TAKE PRIDE IN YOUR WORK
A partner with in-house capabilities
and the latest tools can save you time,
money, and regulatory headaches over
the lifetime of your operations.

We take pride in understanding your
regulatory needs, aligning our work
with your business goals, and
treating your budget like its ours.

Trihydro is a national consulting firm that provides engineering and environmental solutions to meet the needs of the mining industry.

EVERYONE NEEDS PRINCIPLES TO GO BY. Learn more about how we do business at trihydro.com

Amarillo, TX | Austin, TX | New Braunfels, TX | 800-359-0251 | Plus a network of offices nationwide
Made in America
Built for the World

HilliardBrakeSystems.com
WHEN IT NEEDS TO BE

BUILT TOUGH, HARD WORKING, DURABLE, HI-TECH, & READY TO WORK

WE’VE GOT YOU COVERED.

HOLT CAT® offers:

- Largest Inventory of New and Used Cat® Equipment
- 584 Field Service Trucks On Call 24/7
- 202 Cat-Certified Technicians
- Lease, rent and purchase options available

Need hard working equipment and first-class service? Call us now.

(877) 734-3116

HoltCat.com