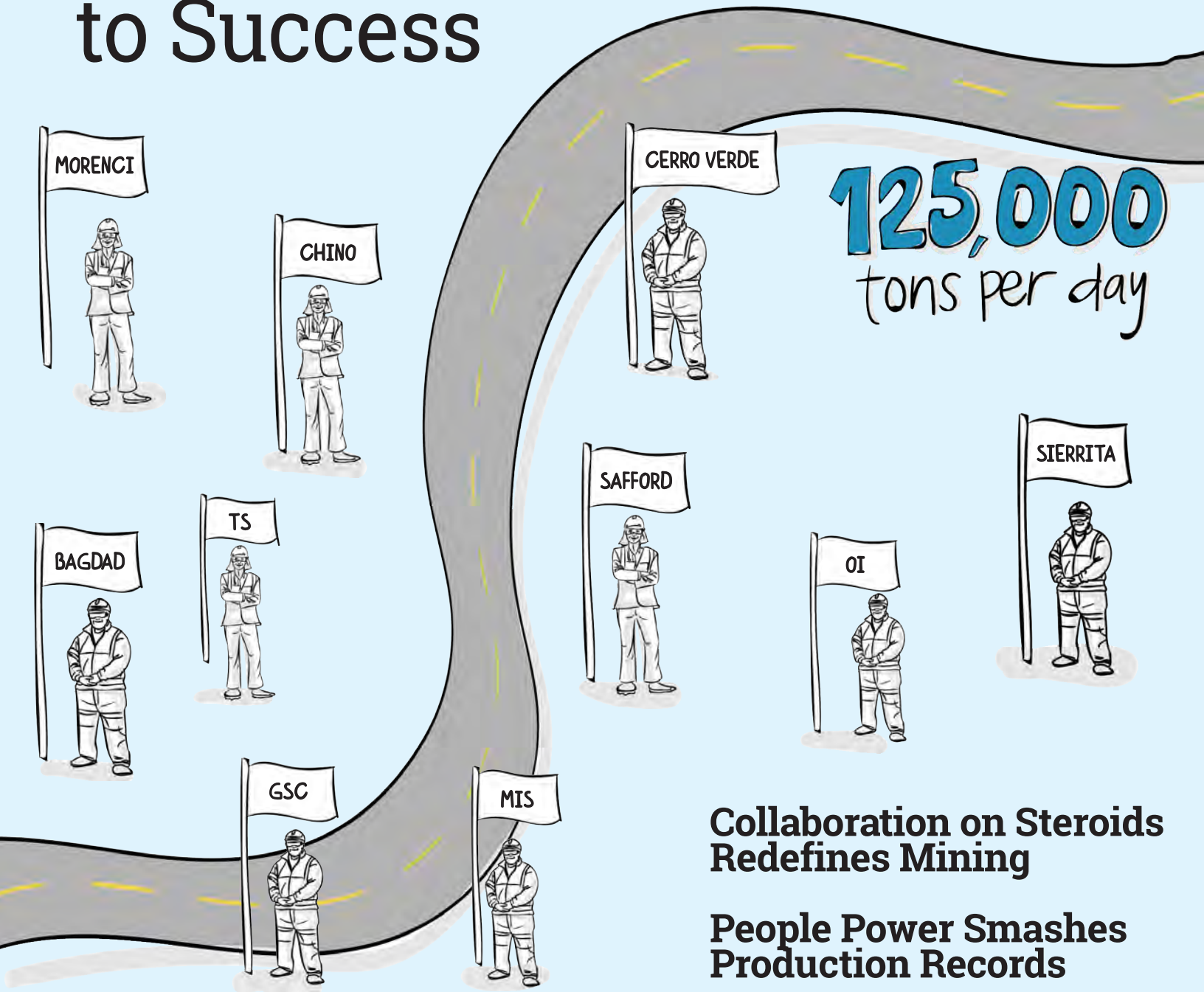


Building Americas' Concentrator The Road to Success



125,000
tons per day

**Collaboration on Steroids
Redefines Mining**

**People Power Smashes
Production Records**

The Power of You



Thank you for reading the Americas' Concentrator issue of The Miner magazine about the excellent work at sites across North and South America.

First, though, I want to express my deep appreciation for your commitment during these unusual times as we work to fight the spread of COVID-19.

At the magazine's print deadline, the company's focus was on protecting the health and safety of our employees, their families and the communities where we operate by supporting precautionary actions and public health responses.

Before this happened, however, this issue was created to celebrate the difference you have made, and it's good and important to recognize great work. The stories showcase examples from across the sites, and the poster in the center is detachable by removing the staples.

Consider, too, that this work may come at an even more important time in our company's history. This approach has been the engine behind every recent success surpassing what we thought was possible. I have watched this organization do amazing things in the last year, and I have no doubts we will continue to see amazing things in the future.

If you have been with the company for any length of time, you know we are constantly battling lower ore grades and higher operating costs. Americas' Concentrator is successfully driving our efforts to become more efficient and reduce unit costs, which will be key to our future.

We've already increased our competitive advantage by being the first company to scale this new approach to mining, and much of the capital investment already has been made. Now, we stand to redefine our industry and demonstrate Freeport-McMoRan's resiliency and longevity by getting more out of existing mines.

I've been impressed by the numbers, of course, but I am more impressed with your enthusiasm. I ask you to continue this attitude in the days to come. This is a crucial moment for us to come together, and the way we work as a team will see us through this tough challenge.

Our company traces its history to 1834 and has weathered the ups and downs of 186 years. Together, we will weather this storm, too. We've been here for generations, and we intend to be here for many more.

Stay safe,

Red Conger
President and Chief Operating Officer-Americas

Linda Hayes

Vice President-Communications

EDITOR

Ruthanne Van Dyke

Director-Corporate Communications
and Editorial Operations

ASSISTANT EDITOR

Kelly Ettenborough

Senior Communications Specialist

WRITERS / PHOTOGRAPHERS

Tom Stauffer

Senior Communications Specialist

Derek Sikes

Senior Communications Specialist

Marisa Esquer

Communications Specialist

Amy Talkington

Manager, Corporate Communications-
Administrative Functions

Dale Stephenson

Senior Communications Specialist

Miko Sularso

Communications Representative

Esperanza Morillo

Manager, Corporate Communications-
Initiatives and Projects

PRODUCTION

Missy Spruit

Communications Representative

CONTACT US

FMI_CorpComm@fmi.com



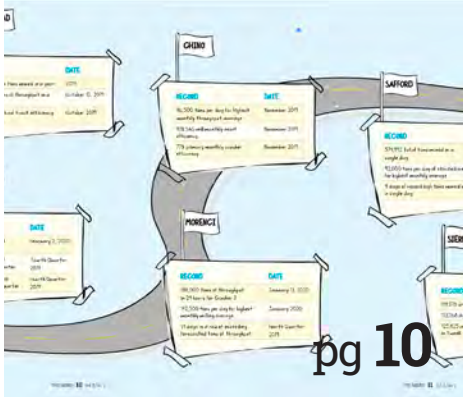
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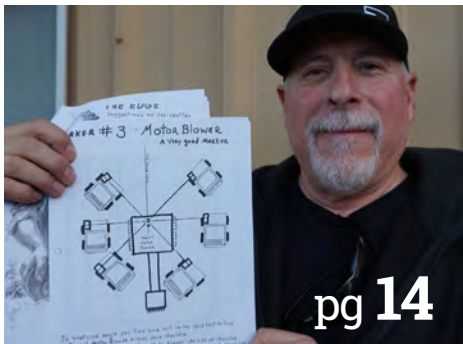
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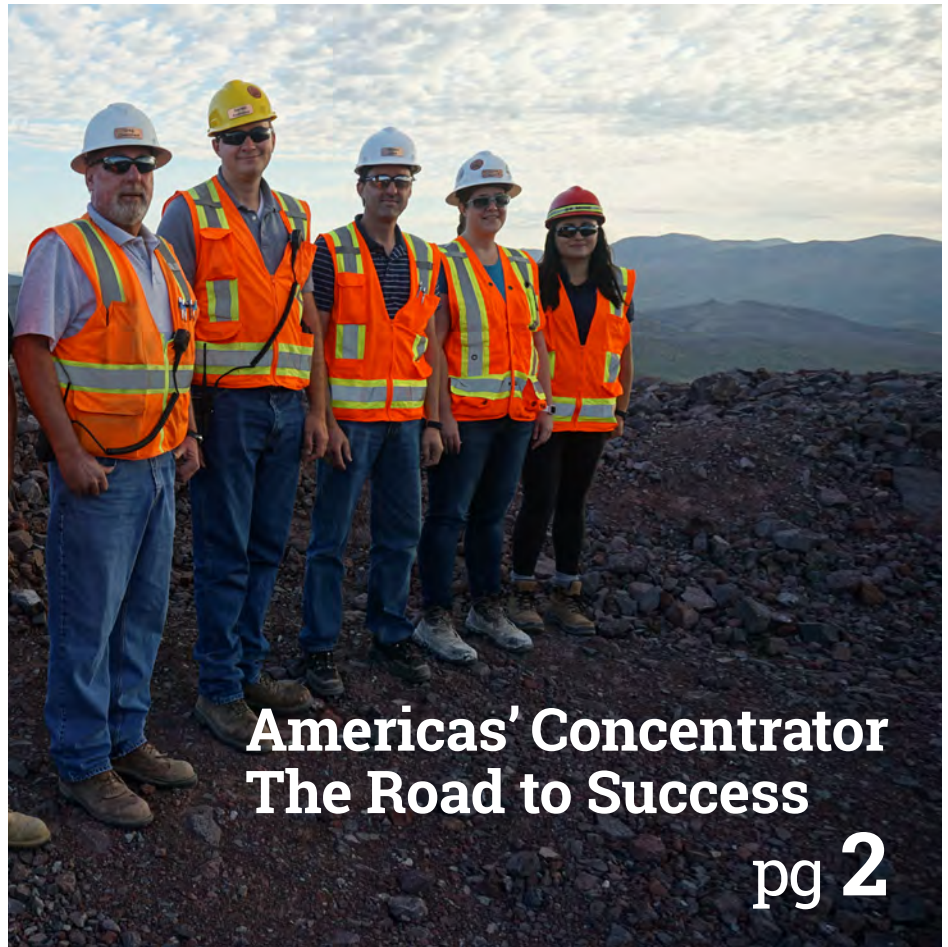
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Safford Innovation Engineers Garrett Anderson, center, and Raquel Crossman, second from right, join other Safford Agile Team members at the Lone Star pit to observe shift change efficiency, a subject of improvement efforts. The rest of the team are, left to right, Justin Crum, Supervisor-Mine Maintenance; Ryan Magnuson, Metallurgist; Greg Overstreet, Senior Supervisor-Mine Operations; Shawn Lines, Procurement Lead-GSC; and Gabriella Archunde, intern.

Americas' Concentrator The Road to Success

"This is the best thing we've ever done as a company." That's high praise from Raquel Crossman, Senior Innovation Engineer-Safford, who once called herself the No. 1 skeptic on site when it came to artificial intelligence and agile.

Like many employees, she initially doubted the merits of the company's approach to increase copper production without building another concentrator, an unprecedented industry initiative called Americas' Concentrator. Then results, big and small, started rolling in.

"I just remember this particular day on my first team early on and I said 'OK, I see this now. I get it,'" she said. "It's about trying to find what works, that little small increment, and then building on that. And then doing that over and over again."

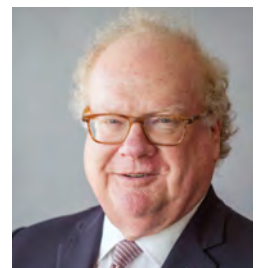
While employees' contributions already have delivered results, projections forecast these productivity enhancements, driven by people and innovation, will add up to 100 million more pounds of copper in 2021 and 200 million more pounds of copper in 2022 and each year beyond from operations in the Americas, all while maintaining Safe Production.

"In more than 40 years working in the mining industry, our Americas' Concentrator initiative is some of the most rewarding work that I've ever been engaged in,"

said Red Conger, President and Chief Operating Officer-Americas. "I know this work is difficult, and it's not easy to make changes. But, I couldn't be prouder to see our teams' talents and abilities used in great, new ways."

A FANTASTIC REALITY

At Bagdad and Morenci, Safford and Chino, Cerro Verde and Sierrita, results demonstrate the wonder of this new combination of agile, a collaborative approach to work, with analytics from artificial intelligence to support decision-making and empowered employees.



"I couldn't be prouder to see our teams' talents and abilities used in great, new ways."

— Red Conger, President and Chief Operating Officer-Americas

“You’ve got these technology tools that point you in the right direction and every single person is armed and able to have this safe zone where we can try out new things,” said Cory Stevens, Vice President-Operational Improvement.

Employees can use the “new ideas and quickly determine whether that’s the right route to continue on – or we can adjust accordingly. This has been a fantastic reality for us.”



“What’s exciting to me, even more than the records being set on a regular basis, is the way people are thinking about how we can do our business better.”

– Josh Olmsted,
Senior Vice President-
Copper Operations

working beyond the forecast and focusing on ways to continually improve, added Stacey Koon, General Manager, Administration-Morenci, who is on assignment with the Americas’ Concentrator project.

“It’s not to suggest that we’re broken or trying to fix something. Our business is highly performing and successful because we’re good executors,” she said. “The shift is to change our way of thinking to what could be and see how far we can go from there.”

PEOPLE OVER PROCESS

About two years ago, Bagdad launched a pilot project in the mill with a goal to maximize copper production. The method used artificial intelligence to crunch numbers and an agile framework for employees to test and refine changes to bump up production.

Supervisors had to quash misconceptions of robots taking over decision-making and point to the importance of the team’s collaboration and knowledge. The high-powered computing system generates millions of possible combinations for operating parameters and makes recommendations for the teams to investigate, consider, prioritize and complete.

“Early on, we truly saw it as a project. We saw it as a tool, artificial intelligence, supporting this goal of more copper,” Koon said. “Empowering our people and making them part of this journey is really key to the success of Americas’ Concentrator. People on the front line work with that equipment every day, and their voices and their ideas matter.”

Once employees experience the transformation, they are energized and look at their work in a fresh light, wanting to push to the next opportunity, said Sarah Elias, Senior Supervisor, Health and Safety-Bagdad.

“Instead of operating under limitations, we are discovering our potential, and the results are clear. Bagdad broke 26 records in 2019. If we have

In the fourth quarter of 2019 alone, employees broke numerous production records, and the company already has made significant progress toward this year’s goal, all with very little capital costs.

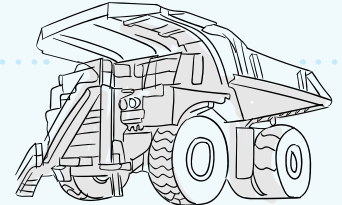
“What’s exciting to me, even more than the records being set on a regular basis, is the way people are thinking about how we can do our business better,” said Josh Olmsted, Senior Vice President-Copper Operations.

“It’s the change from thinking about how to meet forecast plans to how can we optimize and maximize the process – a small change in the way it’s said but a fundamental shift in how we look at the business and bring more value to all of us.”

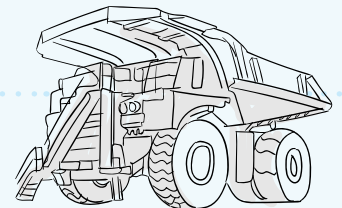
This approach to bringing more value is reflected in conversations around strengthening the company’s high-performance culture by

125,000 tons per day

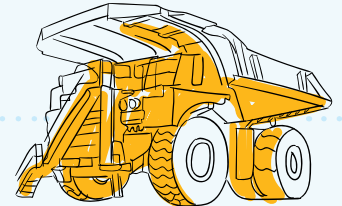
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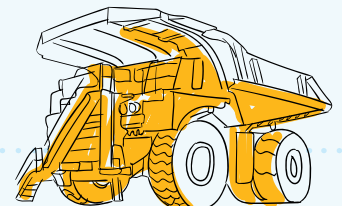
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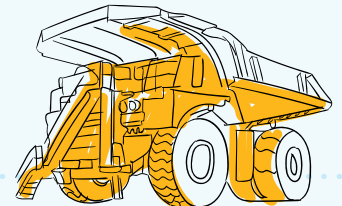
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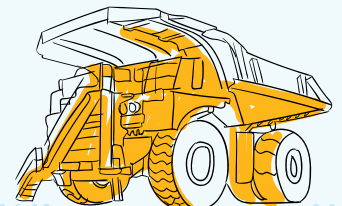
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20



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Before production changes due to the public health response surrounding COVID-19, progress for 2020 was at an additional 82,000 tons of throughput per day.

“We have been able to see significant improvement to our processes and our outputs, with minimal amounts of money.”

– Jeff Monteith, General Manager-Safford



shown ourselves that we can uncap the mill, why would we go back?” Elias said. “You can argue all day long on philosophy and belief systems, but you can’t argue with results.”

This wildly successful pilot project teased at the company’s untapped potential at a time of lower copper grades, higher operating costs and longer haulage profiles.

“In just a short six months, we were able to increase throughput by 15 percent while improving recovery, which is just unheard of in past performance work – so that just really got us excited about what we could do throughout the rest of the company,” Conger said.

THANK YOU, NEXT

At Safford, they were planning a capital project to increase efficiency. But Safford General Manager Jeff Monteith wanted to know if they could achieve the same increase in the daily mining rate with agile teams instead.

“They had made tremendous progress with huge dividends at Bagdad, and there was really positive feedback from leadership,” he said. “We knew this was coming our way, and we went for it. We have been able to see significant improvement to our processes and our outputs, with minimal amounts of money.”

The successful Safford experience was the turnaround for Crossman and her colleague Garrett Anderson, Innovation Engineer I-Safford, as they saw success from relatively minor changes such as adjusting a crusher’s set point or decreasing the time to swap out haul truck operators at shift change. Today, these early adopters help lead teams through the agile process.

“We started seeing results in the first few weeks of the project, and I mean an extra 3,000 tons a day through the crusher, so you can’t argue with that. That’s when you stop being a skeptic,” said Anderson, who initially equated agile with multiple meetings packed with jargon.

Crossman’s initial doubts help her relate to others who are new to the process. “It’s really easy for me to talk to people who are dubious because of how agile sounds, because I was right there,” she said. “I tell people to suspend their skepticism and give the process a chance.”

At Morenci, teams went to work in September and already are seeing wins. The Metcalf mill secondary crusher was running under capacity a significant amount of the time, and one team member worked with operations to create a decision tree to help improve consistency.

Then, plant Metallurgist John Carlson took the decision tree and created an automated model to track feedback, giving operators additional information to make decisions and improve overall performance.

One improvement came after engineering and maintenance crews installed upgrades that allowed a conveyor belt to increase its capacity to 5,000 tons per hour from 4,350 tons per hour, pushing mill output by an additional 15,000 tons per day.

“Our teams have been refocused on items that impact the business in a big way, and I am proud to be a part of this new



The Sierrita team turned a quick failure into a big win for production. On the back row, left to right, are Stanley Igbokwe, Mechanical Engineer II; Ignacio Arenas, Diagnostic Electrician; Sonny Udero, Senior Reliability Engineer; Andy Cillitto, Superintendent-Mine Maintenance and team Product Owner; Regi Sanchez, Supervisor-Health and Safety; Dennis Martinson, Senior Planner; Brian Robb, Technical Coordinator; and Caleb Stanton, Metallurgist II, with Martin Pesqueira, Supervisor-Crush and Convey, in the front row.

process,” said Micah Balfour, Senior Mill Maintenance Supervisor-Morenci. “The results agile produced in Metcalf alone are living proof new ideas make a difference and that will forever resonate in my mind. It’s been a positive and constructive change in the workforce and in the field.”

QUICK SUCCESSES AND QUICK FAILURES

TROI, or Throughput and Recovery Optimization Intelligence, is a data system to create a digital twin for the processing plant and provide real-time data to unlock bottlenecks for more consistent operations on the quest to expand production.

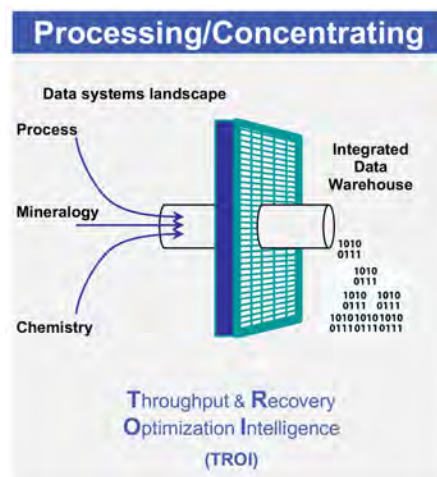
Sometimes, those twins match up. Sometimes they don’t. That’s how the process unfolded at Sierrita when they increased one belt’s production to 6,600 tons per hour from 6,000 tons per hour and illustrated the idea of continuous improvement.

Historically, one spot on the conveyor belt was a bottleneck in production, so in November, the team started looking for ways to optimize its capability to feed the crushers. But, when the agile process helped to clear the bottleneck, material began backing up on another conveyor belt and shut down production.

The reaction from front-line employees was simple: agile may have fixed one thing, but it caused a new problem. The team along with the customer rolled up their sleeves and got back to work.

“The bottleneck moving to a new location is not necessarily a failure but definitely brought to light our team’s need to enhance our communication and be more transparent with intended outcomes and possible shortfalls that may occur,” said Andy Cillitto, Superintendent-Mine Maintenance and Product Owner of Sierrita’s Crush and Convey agile team.

The team mobilized several projects around the new bottleneck, and by opening a transfer chute, met the goal. Now, the site could be looking at almost 5 million more tons annually. As a bonus, the project highlighted the value



TROI, or Throughput and Recovery Optimization Intelligence, is a data system to create a digital twin of the physical processes.

of open lines of communication and feedback, which are both critical to continued future success.

“We listened to our customers and worked with supportive management interested in what we think we should do instead of just telling us what should be done,” Cillitto said.



The Fox team in Cerro Verde focuses on improving concentrator efficiencies and throughput.

MEANWHILE, AT CERRO VERDE AND CHINO

In Cerro Verde, CHLOE, the acronym for Crusher, Haulage, Loading, Optimization, Engine, is an overarching project to ramp up the mine to create the best possible production.

Production already has increased by 10 percent, and the teams have identified opportunities to increase the concentrating rate to 420,000 tons by 2021, which will make Cerro Verde the biggest concentrator in the world.

After setting records throughout last fall, the two concentrators hit a new combined milling record of 497,764 metric tons in early February.

“Employees at all levels contribute their suggestions, and every idea is welcomed,” said Fio Giana, Crush and Convey Manager-Cerro Verde.

“We all have a common goal to improve the company in safety, efficiency and productivity. Hand in hand, with the

help of these teams, we’re adding value, tons and pounds to Americas’ Concentrator.”

Replacing a mill liner at Chino recently turned into an agile kind of collaboration on a project as this new way of working becomes more ingrained inside and outside of formal agile teams. Production is safer and cleaner now – and throughput increased.

“We’re looking at about 2,000 tons a day of improvement, so if both mills can perform like this one, that’s almost a 33 percent increase to our operations here, which is huge,” said Ryan Fidler, formerly the Superintendent, Mill Maintenance-Chino and currently Operations Superintendent-Bagdad Concentrator.

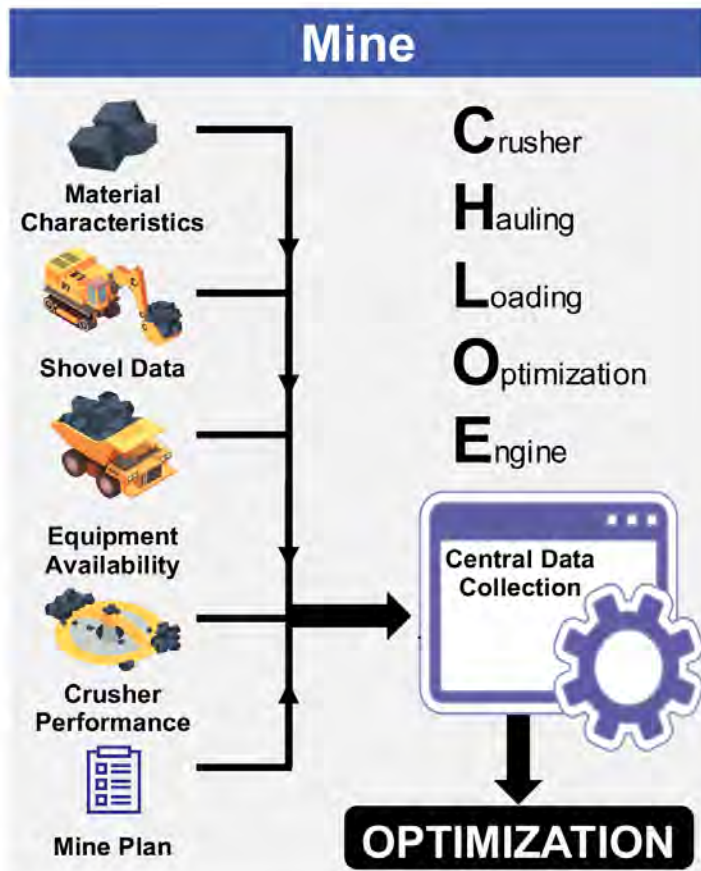
WORKING BEYOND THE FORECAST

As production continues to ratchet up, sustainability looms as the question for 2021 and beyond.



“We all have a common goal to improve the company in safety, efficiency and productivity. Hand in hand, with the help of these teams, we’re adding value, tons and pounds to Americas’ Concentrator.”

– Fio Giana, Crush and Convey Manager-Cerro Verde



CHLOE, the new girl in Cerro Verde, is a project to ramp up the mine and increase production.

FAQs

What is Americas' Concentrator?

It is an initiative to safely deliver 200 million pounds of incremental copper per year by 2022 by leveraging the experience of people, artificial intelligence and the agile process.

What is agile?

Simply put, agile is about people. This way of working allows us to tap into the knowledge of our employees and provide an environment where collaboration powers improvement. It is about making minor changes to bring about major change.

Who is involved in making Americas' Concentrator?

Everyone can be involved. While most will not be on an official agile team, everyone should share ideas for improvement. The sharing of ideas – big or small – is the most important part.

What happens when Americas' Concentrator is done?

This new way of working isn't going away any time soon. The company will continue to identify opportunities for improvement and will count on the knowledge of our employees to make it happen.

"I see us really doubling down on supporting our people," Koon said. "The more you focus your organization on supporting people and empowering your people, the more they are energized. The more energized we are, the more we focus on how to have our best day every day."

After all, the teams at the sites are the experts, and it's their feedback, ideas and collaboration challenging the status quo and pushing the company into the future, Monteith added.

"This process is all about collectively going out and giving these teams the opportunities to get the ideas and feedback from those people," Monteith said. "We've had so many contributions

already, and we're just going to keep building on that. That's what gives me confidence we can keep getting more pounds."

As more people ask questions about how to do things better, challenge standards and really work together in a way that the company has not worked historically, the future becomes even more exciting, Olmsted added.

"I think we'll be able to look back at 2020 and see all sorts of Safe Production records have been set, everyone in the organization understands how they impact the business and the Americas are working on the second 125,000 tons per day of throughput!" he said. ■

"We listened to our customers and worked with supportive management interested in what we think we should do instead of just telling us what should be done."

– Andy Cillitto, Superintendent-Mine Maintenance and Product Owner of Sierrita's agile team



The Agile Team Inside and Out

Rugby often is used as an analogy for the agile method because actions feel fast as team members, like rugby players, make split decisions based on well-defined rules. Team owners, like Product Owners, cheer on the team, remove obstacles and set goals.

In agile, about a dozen people make up the typical team. While every team has a Scrum Master and a Product Owner, most are cross-functional members. Let's start with them since they are the ones responsible for the work and the results.

Cross-functional members: Depending on the project, the team will include metallurgists, engineers, geologists, planners, superintendents, managers, supervisors or others. If the team is going to be working with a fair amount of data,



Rugby fans will recognize some of the terms borrowed by agile, such as scrum and sprint.

a data scientist probably will be in the mix too. One of the most common misconceptions about agile teams is that team members take on new agile work in addition to their ongoing jobs. Instead, the job is temporary and full time. After completing the suite of sprints for the Product Owner, a team disbands, and its members go back to their positions, taking a new way of working back to their team.

Scrum Master: While master may be in the title, this person very much serves the team. "A Scrum Master's job is to clear

THE EVOLUTION OF AGILE

They want to do what???!!! Produce a concentrator's worth of additional copper without actually building a new concentrator???!!! (Cue laugh track.) Though much of the mining industry might scoff at such an ambitious undertaking, they, unlike Freeport-McMoRan, haven't witnessed the transformational change already taking place. Although many employees, by now, say or hear agile in daily work conversation, the term – in this context – was not part of everyday conversation here until early 2019.

1930s

ALTHOUGH THE COMPUTER industry embraced agile decades ago, its roots predate computers. People have embraced agile-like iterative and incremental-development approaches for centuries, perhaps even since the birth of the scientific method. The modern-day version came about in the 1930s, when a Bell Labs physicist applied Plan-Do-Study-Act cycles to the improvement of products and processes.



1940s-1950s

THE METHOD LATER WAS USED in rebuilding Japan after World War II, and Taiichi Ohno with Toyota evolved the idea to develop the Toyota Production System — a lean operational model still influential across industries today.

1980s

FAST-FORWARD TO 1986, WHEN a Harvard Business Review article observed that many manufacturers used a team-oriented approach to release new or improved products faster than their competitors.

Rather than developing products in phases from one team to the next, some companies took a rugby-like strategy and engaged the entire organization in advancing and perfecting a design or process, passing the ball back and forth so to speak, as they sprinted toward the goal.



all the obstacles and impediments that are keeping the team from doing the work and delivering value,” said Josh Andres, Senior Innovation Engineer-Morenci.

Coach, mediator, counselor, snack-bar attendant, hall monitor, PowerPoint presenter, coffee fetcher and full-time listener, a Scrum Master doesn’t do or direct any of the work of the agile team.

That said, they have a lot of influence over how well the team performs.

“Teams have to be very transparent with agile, so as a Scrum Master, you absolutely need to have and foster those crucial conversations,” said Ben Blaschuk, Senior Metallurgist-Morenci and Scrum Master.

For a team whose members often are getting their first introduction to agile, a Scrum Master also needs to constantly reinforce and maintain the agile process.

“That’s really important, because it’s a new process, something very different from what we’ve done in the past, so you really need to make sure the team is staying true to it,” Andres said.

For Andres, who has been the Scrum Master of several successions of agile teams at Morenci, the role has been career changing.

“I’m actually an introvert, and this is definitely an extrovert’s role, so has it been challenging for me? Yes, but do I love it? Absolutely. Seeing the wins we deliver, helping teams set new records for production has been so rewarding,” he said.

Product Owner: This team member works with the customer and the team to set its direction.

In some cases, the term customer means an actual customer who buys our copper, but in most cases, the customer is another department or operation within the site or company.

A site’s mill, for example, will be the direct customer for a project designed to decrease downtime of ore flow from the crusher. Often referred to as “the voice of the customer,” the Product Owner makes sure the team is keeping the customer in mind and the sprints will achieve the most viable product for the customer.

The Product Owner also develops and prioritizes a backlog of projects for future sprints. ■



1990s

A SOFTWARE TEAM BORROWED

this approach from the manufacturing sector and applied it to software development, calling the process scrum – another term from rugby. Using the scrum method, the team completed a demanding software project on time, under budget and with fewer bugs than any previous release. Their success inspired the innovators to define and standardize the approach, and in 1995, scrum first rolled out to the public.

2001

SEVERAL DEVELOPERS, INCLUDING

proponents of scrum and other simple improvement strategies, pooled their talents and experience. From this was born a standardized manual for agile methodology, which ultimately found relevance beyond software and IT applications, called the Manifesto for Agile Software Development.



Today

OTHER INDUSTRIES HAVE ADAPTED

the approach to accelerate organization-wide improvements. In Freeport-McMoRan’s case, agile teams, departments and frontline employees collaborate in proposing, testing and implementing ways to squeeze more value out of existing assets and resources.

A synergy of employee ideas, data science and artificial intelligence produces a host of viable recommendations that a site selectively can try in the field and quickly validate through real-time metrics and employee feedback. As that process continues, bundles of improvements emerge within days or weeks, further upping performance standards.

People Power Smashes Pro

BAGDAD

RECORD

DATE

97.84 million tons mined in a year	2019
355,420 tons of throughput in a single day	October 12, 2019
82 percent haul truck efficiency in a month	October 2019

CHINO

RECORD

46,500 tons per day for highest monthly throughput average
93% SAG mill monthly asset efficiency
77% primary monthly crusher efficiency

CERRO VERDE

RECORD

DATE

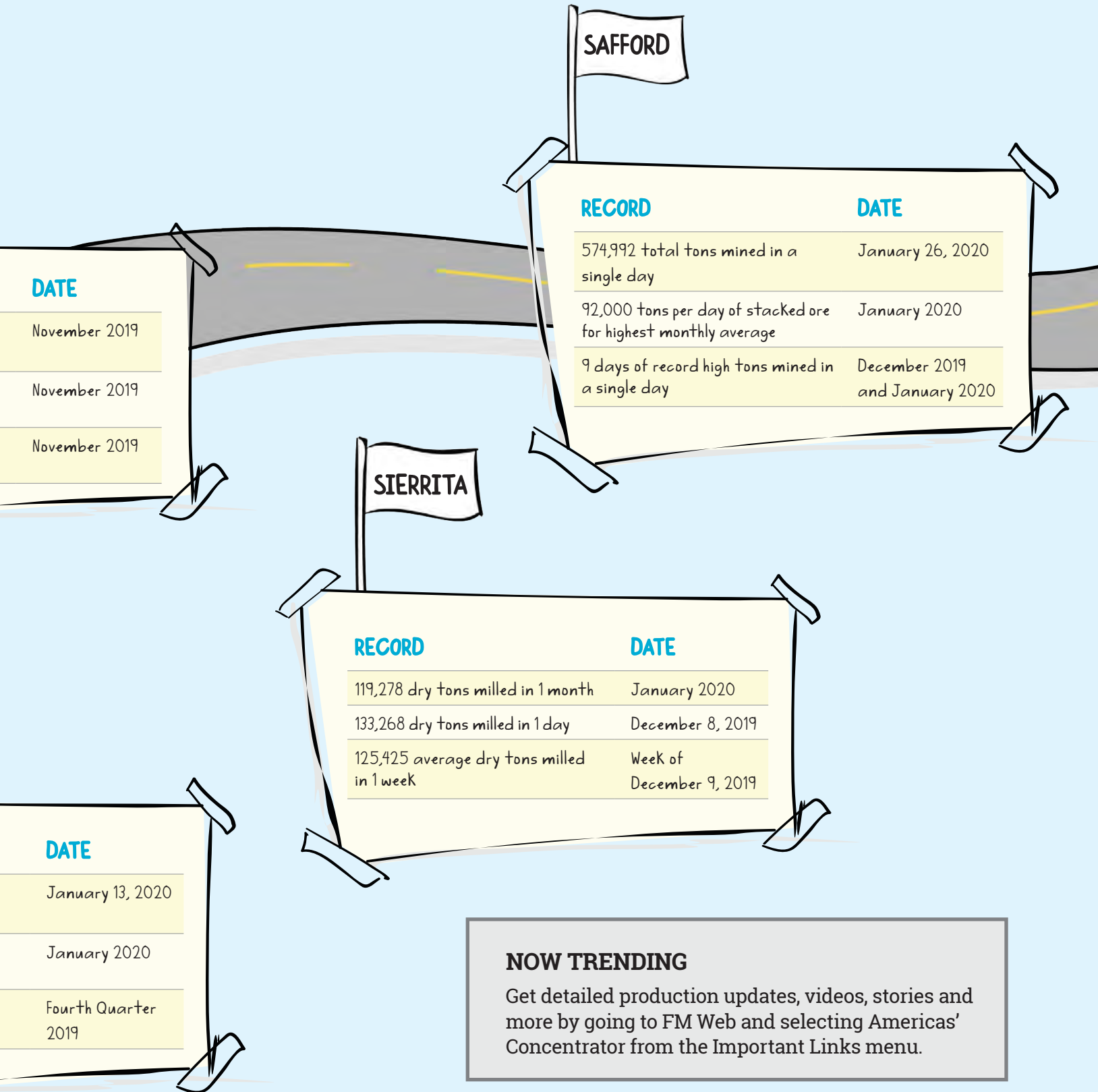
497,764 metric tons milled in a quarter	February 2, 2020
594,300 wet metric tons of concentrate hauled in a quarter	Fourth Quarter 2019
568,000 wet metric tons of concentrate shipped in a quarter	Fourth Quarter 2019

MORENCI

RECORD

188,000 tons of throughput in 24 hours for Crusher 3
142,500 tons per day for highest monthly milling average
21 days in a row of exceeding forecasted tons of throughput

Production Records





Shannon Ennis, a Morenci metallurgist, is now a data scientist.

Data Scientists Enthusiastic About New Roles

THE COMPANY'S NEWLY MINTED DATA scientists know how to mine ore – and now they know how to mine data.

After completing the two-month data scientist apprenticeship program in Phoenix late last year, all 12 have been matched to projects aimed at increasing copper production through the Americas' Concentrator initiative.

"We want to use our own people long term. We can teach them analytics quickly, but it takes a long time to get mining knowledge. Our data scientists have both," said David Sovell, Vice President-Information Technology.

For the last 10 years, sites have collected data points on all aspects of the mining process – from the ore being mined and the haul trucks being operated to the reagents being used.

The result is billions of data points to analyze, and that's exciting, said Shannon Ennis, Metallurgist II-Morenci and new data scientist.

"We have all of this data, but in the past, we weren't using it to its fullest potential. It's really important to have people with the right skill set to create complicated models that can be used to optimize the milling process," she said. "I really appreciate and am happy to have the opportunity to work on a project that makes such a high impact."

With backgrounds as metallurgists, engineers, technical trainers and more, the data scientists are applying

their practical mining industry experience to their data evaluations to improve performance. Recommendations are tried in real time with front-line teams.

"I feel so excited to be part of such an important project for the company and grateful for the opportunity to learn and contribute my knowledge. This is a big endeavor and a challenge for the company to apply artificial intelligence for the first time in the industry, and that feels very motivating," said Luis Oporto, Electrical Maintenance Planner at Cerro Verde and new data scientist.

The inaugural class of 12 was chosen from a group of 327 employees who took the assessment for the apprenticeship, and their success reflects the company's goal to provide opportunities for employees to achieve more.

"We want to take our smart people and give them a chance to do something new, in a high-demand area. We have a responsibility to help our people grow in new areas," Sovell said.

As the build of Americas' Concentrator continues, another data scientist apprenticeship class may be added mid-year. ■

"We want to take our smart people and give them a chance to do something new, in a high-demand area. We have a responsibility to help our people grow in new areas."

– David Sovell,
Vice President-
Information
Technology



Luis Oporto is back in Cerro Verde as a data scientist.

LET THE CEREMONIES BEGIN

Superintendents temporarily have relinquished a metallurgist, mine engineer or whatever the case may be as cross-functional members, and your Scrum Master, Product Owner and data scientists are in place. Now what?

It's on to the ceremonies – the framework of meetings in the sprint process.

1. **Agile Workshop / Sprint Planning:** It all starts with three to five days training on agile principles and developing the team's Objectives and Key Results. The team determines the highest priority items from the product backlog that the team will tackle – the Minimum Viable Product.
2. **Sprint Standups:** These 15-minutes-or-less ceremonies become a morning ritual. A member of every agile team at a site delivers a sticky note-sized summary of what the team accomplished yesterday, what they'll accomplish today, and what, if any, outside assistance or expertise they need.

"Every team delivers value every day," said Josh Andres, Senior Innovation Engineer-Morenci. "You don't want to be the person at the standup saying, 'Well, we didn't really do anything yesterday.' You are spending all of your time

working on this. You are expected to deliver every day." Value is delivered even when a sprint fails to produce its Minimum Viable Product.

"That's a learning, and that adds value, because we now know to try it a different way or to move onto something else," Andres said.

3. **Sprint Reviews / Showcases:** At the end of each sprint, each team reports its results. In showcases – the more formal version of reviews – the Product Owner brings in customers – internal, vendors and contractors. Reviews and showcases also often attract site and company leadership.
4. **Sprint Retrospectives:** This ceremony begins after the sprint review where the agile team reviews the last sprint, talks about successes and potential improvements, and creates a plan for implementing improvements.

The Scrum Master plays a key role here, as the observations gathered every step of the way hold a mirror up to the team. What did the team do well, so-so and not so well?

At the end of a sprint, the team goes back to the next Minimum Viable Product in the backlog, and the next sprint begins. Depending on the intensity and complexity of sprints, teams can do up to three or four different sprints during their agile tenures.



"When we talk to people on the front line, we definitely have our fair share of smirks about terms like Scrum Master, but we just explain that we use these fancy words because it makes us realize that we aren't just holding more meetings."

– Garrett Anderson, Innovation Engineer I-Safford

AGILE GLOSSARY

No matter your particular role in Americas' Concentrator, knowing the lingo might help you better understand how all the pieces fit together. Below are a few of the commonly used key words, phrases and acronyms that you probably are using, hearing or reading on a regular basis.

Advanced Analytics: A data science technique that uses sophisticated tools and techniques to analyze a data set, find insights, and make predictions and recommendations.

Agile: A set of management practices and values based on incremental achievements with requirements and solutions coming from a collaboration between cross-functional teams.

Agile Team: The agile team consists of a Product Owner, a Scrum Master and team members. Agile teams are self-organizing and cross-functional and decide how best to accomplish their work, delivering products in phases to maximize opportunities for feedback.

Big Data: Extremely large data sets that reveal patterns, trends and associations.

Data Scientist: People who collect and input data and use it to build and evaluate models of real conditions at our operations. Using the learnings of those models, they recommend improvements to those conditions – from changing the speed

of a conveyor belt to adding more of a certain type of reagent to generate the ideal-sized bubble in a flotation tank.

MVP: Short for Minimum Viable Product, it's the first deliverable the team will create with a minimal required number of features and some business value so users can / will use it and provide feedback.

Scrum: A framework focused on phased and incremental work used to address complex adaptive problems and creatively deliver products of the highest possible value.

Scrum Master: The Scrum Master supports the team and the Product Owner, driving constant communications and rapid problem solving to deliver a great product and experience. In addition to ensuring that the team follows the agile process, the Scrum Master also plays an important role in clearing all road blocks that could keep the team from succeeding. This includes making sure the team has all the resources needed as well as all the clearance and approvals from departments and areas they're studying and testing.

Sprint: A period of time that includes both incremental and iterative development (one to two weeks), during which a useable and potentially releasable product, also called a Done, is created.

TROI: Throughput Recovery Optimization Intelligence is an analytics model that provides set point recommendations for operators to maximize copper production. It's pronounced Troy, like the name.

Collaboration on Steroids Redefines Mining

There's collaboration – and then there's collaboration on steroids. As more projects get off the ground in support of Americas' Concentrator, employees are embracing the agile work process beyond formal teams – and are finding outlets to share ways to make things better across the wider company.

These amazing results showcase the ingenuity of our employees and illustrate what happens when all team members come to the table and ask: "How can this be better?"

Hand-designed Training Manuals Share 20+ Years of Best Practices

DATA ANALYSIS AND SOPHISTICATED computing technology often get the spotlight in the agile process, but there's also room for good, old-fashioned pen and paper.

For years, haul truck driver Ruben Trujillo has given operator development a personal touch by creating his own training aids, which he has used in mentoring other drivers.

Encouraged by the spirit of collaboration around the agile process, he shared this information with the larger mine operations group.

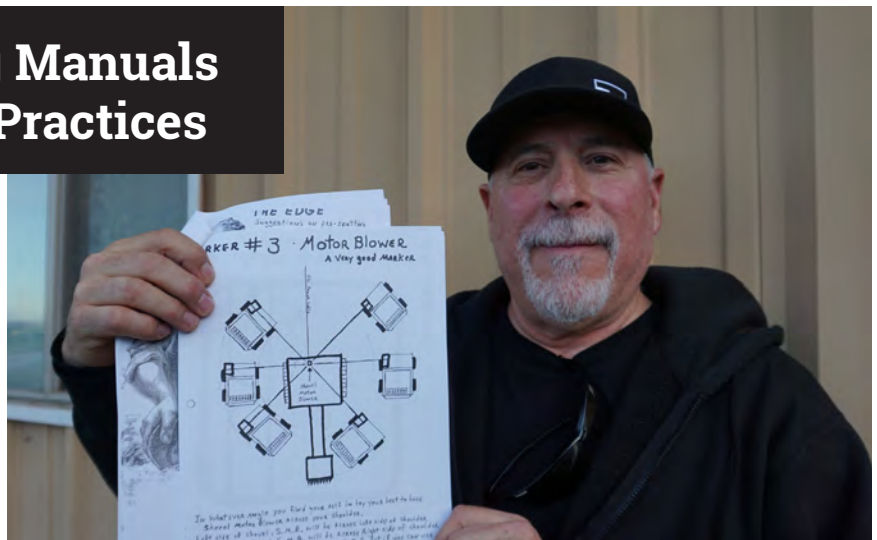
Now, his hand-drawn and -written operator manual has added an element of human perspective and expertise that computers alone could not capture for the agile project around the Haul Truck Operator Scorecard program.

The intricately detailed illustrations and diagrams help clarify various procedures and best practices for all levels of operators – from inexperienced to expert.

"From my perspective, this agile journey has allowed us as leaders to uncover pockets of excellence throughout our organizations. This is a great example that demonstrates the dedication of our workforce," said Jeff Monteith, General Manager-Safford.

A member of Safford operation's Team Revolution Agile group, Trujillo helped roll out the site's HTOS program, which supports Americas' Concentrator by focusing on the most important part of each truck – the driver. Scores already are on the rise.

Just as years of haul truck-monitoring data were vital to the development of the scorecard, so too was input from



Safford operations haul truck driver and mentor Ruben Trujillo displays a page from a chapter of his hand-crafted haul truck operator manual detailing some of the best operator practices.

employees whose years of expertise in the driver's seat qualify them to train and mentor other drivers. In his 40-plus years with the company, Trujillo has logged 32 of those as a mentor, with 14 years at the Safford operation.

"I've filled two thick binders with notes and other information from the last 20 to 25 years," he said of his passion to impart his vast institutional knowledge to others. "I keep adding to it as I think of things to share or as people ask questions that I think others may have."

Trujillo references the documents as he coaches and mentors operators, particularly newer ones.

"Sometimes people don't know what to ask, so I came up with a list of topics to generate questions and discussion," he said, adding that he sometimes uses a small toy haul truck and a mine map to help operators visualize in-the-field scenarios as he explains procedures.

"I've created this manual as something that drivers can continue using after training to maintain and keep improving on their safety and skills."

Morenci: Changes Boost Morale

IDEAS STACKED UP AND IMPROVED production – and morale – as employees collaborated across departments and focused on the larger company vision.

“It has been exciting working with the agile team, and it has been especially exciting when we can celebrate the small wins as a team. I believe change is good for morale and for the company – it’s a great feeling when your voice is heard,” said Carlos Lopez, Mill Senior Supervisor-Morenci.

For example, collaboration between Mine and Crush and Convey reached new levels with the development of a unified scorecard. This tool lets the site track how the two departments interact in terms of production each shift and includes monitoring the efficiency of

“The ability to get people together to share ideas, share past experiences and be open about the risks associated with each idea has changed everything.”

– Mark Vallejo, Superintendent Mill Maintenance-Morenci

Communications is important for collaboration. At Morenci and other sites, employees get updates about Americas’ Concentrator progress on VNET screens.

haul truck use, which impacts the site’s Key Performance Indicators.

“The ability to get people together to share ideas, share past experiences and be open about the risks associated with each idea has changed everything,” said Mark Vallejo, Superintendent Mill Maintenance-Morenci.



**CHECK
RESOLUTION**

Lone Star Haul Road Opens Ahead of Schedule

FROM A MOUNTAIN RIDGE SADDLE that separates the Lone Star pit from the rest of the Safford operation, the completed Lone Star haul road descends nearly 900 feet along 2 miles, tying in with the roads linking the San Juan pit to the crusher complex.

The new road enables Safford to ramp up to full production from Lone Star while mining out the rest of San Juan Phase II over the coming months.

“It was through great collaboration among our Operations, Maintenance and Engineering teams that we hit this milestone early,” said Jeff Monteith, Safford General Manager.

The final road segment was finished in October, well ahead of the planned date. The original construction window would have spanned approximately 21 months, but a subsequent redesign of the road and a persistent team effort cut that schedule by about half.

While working through the challenges of keeping the new road and other Lone Star-related projects on track, Safford has



Collaboration was key to the early opening of the Lone Star haul road.

continued producing copper from its existing source.

“Embracing the agile work process enabled us to focus on pulling the ore delivery haul road forward without impacting stripping targets in Lone Star or copper deliveries from San Juan to our primary crusher.

Our already collaborative team was turbo-charged by agile – a win-win for Safford as well as for the company,” Monteith said.

With the completion of the road, Safford was able to speed up its mine plan, and now Lone Star already is crushing and leaching ore – well before the original August 2020 schedule.



The half crane- / half robot-looking liner handler grabs pieces of mill liner weighing thousands of pounds and places them in the mill where they're bolted on by contractors.

Collaboration and Big Thinking Built Chino's New Mill Liner

A NEW, MORE ROBUST MACHINE TO CHANGE OUT THE LINERS OF THE SAG MILLS – WHERE ROCKS GO IN AND FINE ORE COMES OUT – IS ALLOWING CHINO TO TAKE ADVANTAGE OF NEWER, BETTER MILL LINERS THAT ARE SAFER AND CHEAPER TO RUN.

The entire liner handler project, which could have taken six months or more under traditional project management, was infused with a different pace and focus as the team unofficially adopted the agile process. The project shows how everyone can work this way whether or not they are on a formal team, said Chad Fretz, General Manager-Chino.

"We have formal agile teams go do sprints, and they're rigorous in their process, but working agile doesn't always mean that you need to be part of a formal agile team, you just need to follow agile principles," Fretz said.



"If you do the work to justify something, you can get it done – so don't be afraid to think big and outside the box if you know it will work."

– Ryan Fidler, Operations Superintendent-Bagdad Concentrator

"Incorporating those agile principles into the work we do, that's the culture change that you want. So, it doesn't have to be an agile team out there. It's our people using agile principles to find better ways to do every part of our business. This is our Freeport-McMoRan culture now."

The maintenance and operations team at Chino, the Operational Improvement group at Phoenix, and the manufacturers of the liner and the liner handling machine all played pivotal roles.

Once the team had identified the goal of reducing mill downtime and pinpointing the mill liner as the bottleneck, a true collaborative process was implemented that provided immediate value to safe production.

"Identifying the issue, going after it quickly with a lot of horsepower behind it and a lot of collaboration between all the different parties, I would say those aspects are agile," said Ryan Fidler, formerly the Superintendent, Mill Maintenance-Chino and currently Operations Superintendent-Bagdad Concentrator.

The liner handler takes care of the hundreds of hulking puzzle pieces that make up the inner lining of a mill.

The old liner had 260 of those pieces of steel weighing 2,700 pounds or so each, which are individually bolted on and off. The new design only has 154.

"This makes it many times safer because of less exposure, which means fewer changes where our people are exposed to suspended loads of thousands of pounds. It also saves us about 24 hours in labor per change," Fidler said. "We're also seeing a slight increase in production, roughly 87 tons an hour, so that's an unexpected benefit."

A big part of the go-ahead for the purchase of the new liner handler was that it would pay for itself in the decreased downtime of just two liner changes, Fidler said. "If you do the work to justify something, you can get it done – so don't be afraid to think big and outside the box if you know it will work."

Team Feel the Fuel Burn Goes for Slow

DAVID BARNES, SUPERINTENDENT RAMP-Operational Improvement, accidentally stumbled into agile as part of a previous project aimed at identifying Komatsu trucks with electro-mechanical issues.

Today, he's the Product Owner for one of the company's largest agile teams, with representatives from every site as well as Caterpillar and every Caterpillar dealer within the company's strategic alliance. It's an example of how one smaller project worked and went viral across sites.

"It is more about the people than the process – I love that saying!"

– David Barnes, Superintendent RAMP-Operational Improvement

The project supports the bottom line by making copper less expensive to produce – and in the volatile copper market, every penny makes a difference.

In the past, engine life was measured by service hours, which accumulate as long as the engine is running in any capacity. Using fuel consumed rather than service hours is a

more accurate representation of a truck's actual work.

The team's goal is to increase engine life to 1 million-plus gallons of fuel burned, which is a 30 percent increase from the current standard, across the company's fleet. Existing

tools deliver a wealth of engine health data, and the site team members monitor each engine's health and make removal decisions based on this data.

In January, the team, influenced by the new data relying on fuel burn, deferred rebuilding eight haul truck engines – a \$2 million cost that was in the forecast budget.

So far, the team has created a new engine removal process flow and rolled out the process changes to all North America and South America. Next will be a maintenance plan that is standard to all engines, yet customizable by site, and a standard engine rebuild process.

All of this will include constant feedback from sites. "It is more about the people than the process – I love that saying!" Barnes said. "I also really enjoy the flexibility that agile methodology gives you to complete work and try new ideas quickly."



**CHECK
RESOLUTION**

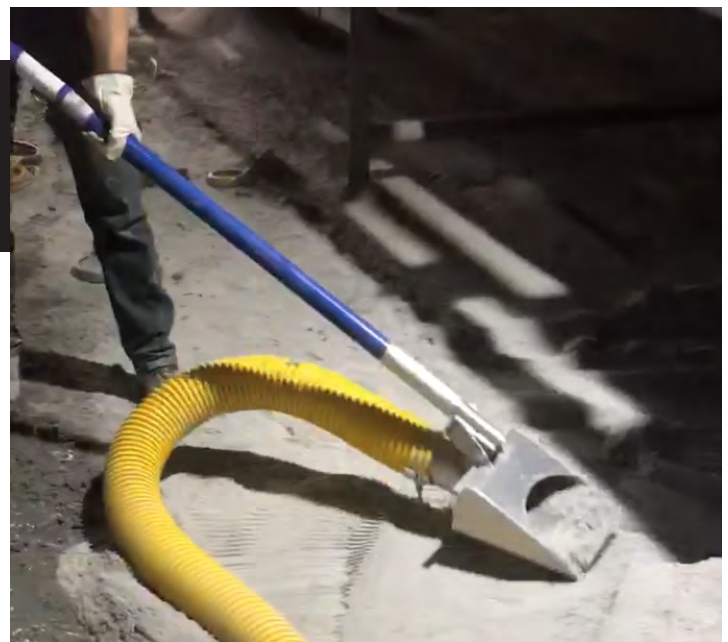
The Dyno machine tests a haul truck engine at Empire, the Arizona Caterpillar dealer in Mesa, Ariz.

Vacuum Lines Could Limit Exposure to Crystalline Silica

PETER GRIMSON, INDUSTRIAL HYGIENE SENIOR Supervisor-Miami, and B.J. Anthes, Mill Operator-Bagdad, recently teamed up to find a more efficient way to vacuum dust underneath belts.

They currently are testing new shovels connected to vacuum lines that have the potential to lower exposure to crystalline silica and make the work easier on employees.

"When there's a lot of spilling, this is going to save us on manpower, letting us use this with the vacuum truck instead of five to 10 people having to crawl up under the belts and wearing ourselves out," Anthes said. ■



Employees Break the Box Office by Raising More Than \$11 Million for United Way

GO ON AND TAKE A BOW, Freeport-McMoRan. You deserve it after making our annual United Way campaign the biggest box-office success in company history!



Together, you pledged more than \$4 million, which grew to more than \$11.1 million

when combined with the company match. That's an increase of 14 percent over last year, and the first time our campaign has crossed the \$10 million mark in support for United Way.

Employee participation was up slightly, but there is still plenty of room for improvement to reach our No. 1 priority of having every employee participate in some way.

"This result is inspiring and demonstrates what generous and caring people we have working at Freeport-McMoRan," said Linda Hayes, Vice President-Communications and United Way Committee Chair. "On behalf of company leadership, I would like to thank all those who donated for joining us in our

giving campaign and investing to make a difference in the communities we call home."

Each year, the company partners with United Way to raise funds for health and human service agencies providing vital resources in the areas of education, financial wellness and health. Resources help ensure children have a quality education, families a stable income and individuals a healthy life.

The campaign continued with the movie-inspired theme: Lights, Camera, ACTION – Give to United Way. Employee coordinators at each site led local efforts, with some sites holding special activities such as prize drawings, volunteer events and competitions.

Employees donating at least \$25 were entered into a grand prize drawing, with Teresa Ybarra in Phoenix winning the campaign grand prize of two American Airlines gift certificates. Winners in all other prize categories were contacted directly.

As in past campaigns, the company's foundation double matched employees' contributions of \$25 or more up to the first \$1,000 and single matched amounts more than \$1,000. ■

Freeport-McMoRan's Top 10 List

Based on the number of employee pledges, these nonprofit organizations were the most popular during the United Way campaign:

1. United Way of Graham and Greenlee Counties
2. St. Jude Children's Research Hospital
3. Valley of the Sun United Way
4. Clifton Volunteer Fire Department
5. United Way of Southwest New Mexico
6. Wounded Warrior Project
7. Boys & Girls Club of Gila Valley
8. United Way of Tucson and Southern Arizona
9. United Fund of Globe-Miami
10. Ronald McDonald House Charities of Southern Arizona

Freeport-McMoRan Named to Forbes 2020 Just 100 List

FREEPORT-MCMORAN has added another feather to its Just 100 cap with its recent selection to Forbes magazine's Just 100 list for the third consecutive year.

The list, released in partnership with JUST Capital, highlights U.S. companies that go above and beyond for their workers, customers and the environment.

The company ranked 43rd overall and was the highest ranked company in the Basic Resources category of industry types.



traded companies based on how they treat five critical stakeholders: their workers, their customers, their communities, the environment and their shareholders. The annual ranking reflects the performance of companies

To produce the list, Forbes and JUST Capital tracked, analyzed and ranked 922 of the nation's largest publicly

on key issues – as determined by polling the American public – that are essential to just business behavior.

"The companies we spotlight on the Forbes JUST 100 List reflect our belief that corporate accountability is critical when creating systemic changes and reimagining capitalism," said Forbes Chief Content Officer Randall Lane in a press release. "These organizations are driving transformative change across industries and leaving a lasting impact on the world." ■

Company Leadership Named to 2020 All-America Executive Team

FREEPORT-MCMORAN'S executive and investor relations leadership ranked first in the Metals & Mining Sector for Institutional Investor magazine's 2020 All-America Executive Team.

Each year, the publication releases an annual ranking of the best executives and investor relations professionals and companies across 44 industries as voted on by money managers, buy-side analysts and sell-side researchers.

Freeport-McMoRan was one of nearly 150 companies to be named Most Honored Companies – a distinction reserved for those companies that rank among the top three in at least two of four award categories.

Richard Adkerson, President and Chief Executive Officer, ranked No. 1. in the Overall Best CEO and the Best CEO-Sell Side in the Basic Materials Category in the Metals & Mining Sector.

Kathleen Quirk, Executive Vice President and Chief Financial Officer, ranked No. 1 both as the Overall Best CFO and CFO-Sell Side in the same category.

Vice President of Investor Relations David Joint ranked No. 1 as the Overall Best Investor Relations Professional and the Best Investor Relations Professional-Sell Side. The company also received second place for Overall



Kathleen Quirk



Richard Adkerson

Best IR Team and Best IR Team-Sell Side.

In addition, the company received first place for Overall Best Environmental, Social and Governance Relations / SRI Reporting and Overall Best Corporate Governance. ■

General Managers Honored by Mining Foundation of the Southwest

THE MINING FOUNDATION OF the Southwest recently honored General Managers Vicki Seppala and Bill Sircy at its annual Hall of Fame Awards in Tucson, Ariz.



Vicki Seppala, General Manager-Climax

Seppala, General Manager-Climax, was awarded the foundation's Medal of Merit, while Sircy, General Manager, Processing-Cerro Verde, received the Medal of Merit Under 40.

Seppala, who earned a Bachelor of Science degree in geological engineering from the University of Arizona, has been with the company since 1995 when she started at Sierrita as a Geotechnical Engineer.

She worked in various roles at numerous company sites, including Superintendent-Mine Operations and Maintenance at Sierrita, Manager-

Corporate Mine Technology Group, Mine Manager-Candelaria, Manager-Fragmentation and Loading and Manager-Resource Management at Morenci, and Director-Corporate Health and Safety in Phoenix.

Sircy joined the company in 2002 as SX/EW Plant Metallurgist at Bagdad. He became Superintendent-Electrowinning at Morenci in 2007, Superintendent-Hydromet and Leaching at Safford in



Bill Sircy, General Manager, Processing-Cerro Verde

2009, and Manager-Crush and Convey in Morenci in 2011. He moved to El Abra in 2015 as Manager-Processing before coming to Cerro Verde in January 2018 as Manager-Milling.

A fifth-generation Morenci employee, Sircy earned a Bachelor of Science degree in chemical engineering from the University of Arizona.

Freeport-McMoRan employees have been well represented by the foundation not only as honorees but also as officers and board members.

The foundation promotes public understanding and education related to mineral resources and the mining industry in the U.S. and abroad.

In 2018, Red Conger, President and Chief Operating Officer-Americas, was selected by the foundation for induction into the American Mining Hall of Fame. Freeport-McMoRan President and CEO Richard Adkerson also was inducted into the Hall of Fame in 2012.

Sircy is the third member of the company to win the Medal of Merit Under 40, as Fio Giana, Manager, Crush and Convey-Cerro Verde, and Justin Cross, General Manager-Bagdad, won the award in 2015 and 2016, respectively.

Established in 1982 and headquartered in Tucson, Ariz., the Mining Foundation of the Southwest funds educational projects in the Southwest, including Mexico, through donations and fundraising activities. ■

New and Expanded Employee Assistance Program Now Available

GUIDANCERESOURCES, the company's new and expanded Employee Assistance Program, is ready to help with confidential counseling and other services.

Over the years, EAPs have evolved to go beyond providing counseling for workplace stress and other issues. Today's EAP is like a concierge for your life – and GuidanceResources is ready with expert content and unique tools personalized to help you with everyday needs as well as master's- and PhD-level counselors.

Here are some recent requests GuidanceResources has fulfilled:

- International packer / shipper to send several bicycles from California to France
- Non-public transportation options for someone who is legally blind and needs help to get to work
- A physician / pediatrician who specifically makes house calls
- Dog party venue where dogs can roam and clients can bring food
- Insurance options for parents who are visiting the United States

GuidanceResources® Online

Login



Welcome to GuidanceResources® Online

GuidanceResources Online is an award-winning, comprehensive, interactive service that provides expert content and unique tools to assist you in every aspect of your life, all in a secure, easy-to-use, personalized environment.

The EAP is a confidential service provided by the company to employees and their families at no cost.

No personally identifying information about participation in the program is provided to the company. ■

Access services 24/7

- 833-962-0716
- guidanceresources.com
(register using web ID: Freeport-McMoRan)
- GuidanceNow app

Boost Your 401(k) Savings

THE 401(K) CONTRIBUTION limit for qualified retirement plans has increased, making it easier to save even more for retirement through the company's Employee Capital Accumulation Program.

Under the new IRS limits, you now can contribute up to \$19,500 in 2020. Employees age 50 and older automatically are eligible for an additional annual catch-up contribution of \$6,500 in 2020.

You can change the amount you put into your ECAP account any time during the year as well as set a recurring, annual increase to coincide with any merit increase you may receive. Simply contact Schwab Retirement Plan Services at workplace.schwab.com or 1-800-724-7526.

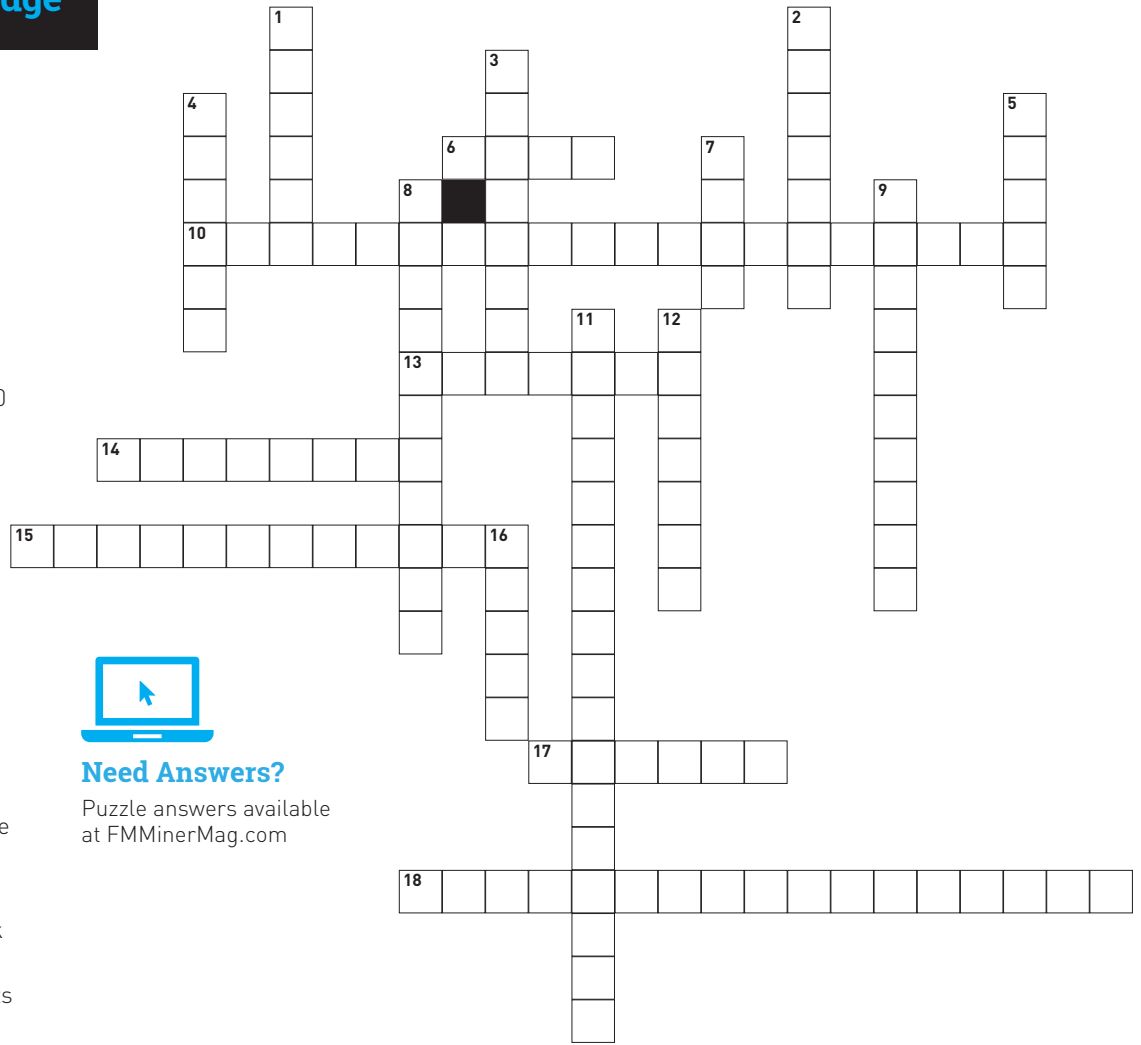
As a reminder, the company provides a dollar-for-dollar match on the first 5 percent of your ECAP contribution. ■



mine your knowledge

ACROSS

6. Employees get updates about Americas' Concentrator progress on these screens.
10. A major company initiative to increase copper production
13. Mill output at this site jumped to 15,000 tons per day.
14. This site increased one belt's production from 6,000 to 6,600 tons per hour.
15. How data scientists feel about their new roles
17. This site broke 26 production records in 2019.
18. A new company benefit able to provide counseling and help with party planning



Need Answers?

Puzzle answers available at FMMinerMag.com

DOWN

1. The most important part of the agile process
2. It's hard to argue with this.
3. This site opened its haul truck road ahead of schedule.
4. The new way of working boosts production, communication and this.
5. What to do with a great idea
7. To help engines last longer, one of the largest agile teams tracks how this burns.
8. Team leader responsible for helping everyone understand agile theory, practices, rules and values
9. Hand-drawn training manuals help drivers of these vehicles
11. How the company gives back to the community in a big way
12. Extremely large sets of numbers that reveal patterns, trends and associations
16. This site reduced downtime with its custom mill liner project.

WORD SEARCH:

- CAPACITY
- COMMUNICATION
- CONFIDENCE
- COPPER
- CULTURE
- DATA SCIENTISTS
- DEBOTTLENECKING
- ENTHUSIASM
- GUIDANCE RESOURCES
- INNOVATION
- LISTENING
- PRODUCTION
- SPRINTS
- SUCCESS
- TEAM
- UNITED WAY



our voices

“What makes you excited about our new, collaborative way of working?”



CHRISTINA CARLING

Senior Technical Instructor-Morenci

“Knowing how to use the agile process has been a game changer for me. I enjoy the partnership within the team – everyone has a piece of the puzzle which adds to the end results.”



JOSHUA GOODWIN

Planner II-Safford

“Our vans are not designed for off-road use, so I’m excited about the lift kits and skid plates we have installed on them to reduce damage from the rough conditions in the mine.”



DONNIE TAYLOR

Lead Mill Mechanic-Bagdad

“I think it’s a good deal for us. Sometimes they think of something that we haven’t thought of before, or we take an idea and just make it happen. I think it has really helped us a lot.”



BUNNY SKKY-SNODDERLEY

Mill Lab Tech III-Bagdad

“There’s been positive changes like the time saved in the way we handle flotation chemicals to recover copper. We now have two tanks. We have a stronger pump. We are going to have new piping put in to help us fill our tanks a lot faster. We used to have to handle this multiple times a day, and now we don’t.”



APRIL FERNANDEZ

Mill Operator II-Morenci

“What I like is the collaboration and breaking down the silos. I have an operational background and to be involved with the different groups (Maintenance, Planning, GSC) in the same room is very empowering by sharing knowledge, ideas and experiences.”



MATT WOLFGANG

Chief Innovation Engineer-Phoenix

“The level of engagement across the company is amazing and that has led to great success and advancements. This is a great thing to be a part of.”



DENISE BEJARANO

Crusher Operator-Safford

“I like that safety is improving at the same time as production! We used to have to stop or slow down the primary crusher frequently to deal with visibility issues from dust, blind spots and glare, but a new infrared camera that can see to the bottom of the crusher has solved the problem.”

“Working with the agile team has been an amazing experience as an operator. We’re able to get other people involved in our daily work, give them a better understanding of what we do and brainstorm great ideas to overcome obstacles. Our Site Production goals’ team is stronger than ever.”



WALTER AGUAYO

Senior Reliability and Process Engineer-Cerro Verde

“The work is dynamic and challenging! It’s great to work as a team with the different areas of the company as we maximize production capacity and efficiency.”



FRANK MARINEZ

Diagnostic Mechanic-Sierrita

“It’s great to have frontline employees and supervision collaborating on a team to accomplish a goal. I feel a lot of pride being picked to be a part of this team with the ability to put front-line employee’s ideas in place and being part of something bigger than the day-to-day work.”