

by E. Victor Brown

# Changing the Maintenance Mindset

**Baker Rock Resources experiences a  
evolution in its quarry culture, from reactive  
to preventive and predictive.**

By moving from reactive to proactive maintenance, Baker Rock Resources was able to achieve a 58-percent decrease in production downtime and a 28-percent increase in hourly production rates.



**L**ike all quarries, the journey from being a reactive plant to one that operates within a preventive and predictive equipment culture can be a long one. The question to be asked despite the lengthy journey is: Can the gains be immediate, while also being sustained and expanded for the long haul? For Northern Oregon's Baker Rock Resources, the answer appears to be a resounding 'yes' as the company built on its gains in efficiency, maximized productivity, and increased uptime with its stationary equipment in its Beaverton, Ore., quarry via implementation of Total Process Reliability (TPR) principles.

As an outgrowth of Total Productive Maintenance principles devised by Japanese Engineer Seiichi Nakajima, TPR is about increasing equipment reliability, decreasing downtime, and creating a unified asset management process. This is embodied in permanent and engrained methodologies that shift processes and mindsets in ways that change the company's culture from top to bottom. While the results have, thus far, been impressive, a closer look shows how changing and tracking maintenance and reliability processes with equipment is about changing the company culture and creating shared partnerships with its personnel and crews.

Founded in 1956, the family-owned company and its more than 100 employees supply aggregate and paving materials to Northwest Oregon via divisions in Beaverton, Dayton, and Malala. With ongoing relationships with major and minor road and construction projects throughout the state, Baker Rock's main Beaverton quarry spans 250 acres and processes an average of 1.5 million tons of aggregate per year. Like many aggregates operations around the country that have been around for any length of time,



"Our overall goal is maximized plant efficiency in terms of time and cost, so it's key to have information management, as well as KPI creation, to delineate those goals and necessary benchmarks for both operations and service so everyone knows what you're trying to accomplish," says Cristina Acosta, maintenance planner/scheduler for stationary equipment.



"By tracking everything from hours and life on everything that you can possibly think of, you get a better understanding of what is going on. Without that historical information, it's nearly impossible to make progress in maximizing productivity," says Bryan Loerzel, stationary equipment service manager.

inefficient maintenance processes were suppressing true gains in maximized up-time, productivity, and future growth.

## Assessment and goals

After implementation of a customized TPR strategy for its rolling stock in partnership with Raleigh, N.C.-based consulting firm TBR Strategies, Baker Rock has turned to

the maintenance and reliability consultancy to address and correct the challenges in its stationary equipment, starting with its primary Beaverton quarry.

The success of the company's rolling stock (mobile equipment) maintenance program yielded a 2015 reduction in emergency work to a low 4 percent, down dramatically from 2011's 50 percent. The effect is a projected 30-percent reduction in maintenance cost compared to 2014. This success opened the need to expand to other areas in the company, such as the quarry.

The quarry's maintenance department includes two highly skilled ground men for daytime operational repairs and an equally skilled maintenance crew of four for major scheduled downtime repairs. Unfortunately, they had become mired in an unstructured repair regimen that dealt with problems as they occurred.

Baker Rock's equipment division director, Brian Young, was instrumental in developing the relationship with TBR Strategies and its customized TPR plan for the company's rolling stock. With ownership seeing the big gains in that aspect of the business, they were convinced that moving forward with stationary equipment at the quarry was the next logical step. "Despite numerous repeating failures, there was no methodology for going to the source of the problem via a structured root cause analysis," Young explains.

The consultant-based TBR team, under the direction of its CEO Preston Ingalls, worked with Baker Rock's Cristina Acosta, maintenance planner/scheduler for stationary equipment, and Bryan Loerzel, stationary equipment service manager. As project directors, they were instrumental in partnering with TBR to perform an assessment of current methodologies, as well as development, implementation, and eventual rollout of the new processes.

"Previous management had utilized a verbal-only, unstructured communication process without documentation or computer records of schedules, reports,

and work," Loerzel says. "Consequently, we were excited about making the change and implementing some much-needed structure."

The customized TPR process developed for Baker Rock includes:

- Reporting and tracking protocols for all maintenance and repairs with maintenance re-organization;
- Revised and reorganized work order system with implementation of computerized planning, scheduling, and reporting;
- Preventive maintenance and predictive maintenance protocols and forms that would revise and reorganize interdepartmental processes;
- Establishment of key performance indicators (KPIs) to codify goals and how to meet them; and
- Reimagining and redevelopment of inventory and stocking, as well as tracking protocols, to ensure ongoing critical need and secondary stocking, as well as restocking in order to decrease expenditures.

The goals of the new system would be to:

- Gain control of work through the work order system;
- Maximize the effectiveness of the crews via planning and scheduling; and
- Begin eliminating downtime and recurring repairs by prioritizing inspections, work, and schedules while ensuring that the right parts, tools, and employees are available to do the work and conducting root cause analysis examinations.

## Implementation, buy-in, and rollout

Once the assessment was completed and the plan was laid out and approved, implementation began in March of 2015. Acosta used a cross-sectional approach of departmental input to help shape the process so that all facets of the company were represented. "Our overall goal is maximized plant efficiency in terms of time and cost, so it's key to have information management, as well as KPI creation, to delineate those goals and

## Award Winning Reliability

In October of 2015, Baker Rock was presented with Certified Laboratory's Equipment Reliability Program Award. The annual award recognizes North American companies making the most progress toward developing new proactive maintenance routines in conjunction with its certified complete lubrication program. This year, Baker Rock took first place.

"Baker Rock has 50+ years of history with a major oil company and had been running an oil analysis program since the '70s, but reliability was suffering, and shop technicians were frustrated by existing processes," said Certified Lab consultant Todd Edwards when he presented the award. "Specialists collaborated on a new action plan and went to work executing what amounted to a cultural shift at all management levels."

Certified Labs measured marked improvements to proper lubrication and handling, labeling, using its proactive oil analysis and fuel quality assurance programs, failure mode analysis, value recognition reports, energy surveys, and lubrication training classes. "Baker Rock's commitment to the development of its people and proactive maintenance processes are second to none, and it shows itself in increased uptime and greatly reduced parts replacement and labor costs," Edwards said.

necessary benchmarks for both operations and service so everyone knows what you're trying to accomplish," Acosta says. "By working together to create and disseminate that plan, all teams can work together towards the prescribed goals."

"We performed one Root Cause Analysis investigation on the rock breaker on the jaw," Young says. "We also implemented a failure mode and effects analysis (FMEA) in June so it is very new, but it is complete and in use with an audit form to make adjustments if the FMEA solution doesn't work."

At this stage, Loerzel began laying out a daily work and maintenance schedule so that crews understood what was to be done every night. Daily inspections were implemented with an emphasis on story writing for the complaint, cause,

and correction. This enabled crews to move beyond just replacing parts to inspecting and documenting why it failed and how to best correct it as part of a comprehensive failure analysis process.

According to Young, performing thousands of cursory preoperational inspections without real direction and goals had desensitized crews to the process. "Instead of walking through and maybe pencil whipping, we now had a pre-op inspection process where ground men and operators utilized vendor recommendations and comprehensive checklists and reporting," he says. "Write-ups increased tenfold as they were now comprehensively looking for potential problems and finding things that they had never noticed before. This quickly eliminated repeat failures because we were addressing so many problems."

The daily comprehensive inspections led to all stationary equipment running better with maximized uptime. The data tracking and throughput was crucial to this result. "By tracking everything from hours and life on everything that you can possibly think of, you get a better understanding of what is going on," Loerzel says. "Without that historical information, it's nearly impossible to make progress in maximizing productivity."

Loerzel explains that, above all else, implementation was about communicating with the crew about the permanence of the process moving forward, and simultaneously providing them with a forum to ask questions, give feedback, and make suggestions. "It was imperative to let them know that their opinions mattered, so when they are given some paperwork on a maintenance project or schedule, they can provide us with their take on ways to make it more efficient," Loerzel says. "They know that we'll look at their suggestion and incorporate it when we can both see that it will improve the process and the outcomes."

### Tracking

In order to totally revamp the reporting process, Acosta immediately instituted a form-based production report where crews reported each downtime or each issue that they had on a daily basis during production. Once they were approved by operations, they were put into practice where they were filled out daily by crew members and submitted electronically so that they could be accessed by computer. This data was then compiled into comprehensive reports for each asset using their computerized maintenance management system (CMMS). This enabled quick access and review of downtime incidents for each piece of equipment, as well as the specifics of the problem.

These reports then became part of an ongoing review process by Acosta and Loerzel as heads of the service teams. The compiled statistics and metrics that make up the reports are then presented by the service team directors to operations personnel in weekly meetings. Here, each

previous week's KPI is reviewed against assessment of average ton per hour, downtime, and uptime metrics, as well as other data points in discussions.

The reports are then modified with included remarks and suggestions from service team directors and operations personnel before submittal to Young, who presents and discusses them with ownership in a separate weekly meeting. "In creating that process, we were able to really provide structure to a maintenance crew that I think had lacked it for some time," Acosta explains. "That structure was so very well received, and they are executing it at a very high level."

### Results

The reporting and tracking protocols immediately began to yield results as issues with the grizzly bars at the discharge end of the feeder in the scalping screen were able to be seriously

addressed. In addition, a longstanding series of unresolved issues with the stacking conveyor became part of the process as well. With this particular challenge, report reviews followed by brainstorming and discussions had yielded no clear solution.

In the original TPR assessment and implementation phase, the TBR consultants had stressed knowing when a problem required outside support to bring it to resolution. Acosta was quick to praise Ingalls for this valuable insight. "Preston impressed upon us that it's not just about our maintenance crew being able to solve problems, but also about being able to utilize the vendors that we have around us and taking advantage of their experience and knowledge," Acosta says.

In short order, the speed change and motor efficiency issues with the conveyors were resolved, as well as the issues with the scalper. After reorganizing the graveyard maintenance shift, Loerzel

was able to provide the crews with a full eight-hour maintenance shift where it originally had been just four hours due to other duties.

Just as with the daytime crews, the new graveyard maintenance plan included clear directions, reporting mechanisms, and bundled tools, parts, and plans for the scheduled work. The implementation of the TPR process also ushered in the formation of structured operator care programs like equipment improvement teams and clean, lubricate, adjust, inspect, repair, and eliminate protocols.

At this point, the true gains of the new processes, reporting, and tracking began to emerge. Within just six months of the new culture being in place, the company saw downtime decrease by 58 percent and production increase to more than 100 tons an hour on stationary equipment, which amounts to a 28-percent increase per hour. This change also ushered in the elimination of one of the

# Is Your Equipment Emergency Rate Below 3%?

## WHY NOT?

Our consultants offer almost 100 years of combined experience in maintenance and reliability. We can put our expertise to work and help you begin your journey to become **Best in Class**.

If you want to reduce emergency maintenance to **3% or less**, and reduce your maintenance costs **25 to 30%**, call **TBR Strategies** today.



EXPERTISE ON THE WAY



919.341.1387

www.TBR-Strategies.com

two crushing shifts and elimination of the graveyard maintenance shift altogether.

With the major downtime and production improvements, graveyard shift workers were able to work during a day-time swing shift where they interact with other managers, workers, and employees at Baker Rock. Currently, the company is now tracking every single component life and implementing studies on new and different products to extend or increase expected lifecycles. This is all made possible by the data tracking measures and more effective use of its CMMS.

According to Acosta, the tracking of KPI's, work orders, and everything in the quarry were instrumental in being able to see a difference in how the maintenance was being executed. "While we knew that we were going to improve, I don't think that anyone expected it to happen in just six short months, which was very exciting, but realizing that we had more room to grow and improve was the truly exciting part," Acosta says.

### Creating a vision for the future

As Baker Rock builds on the gains made in the present, it is also planning for the future with implementation of a new inventory process. This will ensure proper tracking of inventory to keep essential and non-essential parts on the shelves via proper documentation protocols when something is taken from stock. After recent completion of a full and exhaustive inventory, the data is now being entered into the company's CMMS so that the company can watch the parts and get data back on usage patterns.

On another front, the company is implementing the rollout of a full and complete secondary shop directly on the quarry floor to provide a clean and dry storage and repair environment for mechanics, welders, and fabricators. This will not only be an in-depth parts room, but also a well-designed and fully permitted location where they can work and keep their tools/parts in a dry environment during the winter season. "Our goal is to have this phase completed

by March of 2016 so that our new quarry shop will work in conjunction with our new inventory system to lower downtime even further and help us operate even more cost efficiently," Acosta says.

At this stage, the company is working with several vendors on real-time monitoring of voltage draws, heat, rpms, and other aspects of stationary equipment. The goal is to incorporate tracking automation, as well as barcode predictive maintenance that includes a lot of oil analysis and thermography that will become part of the condition monitoring process.

ing increased production and efficiency, decreased downtime, and other gains from tracking, reporting, and maintenance protocols/tools via TPR, Baker Rock sees a future full of possible gains and expansion of the concept.

Even though all of its locations are involved in the TPR process, the current focus is on the main Beaverton quarry, which is massive in comparison to the others in Dayton and Molalla. This will create proof of concept so that specific processes that will benefit the other two division quarries can be rolled out over time.

**"While we knew that we were going to improve, I don't think anyone expected it to happen in just six short months," said Cristina Acosta.**

"Our future is all about automated tracking using computers to analyze and manage a lot of this," Young says. "We've already seen what it can do with the rolling stock as we've incorporated various monitoring and GPS systems, so we're excited to see how this will help us make even bigger gains in our quarry with stationary equipment."

Other aspects currently underway include completely rewriting preventive maintenance protocols according to manufacturer guidelines via the creation or compiling of vendor recommendations and vendor service and maintenance manuals for stationary equipment stock.

According to Young, these did not previously exist because a majority of their equipment is custom built.

"We are getting rid of the 'lore' where we think we know what we're doing because we've done it a certain way for so long," Young explains. "We're specifically addressing equipment to manufacturer guidelines, which is integral to future improvements."

With the clear gains from TPR affect-

Young explains that the gains brought about by new processes are rooted in two-way communication, valuing the immense role of crews and personnel, as well as imparting a sense of trust and partnership. "We hire the best people and trust them to do the job by giving them ownership of it because our management philosophy is that as managers, we work for them rather than the other way around," he says. "Consequently, it's supremely important to have open, two-way communication where they can provide their input and buy into the process when implementing such a big change like this because they are the key to making it work. Once they feel that partnership and see its effects in action, they work harder, more efficiently, and are happier because of it, which has created a very different culture than what has existed in the past." **AM**

E. Victor Brown is a freelance writer specializing in technology, data, and processes with an emphasis in healthcare, business, manufacturing, and industrial sectors.