

Why this Newsletter?

Our world, whether viewed from home or at work or somewhere in between, continues to change faster and faster due to technological innovation. A part of this comes from the current state of scientific research and modern engineering advances, but much of the change also comes from somebody's idea combined with use of existing tools or systems, coming together to apply a technology to the world that we know. Not every idea is great, and not every change is an improvement, but our own personal acceptance of a given change is largely due to the benefit we see coming from it vs. what it will take to bring it into our life. It works similarly in the business world.

As a company, Hecla continues to keep an eye on coming change and it evaluates products in various ways to see if the timing is right to introduce new technology into a specific application to make that situation better. Hecla's mining operations, with 1,400 or so total employees, are scattered geographically across three countries, four time zones, and three languages. Sometimes this type of separation can make us feel that we are 'fighting the battle' by ourselves, when, in fact, other persons at other Hecla mines or properties may be considering or evaluating the same technology to possibly fit their needs, i.e., make work safer, use time and money more efficiently, make compliance with rules easier, etc.

The intent of this periodic newsletter is to make Hecla employees aware of the types and status of technological innovation being implemented or evaluated at various locations in the company. Additionally, each of the short articles included in the newsletter includes the name of a key Hecla contact person for the site(s) where the work with the technology is being done.

If you would like to know more about a specific project, to see if it may be something you want to bring into your site or even if you just want to learn more about it, now you know who to contact. This side of the business is rapidly evolving and very interesting; our operations in Hecla five years from now could look quite different from today. We hope you enjoy and perhaps learn something from this newsletter.

Jeff Rosser (Director – Continuous Improvement), May 2017



Tele-Remote Mucker

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Produced by Sandvik, this technology is an integrated system for remote control and remote supervision of loader activities. The system being installed is called AutoMine and it uses wireless communication and onboard cameras and a navigation system to keep track of and control unmanned loaders. Tramping routes and the load and dump points are 'learned' by the loader and they are isolated with barriers to ensure no interactions with personnel or other machines. The loader operator is based remotely, in an office, where a duplicate set of machine controls allow the operator to intervene in loader operation as needed and also operate rock breakers, loading chutes, etc.



Where we are using it: Greens Creek

BENEFITS: One of the biggest benefits of tele-remote mucking is that it will do work in its assigned location while miners are in transit, away from the workplace near the end of shift or coming back to the workplace to start a new shift. For instance, the time period between 4 p.m. and 10 p.m. is a busy time for the system at GC so far in its usage. Getting the mucking done in these 'between shift' periods in particular allows the mining cycle to continue

as needed, with the miner able to get back to work quicker breaking more rock, over time increasing the average feet of mining advance per day. With the machine's ability to learn the route, it can tram faster and with far less chance of scraping against the rib of the drift as it makes that trip over and over, reducing downtime and the cost of repairing equipment damage. Computer-controlled machines are typically more fuel-efficient and they don't suffer from fatigue like humans do. Over time, one operator in the control station can control as many as 3 machines by himself, which will increase productivity per person.

PLAN AND PROGRESS: The Greens Creek tele-remote mucking system was commissioned on a 7-cy loader in January 2017. It has been deployed in areas where it can muck from longhole stopes. Much of the activity in Q1 was use of the system to move rock while commissioning the system and training people on how to use it. The mine plan shows 27,000 tons to be handled by tele-remote mucking in Q2. Additionally, wireless coverage underground will continue to be expanded so that there will be more potential areas where this system can be used. Plans are to add a second loader to the system (by retro-fitting an existing machine) and add a third (new) loader with funding already shown in the 2017 budget.

Bob Weeden, Greens Creek

Remote Vein Miner

Produced by Atlas Copco, this project is developing a new electrically powered mechanized mining machine which uses a large diameter rotating cutting cutter head to fracture rock and direct it onto a conveyor belt where it is handled at the back end of the machine. The machine would be able to mine up to a 15' x 15' drift. Two machines operating at a conservative level could match the ore output per day produced by current mining methods and equipment at Lucky Friday.



Where are we considering it: Lucky Friday

BENEFITS: The remote vein miner will help get miners farther away from the working face. It would eliminate the need for drilling and blasting in order to excavate the rock it moves, and the current design also has its own rock-bolting system. Elimination of any blasting helps reduce blasting-induced rock stress that can build and lead to seismic events, a critical concern at Lucky Friday. Using electrical power will replace the use of diesel-powered machines which add heat and diesel emissions into the workplace. The remote mechanical miner concept will allow for an improved mining geometry and mining method that will increase ground stability.

PLAN AND PROGRESS: June and July will be key months for this project as critical decision points will be reached on the project timeline. A small team from Hecla will observe the operation of a similar machine at a platinum mine in South Africa in mid-June. After that, Hecla and Atlas Copco will discuss the latest design and plans and Hecla will need to make a decision on moving forward or not. If it's a go, Hecla would need to commit in July to spending towards long-lead components. If the project proceeds, the current timeline has the first vein miner underground at Lucky Friday for a field trial beginning in late 2019.

Ralph Barker, Corporate

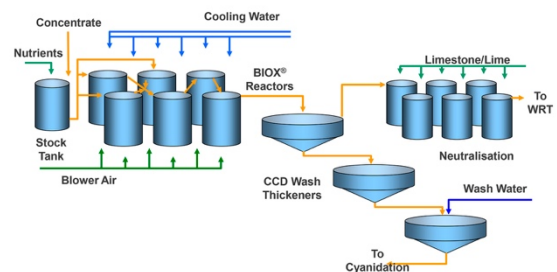
Bioleaching

Produced by Outotec, Bioleaching uses specially selected and cultured microorganisms (bacteria) to help break down refractory (containing sulfide or organic carbon) minerals in which the desired metals are locked up. This approach is much different from current industry processes that use high temperature and/or high pressure to oxidize these rocks in a much shorter time than could be done by nature.

Corporate evaluation for San Sebastian, Hosco project, possibly others

BENEFITS: Around the world, this vendor has helped design 13 bioleaching plants that have run or are currently running. In all of these, the BIOX technology, particularly compared to autoclaves or roasters, requires less capital expense, operates in a variety of climates, requires a low-level skillset to keep it running, requires less money to operate the plant, is less complex to permit, and produces gold at reasonable recovery rates. This process can

BIOX® Flow Sheet



"The remote mechanical miner concept will allow for an improved mining geometry and mining method that will increase ground stability."

"This technology requires less capital expense..."

also allow non-desired materials, such as arsenic, to remain locked up in the rock, making them less able to react after processing.

PLAN AND PROGRESS: The vendor is currently continuing with test work for Hecla but early results are promising, in terms of oxidizing sulfides, taking gold into solution to make it extractable, and keeping arsenic fixed and less mobile.

Dale Dean, Corporate

Ventilation on Demand

With components produced by Mine Site Technologies, this concept describes a system that can be made aware of underground locations of people and mining machines, on an ongoing basis, and accordingly adjust the amount of air flow delivered to these locations. Key parts of the system are location sensors for people and equipment, status sensors (for up-to-date gas concentrations, air flow, air temperatures, fan electrical current draw and output airflow, etc.), remote control devices for fans, and the wireless communication network.



Where are we using it: Greens Creek; under evaluation at Casa Berardi and Lucky Friday

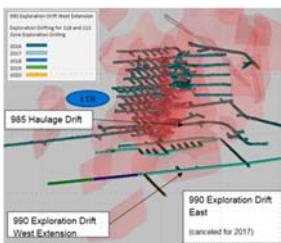
BENEFITS: Ventilation on Demand (VOD) technology helps maintain a safe working environment for miners while determining real-time personnel and machine locations and economically distributing the amount of air to where it is actually needed. It can reduce overall power consumption and its costs.

PLAN AND PROGRESS: Greens Creek already has an existing communications network that allows real-time monitoring and control of some equipment using a SCADA system. GC has an existing system for tracking locations of individual persons and machines underground. To adopt VOD, it was necessary to purchase variable frequency drive controllers for fans to allow them to be remotely operated in a range of settings instead of just being 'off' or 'on.' GC purchased 14 of these controllers, with 7 installed so far, and is developing programming to initially be able to turn off a fan after all employees have exited a stope. More control function complexity will be added later. Plans show all 14 units installed and running by the end of 2017.

Mitch Ammann, Greens Creek; Dave Descoteaux, Casa Berardi

Automated Truck Haulage

Produced by Sandvik, this technology is an integrated system for remote control and remote supervision of truck haulage activities. The system being installed is called AutoMine (same as the tele-remote mucker), using wireless communication, onboard cameras and a navigation system to keep track of and control unmanned haul trucks. Haulage routes are isolated with barriers to ensure no interactions with personnel or other machines. The truck operator is based remotely, in an office, where a duplicate set of machine controls allow the operator to intervene in truck operation as needed and also to operate other remote controls for rock breakers, loading chutes, etc.



Where we will be using it: Casa Berardi and Greens Creek.

BENEFITS: This technology allows continued cycling of haulage trucks with minimal interruption of operation. Time gained by use of unmanned trucks includes that which would otherwise be lost while operators travel to and from the workplace at the ends of shifts as well as time which would be nonproductive during lunch and other breaks. This technology removes operators from the workplace allowing one remote operator to run up to three machines.

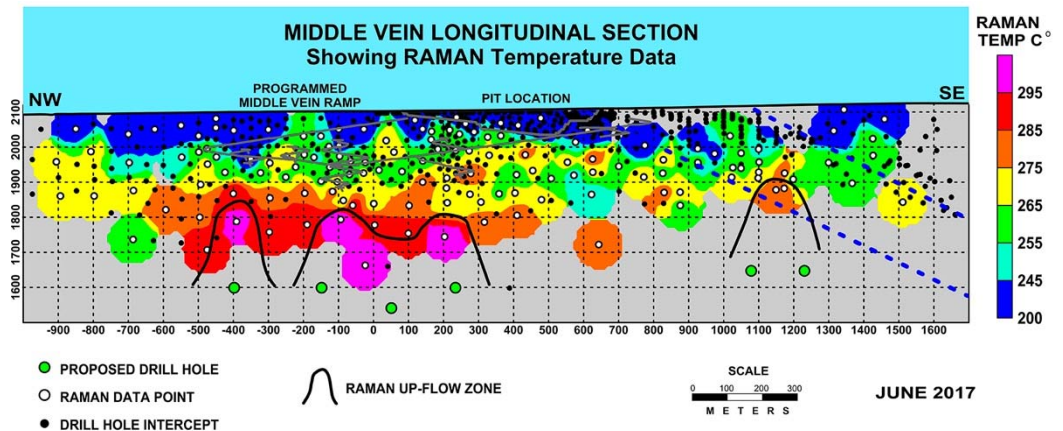
PLAN AND PROGRESS: The Casa Berardi version of this system will be more extensively automated in its scope, including excavation of a dedicated drift to service two mining sectors, creation of ore passes and waste passes fitted with automatically controlled chutes, the purchase of two new 40-tonne haul trucks designed and equipped for automatic operation, and the installation of a remote operator's station in a new mine operations control center at the mine office. The CB system should have its first truck operating in this system in November 2017. The Greens Creek system already has the operator station in place for tele-remote mucking and has a new haul truck at site equipped with the system. However, Sandvik is performing more system testing in Europe which will delay the type of system going into Greens Creek until 2018, at which time the system can be started up with 2 trucks (another truck is expected in late 2017).

Dave Descoteaux, Case Berardi; Bob Weeden, Greens Creek

Raman Spectroscopy

This technique is based on molecular physics principles and it uses the inelastic scattering of light that happens when a laser beam is directed at a mineral sample. The vast majority of light reflected from the sample has the same wavelength as that striking it, but a small portion of the laser light interacts with the molecular vibrations within the mineral, causing the energy of the laser photons to be shifted up or down into a different energy state. This action creates a measurable response (wavelength of the light) that can be captured, like a molecular fingerprint, and this unique information can be compared to a database of responses to identify the mineral sample. Hecla is particularly interested in how this technology can be used to determine order/disorder structure of carbonaceous rocks which is dependent on temperature.

Laser beam on sample.



Where are we using it: San Sebastian (exploration drilling and geological evaluation)

BENEFITS: Raman spectroscopy shows benefits, in particular, when compared to fluid inclusion analysis. Raman spectroscopy is overall quicker (days vs. months) and is less expensive to use. It also provides sufficient results for decision-making, particularly when quick turnaround of drilling results is needed to guide an in-progress exploration drilling program.

PLAN AND PROGRESS: Carbonaceous rock allows for application of this tool and San Sebastian's ore deposits are hosted in carbonaceous shales. Examination of mineral samples in current studies is focused on the indicated temperature shown in the spectroscopic analysis. The more order shown in the sample analysis, the higher the temperature. This information helps the exploration geologist determine where potential hydrothermal fluid up-flow zones may have existed (highest temperatures are associated with centers of up-flow zones) which are usually higher-grade portions of epithermal (relatively shallow, formed from heated fluids) deposits.

Stephen Redak, San Sebastian

Ore Sorting

By Rados International, Steinert US. The principle behind ore sorting is that in some types of geological settings, considering the potential ore minerals and the waste around it, close evaluation of the differences between the rock with potential value and the rock without value can point to a physical characteristic that can be used to classify and sort broken rock so that only the ore gets processed. A key element of this classification is that the differentiation approach, using technologies like x-ray diffraction, x-ray transmission, etc., must be accurate and be able to be performed quickly in a production environment to classify, map the rock fragment locations in the material flow, and then divert individual waste particles out of the flow.

“close evaluation of the differences between the rock with potential value and the rock without value...”

Corporate evaluation for San Sebastian, Hosco project, possibly others

BENEFITS: By upgrading the ore fed into the mill, higher grade material makes it into the plant, increasing efficient spend for processing energy, reagents, etc. This allows for more mill feed into a plant of a given size, generating less relative tailings, putting more demand on the mine for ore supply, and providing a higher potential revenue from output of metals.

PLAN AND PROGRESS: This technology is in Phase II of testing with ~9,000 lbs of Hecla sample material to be tested by each of the two vendors. Algorithms for determination and sorting of ore/waste developed in Phase I will be tested in this next phase. If Phase II goes well, the next step is a feasibility study based on a mine plan for the targeted deposits, followed by plant design and engineering. At the earliest, an ore sorting plant would not be in operation for Hecla until Q4 2018.

Dale Dean, Corporate

Automated Drill Control

Produced by Atlas Copco, the automated drill control system is called Feed Angle Measurement with hole depth, or FAM 3 for short. This system provides for a 3-D drill round design to be entered into a drill jumbo. Once the underground drill locates itself in 3-D space and the miner starts the first hole, the drill automatically drills each planned hole in the round true to the design.

Where are we using it: Casa Berardi

BENEFITS: This technology maintains underground excavation true to the mine engineer's design, reducing over-break and under-break. It efficiently provides more face advance per foot of drilling, allowing for possible savings in drill consumables and explosives. The improved accuracy supports changing a round design to use longer / deeper holes. While the unmanned machine actively drills a round, the drill operator has more time to perform other support activities in the vicinity.

PLAN AND PROGRESS: as of May 15, 2017: Casa Berardi already operates two jumbos equipped with the FAM 3 system. Plans call for an existing jumbo to be taken out of service for a few weeks when it will be modified with installation of a FAM 3 system in Q3 2017.

Ronald Bordeleau, Casa Berardi

Battery-Powered Mucker

Produced by Artisan Vehicle Systems. Modern mobile rubber-tired machines are predominantly powered by diesel engines. This allows for flexibility in operation, as historically, batteries had lower energy density and were bulky and heavy, requiring electrical-powered mining equipment to be tethered to a trailing power cable or making it get its energy from overhead trolley conductors. Recent advances in battery technology have now helped aid the design of new battery-powered loaders that can compete with and even outperform diesel machines.



Where are we using it: Lucky Friday

BENEFITS: The product chosen is powered by lithium batteries and is marketed as 'zero emission,' providing a stark contrast to the heat emissions from the drivetrain and the diesel emissions from the engine of diesel equipment. So particularly, in the naturally hot environment of Lucky Friday, this machine generates less heat, using less ventilation air to sweep its work area. The machine is sized small to safely operate in the workplace and, relative to the diesel machine it replaces, it is said to have more power which is realized in faster loading of its bucket and higher speeds traveling up a ramp grade. Its design also allows the controls to be more responsive and it is much quieter while operating. Total actual costs to own, operate, and maintain the machine will be tracked to see how they compare over time to diesel machines.

PLAN AND PROGRESS: Lucky Friday purchased two model 153 machines (1.5-cy bucket) and received them late in 2016. Q1 2017 operation was largely spent in commissioning the machines and training operators on their use. With the mine currently idled for the strike, these machines are not in active production duty.

Dave Konsbruck, Lucky Friday

About Us / Contact



Please direct any corrections for this issue and suggestions for future issues or other feedback related to technological innovation in Hecla to Jeff Rosser at the Coeur d'Alene Corporate office at 208.769.4100.

Don't feel left out. This is the initial (not the only) issue of this newsletter and we currently plan to create and issue a new one in the middle month of each quarter: February, May, August, and November. Although we would like to mention every single one of the technological projects within this issue, the newsletter would be too long and would take too much of your time to read. Our list for upcoming issues includes the following projects not discussed in this issue: Casa Berardi – mobile equipment monitoring, Casa Berardi – mine operations control center, Greens Creek – ruggedized underground tablets, Lucky Friday – guided haul truck control, San Sebastian – drone use for aerial mapping, what does it take to make a 'wireless' underground mine, and other topics. This current issue focuses mainly on mining, with some milling projects as well. In the future, we hope to include articles on projects underway in the wide range of support functions throughout Hecla.

Thanks and acknowledgments. Kate Woempner has pulled the bits and bytes of stories and images together into newsletter format and I thank her greatly for her time and skills applied to this initial issue. Additionally, I would like to thank all the project key contacts whom I have pestered (and will continue to pester for future updates) for their time in gathering and sharing information on their projects.

Hecla Mining Company | Coeur d'Alene Corporate Office | 6500 N. Mineral Drive, Ste 200 | Coeur d'Alene, ID 83815-9408

Hecla Mining Company is not only the largest and one of the lowest-cost U.S. silver producers, and the third largest U.S. producer of both zinc and lead, but also a growing gold producer. Hecla owns and operates four mines on district-sized land packages in mining-friendly North American jurisdictions: Greens Creek in Alaska, one of the largest and highest-margin primary silver mines in the world; the newly revitalized Lucky Friday silver mine in North Idaho; the San Sebastian silver-gold mine near Durango, Mexico; and the Casa Berardi gold mine in Quebec. In addition to its diversified silver and gold operating and cash-flow generating base, Hecla has a number of exploration properties and pre-development projects in seven world-class silver and gold mining districts in the U.S., Canada, and Mexico.

Cautionary Statements Regarding Forward Looking Statements

Statements made or information provided in this newsletter that are not historical facts are "forward-looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995 and "forward-looking information" within the meaning of Canadian securities laws. Words such as "may", "will", "should", "expects", "intends", "projects", "believes", "estimates", "targets", "anticipates" and similar expressions are used to identify these forward-looking statements. Such forward-looking statements or forward-looking information include statements or information regarding estimates of silver production for 2017 on a consolidated basis and at each of the Greens Creek, Lucky Friday and San Sebastian mines, annual gold production for 2017 at Casa Berardi, and second quarter 2017 production. Other forward-looking statements include timing and expected benefits of implementing various innovations. The material factors or assumptions used to develop such forward-looking statements or forward-looking information include that the Company's plans for development and production will proceed as expected and will not require revision as a result of risks or uncertainties, whether known, unknown or unanticipated, to which the Company's operations are subject. Forward-looking statements involve a number of risks and uncertainties that could cause actual results to differ materially from those projected, anticipated, expected or implied. These risks and uncertainties include, but are not limited to, metals price volatility, volatility of metals production and costs, litigation, regulatory and environmental risks, operating risks, project development risks, political risks, labor issues, ability to raise financing and exploration risks and results. Refer to the Company's Form 10K and 10-Q reports for a more detailed discussion of factors that may impact expected future results. The Company undertakes no obligation and has no intention of updating forward-looking statements other than as may be required by law.