

# Mining

Z I M B A B W E

ISSUE

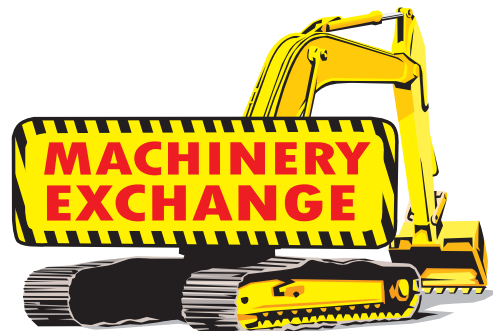
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NOVEMBER 2017



**RELAUNCHING**  
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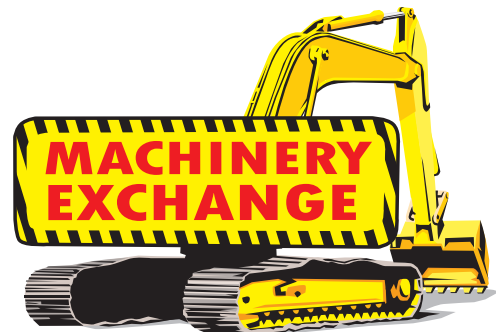


# RELAUNCHING

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# MACHINERY EXCHANGE HITACHI RELAUNCH IN ZIMBABWE



Machinery Exchange successfully secured the dealership for the Hitachi equipment product range and is relaunching this full product range in Zimbabwe.

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of equipment. The equipment does not necessarily have to be supplied by Machinery Exchange. In addition to this service, we offer a trouble-shooting or diagnostics service for the full Hitachi Equipment range, as and when customers require. Our targets in the provision of the full service maintenance agreement are an 85% equipment availability, through disciplined service intervals, proactive inspections, timeous intervention and repairs. This allows the customer to focus on his business whilst we focus on keeping the equipment in good working order.

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# Note from the Editor

Greetings once again to all you faithful readers. As we get to year end we trust you will enter into the new year with new visions to be bigger and better just as we have at Mining Zimbabwe. In this issue we have a mixed bag and have introduced Artisanal Mining as per request from our avid followers.

We applaud the move by government to increase the loan funding for artisanal Miners with a further \$20 million in recognition of the sectors contribution. This will no doubt increase output from small scale miners across the land. With the many messages we receive of many young Zimbabweans with a bit of Capital needing to try it out in the Mining sector this could not have come at the right time.

First read is the relaunch of the Hitachi Range by in Zimbabwe by Machinery Exchange (page 3). Hitachi provides integrated solutions, ranging from the sale of hydraulic excavators, front end loaders, and rigid dump trucks and other construction machinery to services and maintenance.

Caledonia Mining one of the leading Gold producers in the country continues to set the trends and are extending the central shaft to greater depths. The central shaft is currently under construction, and will now be extended by a further 250 metres to a depth of 1,330 metre. Read more about it on page 8.

On page 8, Zimplats is promoting local suppliers from the province its located and about 72% of all required material are being sourced locally. This is an excellence initiative which if implemented by most mines in the country will see creation of thousands of heavily needed jobs. This publication is packed with news, machinery, artisanal mining and much much more.

Have anything of interest to say? Write us an email or connect with us on the various social media handles provided as we love to hear from you. Till next issue, happy reading everyone, stay awesome and stay blessed.

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We welcome your comments

Contact the editor on [editor@miningzimbabwe.com](mailto:editor@miningzimbabwe.com)

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## About Mining Zimbabwe Magazine

Mining Zimbabwe Magazine is a publication focused on the Mining industry of Zimbabwe and how it relates and affects the rest of mining done in other African countries. The magazine's core focus is on the ever evolving face of the mining industry, trends, new technologies, machinery, solutions being developed and used to improve this crucial sector, as well as new opportunities and investments arising from it.

*The go to Publication for all Mining in Zimbabwe*



Mining Zimbabwe



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# Caledonia Mining to extend central shaft at Blanket mine after resource upgrade

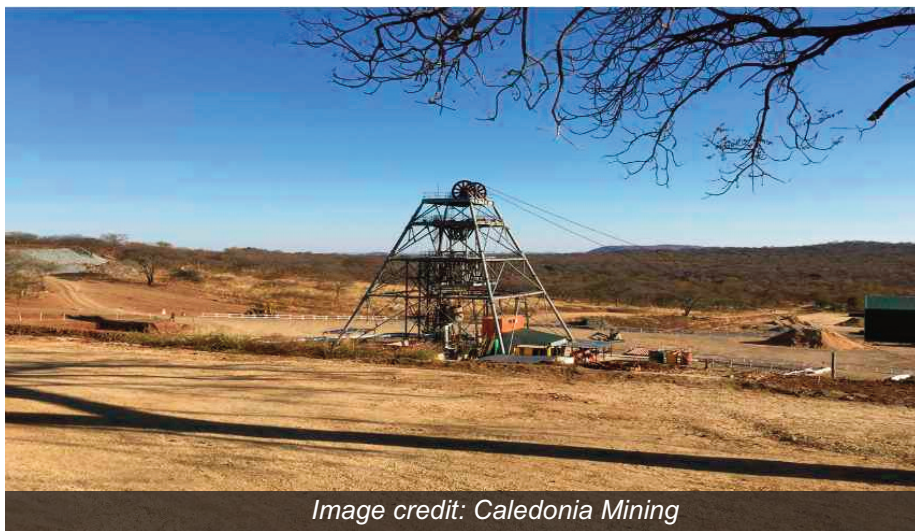


Image credit: Caledonia Mining

Caledonia Mining Corporation PLC (LON:CMCL, NYSE:CMCL) has potentially secured the future of its Blanket mine in Zimbabwe for the next 20 years by opting to extend the central shaft on site to greater depths.

It comes on the back of the recent resource upgrade, which underlined potential volume and grade at depth.

Total measured and indicated gold ounces now amount to 714,000 ounces compared to 671,000 ounces at the end of 2016, the

company said last week.

The central shaft is currently under construction, and will now be extended by a further 250 metres to a depth of 1,330 metres and fully commissioned by the end of the first quarter of 2020, the mining group said.

"The Central Shaft is already a transformational project for our business, and to extend the project an additional 250 metres in depth including development on 34 and 38 levels will potentially secure Blanket's operating future for the next 20 years taking exploration potential into account," said Steve Curtis, chief executive at Caledonia.

"It is significantly cheaper to continue the shaft sinking while we are in the construction phase of the project rather than to deepen a fully commissioned and operational shaft in several years' time," he added.

"The creation of an additional two levels will also increase the mining flexibility and further de-risk the target production of 80,000 ounces per annum from 2021."

The extension and associated capital

development of additional production levels will cost around US\$18m to be funded by Blanket's internal cash generation.

A preliminary economic assessment (PEA) indicates a project NPV (net present value) over the life of mine (LOM) of US\$193m based on a gold price of US\$1,260/ounce and a 10% discount rate.

Total output from the measured and indicated resources over the life of the mine is expected to be around 420,000 ounces and production from inferred resources is expected to be around 550,000 to 600,000 ounces between 2018 and 2031.

Caledonia expects that its long term All-In Sustaining Cost (AISC) guidance is expected to remain in the range of US\$700 to US\$800 per ounce.

Notably, the indicated resource below 30 level of 37,000 ounces justifies as a standalone project alone the investment of US\$18m for the shaft deepening and the additional two production levels.

Caledonia said it had also started a mid-shaft loading system at Blanket using the existing Central Shaft infrastructure to handle development waste to improve handling capacity and alleviate pressure on Number 4 shaft.

## About Caledonia

Following the implementation of indigenisation in Zimbabwe in September 2012, Caledonia's primary asset is a 49% interest in an operating gold mine in Zimbabwe ("Blanket"). Blanket plans to increase production from 50,351 ounces in 2016 to approximately 80,000 ounces in 2021.



# Calls for More Underground Chrome Mining

In a keynote opening address to the packed thirty-third Chromium Conference, Zimbabwe's Permanent Secretary of the Ministry of Mines and Mining Development Munodawafa mentioned the need for agglomeration technology for the processing of chromite fines and concentrates. "We believe that without these interventions, the chrome sector may not give us as much value as we want," he said.

The past few years have been difficult for the chromium market. In 2016, prices for

chromite, an iron and chromium oxide, and ferrochrome, a chromium and iron alloy, hit six-year lows due to falling production costs, oversupply and slower demand.



Despite those issues, at the end of last year, International Chromium Development Association market research analyst Loïc Racon said that the chromium market was "awakening," and that momentum would increase due to Chinese demand.

China, the world's largest stainless steel producer, consumes more than 50 percent of the world's ferrochrome and stainless steel output. Zimbabwe and South Africa hold the majority of the world's known chrome reserves.

South Africa is also the world's largest producer of ferrochrome. Last year, the country produced 14,000 MT of chromium, beating out the rest of the world's chromium producers by a wide margin. Other top chromium-producing countries include Kazakhstan, Turkey and India.

## Zimplats engages local Zimbabwe suppliers

Platinum miner, Zimplats is empowering emerging businesses in Mashonaland West of Zimbabwe through engaging them to offer their products and services to the miner.

Currently, about 72% of all Zimplats required materials are sourced locally through engaging small businesses in their supply chain. This is being done through a three-pronged approach where manufacturers whose businesses have folded, are being helped back on their feet.

It also involves working with small businesses to supply materials such as silica, protective clothing and engineering equipment among other things.

In an interview, Zimplats head of corporate affairs, Busi Chindove said they are working with several small companies in the province. According to Chindove, some of them have been helped to grow and can

now operate on their own.

"We committed ourselves from 2008 to work with local suppliers and our board gave us a target of having 60% of all our materials sourced locally. We managed to meet the target in 2013. Currently we are now at 72%. We said we cannot flourish while other small companies are struggling," she said.

*"We committed ourselves from 2008 to work with local suppliers"*

Chindove said the target now is to have some of the products manufactured locally rather than being imported. She said Zimplats is working with more than ten companies with some of them comprising women only.

With a 5 000 strong workforce, some of the companies are supplying overalls, dust-coats and gumboots among other things. One of the companies started with just

three sewing machines, which have since increased to thirty.

Chindove has asked other mining companies to grow with the communities they operate in.

"If this is replicated, then it means more companies will grow and with it, the economy and the livelihoods of the people," she said.

Chindove urged small companies who are given contracts to supply materials, to uphold high levels of integrity in meeting quality and agreed time-frames.

Zimplats is one of a few mining companies that are running a successful Community Share Ownership Scheme, the Mhondoro-Ngezi-Zvimba-Chegutu Community Share Ownership Trust.

The miner has managed to surrender \$10 million to the Trust.



# RBZ to increase artisanal miners fund to \$60 million

THE Reserve Bank of Zimbabwe (RBZ) plans to increase the loan facility for small scale miners to \$60 million from \$40 million in recognition of the sector's contribution to increasing gold deliveries and export earnings.

According to the Chronicle RBZ head of exchange control directorate, Mr Farai Masunda, told delegates at last week's ZimTrade exporters conference in Harare, that a combination of the five percent export incentive and the \$40 million loan facility for small scale miners had contributed significantly to the overall improvement in the performance of the gold sector.

"The Reserve Bank of Zimbabwe is happy with the performance of small scale miners and attributes this to the impact of support measures to the sector," said Mr Masunda.

"There are plans to increase the loan fund to \$60 million to scale up their operations realising that they have surpassed big corporates."

He was responding to a suggestion by one of the participants for Government to scrap the export incentive to the mining sector and focus on manufacturing, whose contribution to exports remains low at below 10 percent.

Mr Masunda defended the export incentive and loan support, saying these facilities have

helped increase gold deliveries and curb smuggling of precious minerals.

Small scale miners have maintained a positive growth trajectory recently – outpacing big corporates in the third quarter 2017 gold output by 29 percent to settle at 4 043kgs compared to 3 120kgs produced by established companies in the same period.

Two weeks ago Fidelity Printers and Refiners, the

In cumulative terms both primary and small scale miners have since January delivered 17.163kgs of gold to Fidelity with the former recording 8.494kgs compared to 8.669kgs by the latter.

In September alone primary producers' output stood at 1 046kgs compared to 1 111kgs posted in August.

The figure lags behind output by small scale miners who scooped 1 449kgs in September compared to 1 446kgs in August.

According to the Fidelity report, the third quarter has recorded the highest deliveries this year at 7 162kgs compared to 5 364kgs in the second quarter and 4 637kgs in the first quarter.

Zimbabwe's gold production has been on a steady rise since January despite a few setbacks in the first quarter where mining operations were disrupted by incessant rains.

The mining sector dominates the country's sole exports, contributing about 60 percent of total exports anchored by gold, platinum and diamond.

Last year, Zimbabwe gold output closed at 24 tonnes and this year the Government has projected about 28 tonnes of the yellow metal by December 2017.

gold buyer in the country, reported that small scale producers' output grew by about 58 percent from 2 543kgs in the second quarter to 4 043kgs as at end of September 2017.

Primary producers on one hand recorded a 10 percent increase from 2 820kgs to 3 120kgs.



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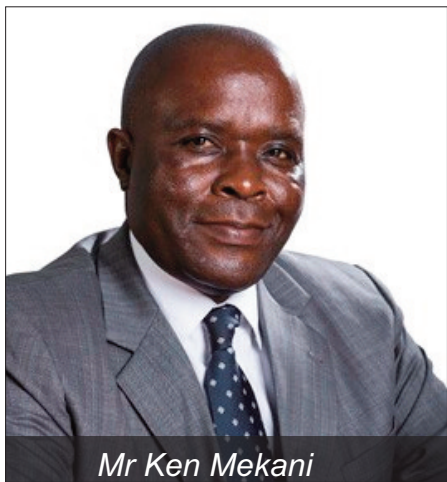


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A LIQUIDITY SERVICES MARKETPLACE

# Metallon Corporation

## Reorganises To Improve Efficiency



*Mr Ken Mekani*

Metallon Corporation ('Metallon'), the gold mining, development and exploration Company with producing assets in Zimbabwe, has announced a restructuring of its business as part of a strategy to increase efficiencies and meet growth targets.

As part of this restructuring exercise, each of Metallon's four operating mines will now operate as separate entities. By making the mines standalone operations, Metallon will increase efficiency and allow each mine to manage its own assets and operations more effectively.

### Metallon runs four mines, namely

- **How Mine,**
- **Mazowe,**
- **Redwing**
- **Shamva.**

Each of these mines is now operating under separately registered companies, namely Bulawayo Mining Company, Goldfields of Mazowe, King's Daughter Mining Company and Goldfields of Shamva, respectively.

The companies will have their own Boards and Management that will now assume all

responsibilities over operations and suppliers, thereby reducing bureaucracy and bringing renewed focus across the Group. New Managing Directors have been appointed to run the operations.

Ken Mekani, Chief Executive Officer, Metallon commented;

"As the country's leading gold producer, Metallon has a duty to invest in production and help meet national gold output targets. Metallon has an ambitious plan to increase gold production.

As part of that plan, we had a thorough evaluation of our structure and operations. One of our key findings was that in order for us to efficiently exploit our assets in the future, we require each mine to focus clearly on managing their own operations.

"Reorganising the Group will allow each operations to manage and exploit the vast potential of our assets more efficiently. By empowering each mine, we are making the company stronger as a whole."

The re-organisation is a continuing exercise and stakeholders will be update on material developments as necessary.

### About Metallon Corporation

Metallon Corporation Limited is the leading gold mining company in Zimbabwe. Metallon owns and operates four gold mining operations and has a world class gold resource of over 8.3Moz. How Mine, near Bulawayo, is the flagship mining operation and produces over 55% of production. Shamva and Mazowe Mines, both located near Harare, each produce approximately 22% and 13% respectively and Redwing Mine, near Mutare, is currently ramping up production.

Gold production in 2016 was 94,212 ounces and the budget for 2017 is 115,000 ounces. Metallon is focused on increasing gold production significantly through ambitious expansion plans across all Zimbabwean operations and developing gold mines in Tanzania.

Metallon, founded by its Chairman, Mzi Khumalo, is committed to investing in all its operations and working responsibly in relation to our people, the environment and the communities in which we operate.

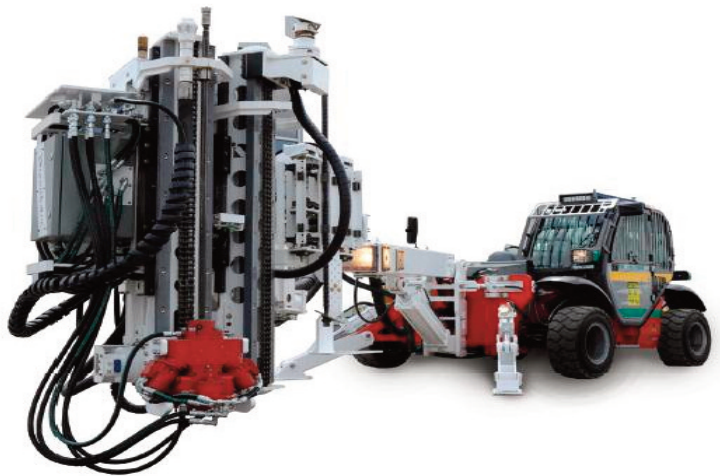




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# Small-scale miners

## Contribute 7,2 tonnes of Gold



EXPORTS have shot up to US\$4 billion as at September 29, 2017, with the mining sector continuing to outshine other sectors of the economy, raking in a staggering US\$1,718 billion – representing 68 percent of total earnings – largely driven by gold. Statistics from the Reserve Bank of Zimbabwe (RBZ) show that export receipts stand at US\$4,04 billion. The figure is already higher than the US\$2,8 billion generated all of last year.

Of the export earnings realised up to September 29, gold arguably the metal driving the economy has raked in US\$683 million representing a 38 percent contribution to overall exports. Platinum, which Government is keen to benefit locally to increase revenues, has generated US\$653,2 million which translates to 36% of total export earnings. Ferrochrome comes third on US\$236 million – which implies a 34 percent contribution while chrome has brought in US\$73,3 million. Diamonds pumped in US\$64 million while “other” exports generated a combined US\$93 million for the period to September 29, 2017.

Last year, the country generated US\$1,4 billion from mining. It is the dominance of gold in the minerals category that continues to impress after contributing 42 percent to exports all of last year, followed by platinum on 40 percent. Critically, the reversal of contribution patterns between large and small-scale miners who use ordinary

mining tools such as picks and shovels compared to the high-tech equipment used by big miners – has astounded experts.

By August, total gold deliveries to Fidelity Printers and Refiners (FPR) – the gold buying arm of the RBZ – had reached almost 14,7 tonnes. Of this, small-scale miners contributed 7,2 tonnes while primary producers weighed in with almost 7,5 tonnes. FPR gold operations manager Mr David Mpofu told small-scale miners at a Gold Mobilisation Outreach campaign in Mazowe in September that they contributed 1,46 tonnes (57,39 percent) in August alone, compared to 1,1 tonnes (42,6 percent) delivered by primary producers. “In September, small-scale miners produced 1,49 tonnes (59,39 percent) compared to one tonne (40,6 percent) delivered by large-scale miners. “So, it shows that you are working. That is why we came here to meet you and encourage you to continue doing well, and delivering to Fidelity where you get more money compared to illegal gold buyers,” said Mr Mpofu.

***“It is the dominance of gold in the minerals category that continues to impress***

Small-scale miners in Mazowe revealed that they are paid anything between US\$29 and \$35 by illegal gold buyers. But FPR, whose price is directly linked to the international market, was US\$42,80c last Thursday. Crucially, FPR pays a further 10 percent above the international market price, to incentivise miners to deliver more gold through the formal market. Illegal gold buyers, who lay siege on hapless small-scale miners – offering them inducements which

include food, money to transport their ore to nearby mills and sacks to carry the ore – are understood to be prejudicing the country of approximately 700kg (about 0,71 tonnes) per month. This has prompted FPR to embark on nationwide Gold Mobilisation Outreach programmes beginning last Thursday to November 24, to conscientise small-scale miners of the benefits associated with delivering gold to formal channels. RBZ Principal Inspector – Exchange Control Inspectorate, Mr Paul Mapanzure, who was part of the outreach programme, also underscored the centrality of small-scale miners in gold deliveries and consequently foreign currency generation. “As the mining sector, small-scale miners are important to the Reserve Bank because when we look at the money coming into the country, the bulk of it is coming from mining. “Some of the minerals we are mining and exporting are platinum, chrome and diamonds. These (minerals) are the ones generating the bulk of our money. “But why are we encouraging the production of more gold? We hear of the 27 tonnes that we are targeting this year. We want to use the foreign currency generated internally, you are aware that we are using a multi-currency (system) including US dollars, (British) pounds, euro, rand, pula, remnimbi (and) yen; all these currencies are foreign and to get them, we need to export,” said Mr Mapanzure. He added that once the foreign currency has been generated, it will be used for transactions in shops, paying salaries, buying drugs, food, fertilisers and equipment required by small-scale miners to extract gold.

With just over 17 tonnes of gold delivered to FPR so far, miners need to up their game if the 27 tonnes target set for this year is to be achieved.





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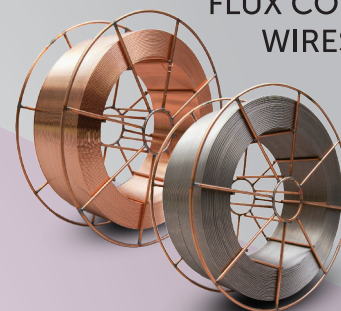
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# Digital Revolution

## to Transform the Mining Sector

**A**doption of automated vehicles and technology will continue to gain traction in the mining industry, as operational efficiency and safety gain centre stage. During the forecast period 2015-2020, the global smart mining market is anticipated to increase at a compound annual growth rate (CAGR) of 14.5%, and rake in US\$ 13 Bn in revenues. The key areas which are currently witnessing increasing automation include surface drilling technologies, simulator training, and machine guidance.

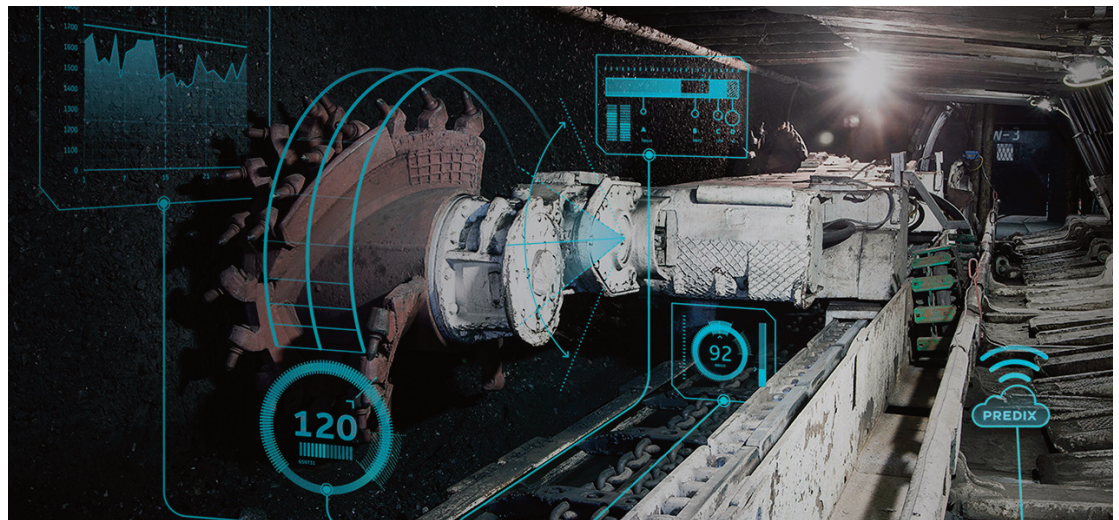
The key trends expected to shape up the adoption of smart technologies include,

### Robust Adoption of Internet of Things (IoT)

Rapid advancement in technology will continue to influence mining operations. While a fully connected mining site may be still be a few years away, IoT is increasingly being adopted in mining equipment and vehicles. To increase operational efficiency and reduce downtime, miners are using advanced tools for predictive maintenance. The use of IoT in scheduling and predicting maintenance and repair tasks is expected to play a key role in its widespread adoption.

### Investment in Simulation Technology

Simulation technology is gaining traction among miners owing to its proven benefits in responding to emergency situations. While the technology per se is highly efficient,



shrinking budgets have resulted into limited adoption. However, the technology is poised to witness widespread adoption in the long run.

### Growing Use of 3D Imaging

3D imaging is being widely used for exploration of mines, and this trend is expected to become stronger in the future. It is anticipated that adoption of this technology will grow on account of its growing use in planning and targeting of drill holes.

### Implementation of Remote Monitoring Systems

Remote monitoring systems enable miners to collect data from the site in real-time and transmit it to the local centre in real time. A significant percentage of mining companies have successfully adopted remote monitoring systems in their operations. Implementation of remote monitoring systems is anticipated to witness an uptick in the near future.

### Smart Mining Market: End-user Survey Analysis

FMI conducted an end-user survey with leading mining operators based in Middle East & Africa (MEA), ASEAN, Oceania, and BRIC. Some of the key findings of the survey include,

*The key areas which are currently witnessing increasing automation include surface drilling technologies, simulator training, and machine guidance.*

- Over 88% respondents agreed to using smart mining technology solu-

tions in both surface and underground mining.

- Smart mining will witness the highest adoption among miners in Oceania, followed by ASEAN
- Nearly 31% respondents that did not use smart mining technology solutions currently planned to deploy these solutions in the next one year
- Companies operating in both (surface & underground) mining types managed over 70% of logistics and production operations in-house
- Survey results concluded that among all the mining operations, major volumes of the



# Digital Revolution

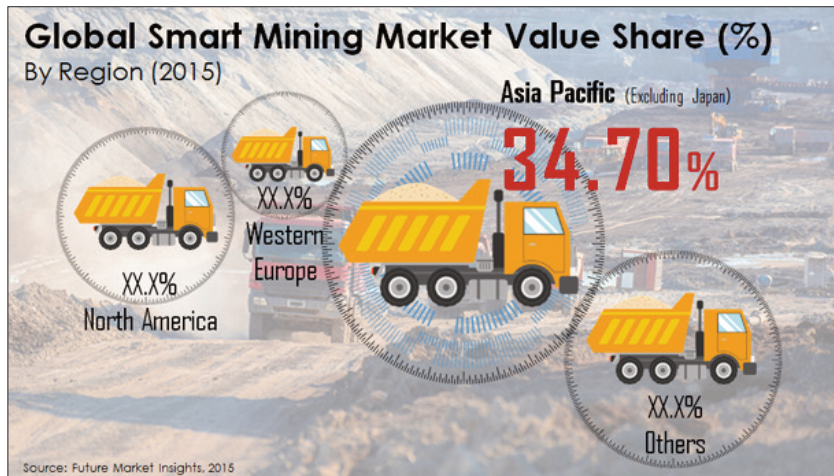
## to Transform the Mining Sector

the production process is managed in-house  
(Complete findings of the survey are available  
in the report)

### Smart Mining Market: Analysis and Forecast by Automated Equipment

Excavator machines and load haul dumps will witness the highest level of automation during the forecast period 2015-2020. Collectively, these two equipment segments are expected to account for 50% revenue share of the overall smart mining market in 2020.

Asia Pacific excluding Japan (APEJ) will continue to remain the largest market for smart mining globally. North America and Western Europe will remain the other lucrative markets for smart mining equipment and services during the forecast period. APEJ accounted for nearly 35%



revenue share of the market in 2015; by 2020, the revenue share is expected to reach 38.6%. US\$ 1.63 billion worth of smart mining equipment and services were sold in North America in 2015. The North America smart mining market is anticipated to increase at a CAGR of over 12% through 2020 and rake in nearly US\$ 3 billion in revenues.

### Leading Players in Global Smart Mining Market

The leading players in the global smart mining market include Hitachi Construction Machinery Co. Ltd., ABB Ltd., Komatsu Ltd., Outotec Oyj, Copco, Caterpillar Inc., Atlas Joy Global Inc., Cisco Systems Inc., and Alcatel-Lucent. In addition to raising awareness among end-users, these players are investing in R&D to launch cutting-edge products and services in the market.

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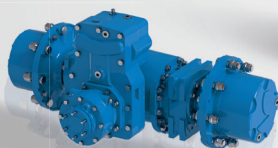


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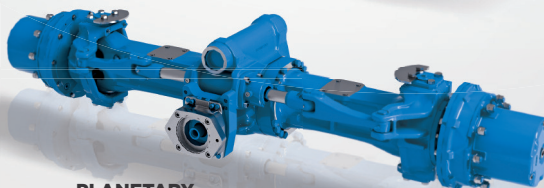
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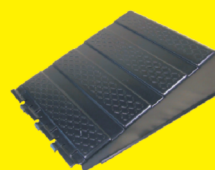
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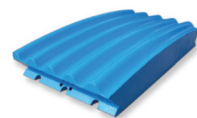
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# ASI, Liebherr to collaborate on Autonomous ready mining trucks



**A**utonomous Solutions, Inc. (ASI) and Liebherr Mining Equipment Newport News Co. (Liebherr) have announced that Liebherr's new autonomous ready haul trucks will be compatible with ASI's autonomous command and control platform; MOBIUS. Liebherr's vision of an autonomous haul truck includes an open interface that enables the truck to integrate to ASI's Mobius platform. Liebherr's autonomous vehicles can be controlled under an OEM agnostic command system for autonomous vehicles, providing maximum flexibility for their customers.

"By adopting the Mobius platform, Liebherr is poised to differentiate its autonomous vehicles by addressing the market need for

interoperability and openness," explains ASI's Drew Larsen, Director of Business Development over Mining. "I believe the market will welcome Liebherr's decision."

Liebherr has integrated with the Mobius protocols for its vehicle control interface, rather than establishing a proprietary command and control platform on its own. This move to an open platform will provide much needed flexibility to their customers when integrating different autonomous vehicle types throughout a mine site.

Autonomous Solutions, Inc. is a world leader in vehicle automation. ASI's Mobius platform provides an OEM-agnostic, interoperable command and control software solution for

autonomous vehicles. Mobius enables mine operations to integrate a variety of mining based vehicles under a comprehensive platform.

Liebherr Mining Equipment Newport News Co. has been manufacturing large mining trucks designed to handle payloads of up to 363 t / 400 tons for the international mining industry since the mid-1990s. The trusted diesel-electric drive concept ensures the highest level of cost-effectiveness and, when paired with a Liebherr R 996 B or R 9800 mining excavator, the trucks are perfectly suited for the demands of mining environments. Customers can expect a high level of performance from these machines at the lowest cost per ton.



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# Mining vehicle intervention

## system detects and prevents collisions



Hexagon AB, a global provider of information technologies that drive productivity and quality across geospatial and industrial enterprise applications, announced the launch of HxGN Mine VIS, a vehicle intervention system that detects and prevents collisions by automatically slowing down or even stopping a haul truck if an imminent collision is detected. HxGN Mine VIS will be officially unveiled at HxGN LIVE 2017, Hexagon's international conference hosted in Las Vegas, Nevada, USA.

Leveraging industry-leading technologies from Hexagon Mining, Mine VIS is an additional layer of safety on top of the Collision Avoidance System, (CAS) helping to avoid incidents, injuries, and fatalities. Mine VIS manages traffic in the pit and, by reacting when and if operators do not, it ensures safety rules are followed.

Hexagon President and CEO, Ola Rollén, said, "Safety demands more than just partial solutions. Mines can be dangerous places. Heavy traffic, large equipment, and poor visibility all create the potential for accidents. Mine VIS is a significant enhancement to a safety portfolio that can save customers from the costly consequences of accidents. It improves CAS by taking control of a machine if the operator does not react appropriately to a CAS warning."

CAS provides drivers of large vehicles with 360°-proximity detection at any speed and in all conditions via cabin display units. It is installed in more than 25,000 vehicles in over 60 mines worldwide.

Mine VIS can take control of the machine in certain defined situations if the operator does not react appropriately to the initial CAS warning. The system can act depending on the situation, either by inhibiting propulsion, activating the retarder, or applying the service brake.

True to Hexagon's integration strategy, Mine VIS can also be used in conjunction with the company's fatigue-detection, alerting, and reporting solution, FatigueMonitor. It uses the same sensors and user interface to protect the customer's initial investment. Hexagon Mining worked closely with an OEM to realize this vision of a last-resort system that mitigates the consequences of a collision.



# Ore crusher SA

## Impacting Innovation



**Ore crusher SA (Pty) Ltd** is the sole manufacturer of the Ore crusher range of Vertical Shaft Impactors (VSI). Our proud heritage can be traced back over forty years. Our range of VSI crushers continuously prove their superiority over other crushers in the market in terms of product quality, maximum output and ease of maintenance. For quality equipment that simplifies the way you work at a reduced operating cost, think Ore crusher! Ore crusher built its reputation on finding solutions for the most technically challenging scenarios and is considered the benchmark in such applications.

Ore crusher does not only supply VSIs and the wear parts/spares for the crushers, Ore crusher also supplies rotors, lubricators, pumps, screens and process equipment. Ore crusher has a range of oil refiners, which address contaminant-related wear in critical equipment.

### Services

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Ore crusher prides itself on technical expertise, outstanding customer service and support. Ore crusher utilizes its extensive technical knowledge to cater to all your needs and expectations. Ore crusher offers support from plant design to comprehensive product training. Ore crusher delivers wear parts and rotors nationwide within 48 working hours in South Africa.

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OVER FORTY  
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At Ore crusher we have a successful recycling services. We all need to do our bit in trying to

preserve our precious Earth and its resources; this is why we at Ore crusher try to reduce our own carbon footprint in our manufacturing activities and endeavour to help our clients reduce theirs. Ore crusher supplies high chrome castings of various designs to the wear part industry and we will buy back your used castings and recycle them.

### Industries

Industries which can benefit from Ore crusher include: Industrial minerals, precious minerals, quarries and construction.

### Industrial Minerals

Ore crusher enjoys extensive presence in the industrial minerals industry, some applications include preparation and cleaning of manganese and iron ore. We are the Market leaders in the manufacture of silica sands for the glass industry. Ore crusher can assist with clinker and calcining for



# Ore crusher SA

## Impacting Innovation



*Ore crusher Head Office In Benoni, South Africa*

cement production. Ore crushers VSIs are suited to handle Chrome ore and slag crushing circuits. Our vsi has proved to be the ideal solution in certain pre milling applications.

### Precious minerals

Our extensive knowledge and understanding of diamond liberation and suitable range of equipment ensures that Ore crusher is the market leader in ROM and tailings recovery. The Ore crusher vsi has proved to be the preferred option is for alluvial recovery.

### Quarries

Sand and stone quarries have benefitted from our 40 years of experience. Ore crusher has manufactured vertical spindle impactors from 30 to 450 ton per hour both as static and mobile units. Ore crusher continues to demonstrate that we have the most economical VSI solution on a cost per ton basis. Crushing, shaping and differential crushing are our speciality.

### Construction industry

Ore crusher Portable and low volume VSI capable of producing manufactured sand for block and brick manufacture. Ore crusher makes Wear parts for various mixing and matching plants for concrete and asphalt production.

### Markets

Unprecedented success and market acceptance has enabled Ore crusher to expand our quality product range and services into the quarrying and mining industries. Our world class innovations have resulted in our quality products finding growing acceptance in the global market. Ore crusher has representative offices in Australia, The United Kingdom, Mauritius and Zimbabwe. Ore crusher has significant presence in all the SADC countries and is enjoying growth in line with the African emerging economies.

Ore crusher prides itself on meeting the customer's expectations and offers guarantees and warranties in line with these expectations we are an ISO accredited company.

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# How to start a small scale gold mining company

Small scale mining is easy when one knows how. This introduction may help the reader to start in small scale mining activity.

## Knowledge is power

Just like in many other areas of business, knowledge is power. First thing to do in order to start a new gold mining activity is to obtain as much knowledge as possible for your future mining development. You certainly don't need to be an educated miner, but you do need to have access to knowledge and to experts that may help you during your beginning stage. Try to read as many prospecting books and instructions. Get acquainted with the prospecting tools such as metal detectors and gold sluices. Establish few local gold washing plants and process sand, soil or any kind of material, regardless if you are finding gold at the location or not. In fact, such actions, at first sight appearing useless, but they are going to help you in the real time situations. You do need to recognize the traces of black sand and heaviest minerals. You need to practically observe the minerals. Review the periodic table of elements again and especially find out the density or specific weight of gold, platinum, silver and other precious metals. Compare that to the specific weight of black sand and water, and go into deep understanding of the gold as precious metal. You should read at least few books on gold prospecting and some basic books on physics that explain characteristics of gold.

## Legal setup and holding

You should consider making a proper legal structure in order to minimize your taxes and increase your income. If setting up companies in other countries, you have to

consider proper holding companies. You are interested to minimize local taxes, income tax, corporate taxes and any dividend distribution taxes. Share with the government what must be shared, but keep most of your income for yourself. Consider consulting yourself with attorneys or corporate specialist such as RCD Wealth or other similar international consultants. Your legal setup is going to determine the future of your mining company, take it very seriously as your life and life of you partners and family depends on the proper structure.

Make sure you know where to sell the gold. Out of all important factors, one has to know that gold market is well developed and that one can sell gold pretty easy. Gold is sold easily, usually for cash in many locations of the world. Regardless where you are located, there are many gold dealers who are purchasing gold for highest prices on the market. You may work with local gold dealer, however, you should search for a gold dealer with quickest and most accurate turnaround times. Cash paid within 24 hours or at spot is the best that you may get. Distance to the dealer does make difference when mining in remote areas. You need to be able to quickly sell the produced gold without thinking. Raw gold contains silver and other precious metals. A good gold dealer is going to pay you for all precious metals that you deliver to them. Try to obtain the information where all the gold dealers are selling their gold. This may be a larger gold refinery. Contact the gold refinery and see how you can sell your gold and silver produced in your own gold mine directly to the refinery.

Mining land, claim or a mining license

As your next step in starting a new gold mining activity, you would search for the appropriate mining land. You may purchase such land, or acquire it as mining claim or in some countries pay for the mining license. You may also enter the joint venture with the mining land owner or license owner. There are numerous opportunities to consider and you need to find out what is best for you. My advice is to start in any manner you can while having long term strategy to expand to new mining lands and to acquire one such license yourself. Make sure you have the proper mining license so that you can actually start quick in production of gold. Some of companies located in United States and Europe, have been waiting for years to acquire the mining license. Don't let this happen to you. If you are after mining, simply choose another country and go there. African countries such as Tanzania, Ghana, Zimbabwe, Congo, Mali have all those opportunities waiting for you with season 12 months long.

Practical prospecting on the mining land. Engage in practical prospecting on the mining land that you have found. Observe environmental laws at all times. Practical prospecting need not be expensive. Watching small scale miners in Africa will give you tremendous practical approach. It may be so simple that it may look unbelievable. A western geologist with best education may need days, weeks, even months to prepare the proper report of the minerals on such mining land.



# How to start a small scale gold mining company

That is certainly necessary for any large operation. However, African geologist with much less education, by using practical approach, may tell you exactly where is the gold, and within 10 minutes may demonstrate you that gold is there. Learning the most practical approach is of tremendous value. On numerous lands in Africa, one may start within a day to process material. Prospecting for gold is a big subject and its values and technology and effort required cannot be underestimated. Still you need to think for yourself how to get quicker into the business and real gold production by using any means that come available for least expenses possible.

## Establishment on the mining land

Your next step would be to prepare your mining land for the work and in many cases for living. You do need a living space on the mining land, be it a tent, a living container or cabin or a brick house. You and your team, your employees do need a space for living at the place without traveling to distant cities. You are going to need kitchen, and space for material processing, tools, and all the equipment. You would clean the area from any trees or other obstacles. If there are any dangerous animals such as snakes or snake holes, you would need to take care of it. Any existing pits or shafts have to be carefully marked so that people don't fall into it. Think of security for people in the first place. You need to establish yourself on the mining land and to feel as safe as at home.

## Hiring the work force

By using nearby villages you will find many people willing to work in the small scale mining company. In African countries it is very easy to employ local workers. By

providing them some necessary accommodation, food and medicine, they will know you take care of your team and will be loyal to you. Do not underpay your workers. Offer them the average salary but fair to their work. We recommend that each person shall be paid based on their performance, rather than on the time worked. If the performance is double in the same time in comparison to other worker, the person shall receive the double pay. You will not be able to recognize in the first stage who is who and what character your workers have. During the time, this is going to be filtered, and some people will go, some will be fired and most of good people will stay working with you.

## EQV formula for income in gold mining production

The acronym EQV stands for Equipment, Quality, Volume. It relates to three most important factors in the selective mining and small scale mining activities. The mining Equipment has its certain potential capacity. It shall be correctly evaluated including the number of people required to handle such equipment. If more people would raise the potential capacity of volume that may be processed, than the maximum number of people with equipment shall be calculated. If your mining equipment has capacity to handle 30 tonnes of material every day with 5 workers, that is what you wish to achieve daily and routinely. You are targeting the maximum available equipment capacity. The Quality factor relates to the higher grade of ores and better concentrate. Quality is relative to your results. One has to constantly keep an eye on better ores with higher grades, including to improve the Equipment factor and Volume factor to increase the Quality. The Volume factor relates to the amount of ores that is

processed. There are many ways how one can increase the Volume processed, such as properly using Equipment, increasing the number of people, supporting the workers during the mining, awarding people for better performances, keeping discipline and working in few shifts.

The EQV formula for income in gold mining production can be applied on almost any kind of mining activities.



## Gold Production = Equipment + Quality + Volume

Gold productions equals the number of Equipment parts in use plus the Quality of ores and concentrate plus the actual processed Volume of ores.

The expanded EQV formula for income in gold mining is shortly:

## INCOME = Gold Production - (Expenses(EQV) + Expenses(Other))

The INCOME equals the GOLD PRODUCTION less the EQV EXPENSES and OTHER expenses. Small scale mining groups and associations usually do not invest much or pay more money than they produce. This is very important in life and in business. One has to start with least expenses and produce more income over expenses.

*Jean Louis*

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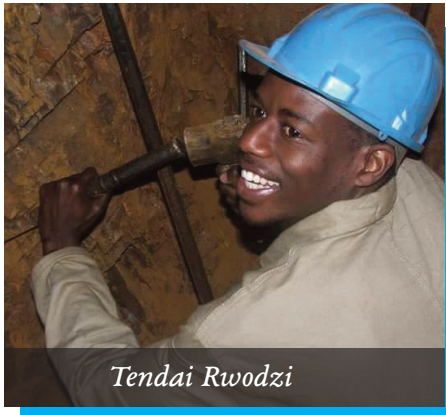


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# A Promising young small scale Miner



*Tendai Rwodzi*

**T**endai Rwodzi is a Board Member of Zimbabwe Youth Council in Charge of Mining. He is the Chairman of Young Miners Foundation. He is a Committee Member in the recently appointed Steering Committee/Taskforce for the Implementation of the Youth Empowerment Model by the Ministry of Youth Industry and Economic Empowerment. He is the Chairperson and Director of Youth Make Zimbabwe which is one of the 4 anchor companies established by Zimbabwe Youth Council to facilitate youth participation in the economy of Zimbabwe.

## Career

After High School Tendai worked at Cargill Cotton Zimbabwe at Tafuna Depot before venturing into mining. Tendai started mining as an artisanal miner (mukorokoza) in 2008. In 2009 he was employed by then Mining

Guru, the Late Engineer Simon Kundai Musanhu to create Mining Business Concepts that will transform artisanal miners (makorokaza) to grow organically to a stage where they can leverage past operations and attract Private Equity Financing thus give access to Exploration and Expansion Capital. That year he was assigned as the Operations Manager for Kutipa Mineral Resources.

In 2010, Tendai formed his first mining company Chiedza Mineral Resources which mined gold in Mt Darwin and Shamva. That year he was a licensed Gold Buyer buying Gold in Mazoe, Shamva and Mt Darwin.

***Tendai started mining as an artisanal miner (mukorokoza) in 2008.***



*Tendai and his team ready for work*

In 2011 he formed Huvepo Mineral Resources and they mined gold in Mt Darwin and Karoi. In 2012 he got a Management Contract for a Junior gold mining operation in Chegutu. That same year Tendai and a colleague Ben Zinyemba formed Chem International Company which has vast interests in mining and processing chemicals.

In May 2014 Tendai formed Leviticus Mineral Resources which is mining semi-precious minerals in Karoi namely Aquamarine, Beryl and Cat's Eyes.

In 2015 he opened Rwodzi Engineering which is a Metal and Steel Company which specialize in fabrication of Housing and



Mining equipment and tools. He is also a Co-Director together with his wife Brenda of LeClasse Events and Rustic Collection which are Events Management and Décor Companies.



## Comment

Tendai has a zeal for Mining in Zimbabwe. He has a detailed insight in the sector, clear objective, vision and foresight on the course Young People ought to take in order to move from Artisanal, to Small and Medium Scale Miners, through to Junior Miner level and eventually Multi National Entities.



*Getting ready to get into pit*



# C20 Rock splitter

**Offers safer, quieter alternative to breakers and explosives**



The C20 Rock Splitter comes in four models; two vertical options ranging from 163 to 183 centimetres long, as well as two horizontal options, from 179 to 211 centimetres long. Contractors can use the splitter with Brokk machines ranging in size from the new Brokk 280, if used with counterweights, and up.

The C20 Rock Splitter quickly breaks large boulders and solid rock in mining and shaft sinking applications as well as cross passage work in tunneling. Contractors drill a 3-inch diameter hole into the rock with a separate attachment before inserting the splitter. The attachment expands with as much as 1,800 tons of force, splitting the rock.

The C20 Rock Splitter, manufactured by Brokk's German sister company Darda, offers contractors a safe and quiet alternative to explosives and hydraulic breakers. It increases productivity in industries including mining, quarrying, tunneling, construction and demolition. Brokk featured the C20 Rock Splitter during CONEXPO-CON/AGG 2017 in Las Vegas.

"We never stop looking for ways to improve safety with our machines," said Lars Lindgren, Brokk Inc.'s president. "Paired with a Brokk 280 demolition robot and counter weight, the C20 Rock Splitter allows our customers to split rock with all the speed and effectiveness of breakers and chippers, but without the noise, vibration and danger common with that type of equipment."

The method is quieter, safer and produces fewer vibrations and dust than breakers and explosives. It presents contractors with a productive alternative in areas where potentially disruptive demolition techniques are not allowed, such as near hospitals, plus it works faster than expanding demolition chemicals, which can take hours. It's also a safer alternative to handheld tools, such as pneumatic breakers, that produce heavy vibrations and can cause worker fatigue that leads to injuries over time.

The C20 Rock Splitter, when combined with a Brokk machine, allows labourers to work from a safe distance – typically 10 to 20 feet away – using a belt-mounted remote control box.



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# Artisanal and Small-Scale Gold Mining Without Mercury



In many countries, elemental mercury is used in artisanal and small-scale gold mining. Mercury is mixed with gold-containing materials, forming a mercury-gold amalgam which is then heated, vaporizing the mercury to obtain the gold. This process can be very dangerous and lead to significant mercury exposure and health risks. In some jurisdictions, mercury use may be illegal or restricted in certain ways. The Minamata Convention on Mercury, a global agreement for reducing mercury pollution, recognizes the risks of using mercury in artisanal and small-scale gold mining, and calls upon nations to reduce, and where feasible eliminate mercury use in this sector.

Although many miners use mercury in artisanal and small-scale gold mining, it is possible to safely and economically recover gold without it. Mercury-free techniques are safer for miners, their families and local communities. They may also help miners market their gold at higher prices.

Many artisanal and small-scale miners are achieving high rates of gold recovery without mercury, benefiting their health, the health of their communities, and the environment. On this page, we summarize some of the techniques in mercury-free artisanal and small-scale gold mining.

## Using Concentration Methods

Concentration means increasing the

amount of gold in ore or sediment, by selectively removing lighter particles. If employed effectively, concentration methods can eliminate or greatly reduce the need for mercury.

Before concentration can begin, ore must be crushed or milled to liberate gold particles from rock and to decrease grain size. Concentration works best when grain size of the milled material or sediment is relatively consistent, so that most particles are of similar size. An appropriate grain size can be achieved using screens or sieves. Once the gold-containing material has the appropriate grain size, one (or several) of the methods described below can be employed to concentrate gold bearing material. Most concentration methods rely on the high density of gold relative to other minerals in ore or alluvium mixture. These are referred to as gravity methods. Magnetic or chemical properties can also be exploited to enhance concentration.

Each mining operation is unique.

Concentration methods must be selected after considering factors such as the type of ore or sediment, other minerals present, gold particle size, and the availability of water and electricity.

## Gravity Concentration Methods

### Panning

Panning uses water to separate heavy gold particles from other lighter particles within a medium sized pan. In this process sediment or ore thought to contain gold is placed in a wide, curved pan along with water. The miner moves the pan in a series of motions designed to eject lighter

sediments. The density of gold keeps it on the bottom of the pan as lighter material is ejected along with water. After a series of successful iterations have been completed, gold will be exposed on the bottom of the pan for the miner to recover.

Panning works best when gold is coarse and well liberated. Under right conditions, panning can produce high grade concentrates or even liberated gold. Then miners can employ gold recover methods such as direct smelting (described below), although many panning operations lead to directly recoverable gold.

Panning offers miners a low cost method of gravity concentration but it requires time and skill to be effective. One of the major drawbacks to panning is that miners must pan small amounts of concentrate. Therefore, panning is often done after other methods of gravity concentration such as sluicing have completed.

## Sluicing

Sluices use water to wash ore or alluvium down a series of angled platforms. As water washes sediment down a sluice, gold particles sink and are captured by material covering the bottom of the sluice, often carpets. Sluices are usually inclined at 5 to 15 degree angle. As moving water travels down a sluice, it generates greater force and keeps gold particles from sinking easily. For this reason most gold is captured at the beginning of the sluice. Carpets or other capturing devices on the bottom of sluices can be removed and washed in a bucket to remove the captured dense material. Sluice design can lead to higher gold



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recovery if the force of the water traveling through the sluice is decreased. A series of rifles can help break the flow to improve recovery. A zig zag sluice also achieves this by creating a drop between the first and second platform that disrupts the velocity of the water as it travels down the sluice.

A simpler alternative to the zig zag sluice is a combination of two sluice surfaces. The first is tilted at a steeper angle than the second, decreasing the velocity of the water as it hits the second sluice, increasing gold recovery.

Sluices can be relatively expensive or affordable depending on the complexity of their design. Simple sluices can be a single angled platform a few feet in length and others can be very elaborate.

Having an available and consistent water supply is necessary to have a functioning sluice operation. This can be done with piping, drums, buckets, or natural flowing water bodies. A constant flow will be better than a bucket-driven flow.

Sluices are good at concentrating large amounts of ore and sediment in a relatively short time but often do not yield concentrates with high amounts of gold. The resulting concentrate must usually undergo further methods of concentration, such as panning.

## Shaking Tables

Shaking tables are elevated tables tilted to one side with raised ridges running horizontally down their length. Mineral feed (crushed ore or sediment) and water are released at one end of the table. The water washes the feed down the table. As the

material is washed down the table, specialized grooves trap gold and direct it to collection points on the side of the table as lighter minerals are washed away. During this process, the table is continually shaken by a motor to agitate the material and aid in the separation of gold particles.

Shaking tables are very effective and can concentrate sizeable amounts of ore at a time, providing high grade concentrates and liberated gold, but they are also relatively expensive and require some experience to operate.

## Spiral Concentrators

Spiral concentrators are specialized pans tilted on an angle with spiraled grooves. The spiral grooves in the pan lead toward the center where a hole is connected to a container to catch material.

A motor is used to rotate the pan continually as concentrate is fed onto the pan by an operator. A pipe extending horizontally across the pan sprays water along the surface of the pan as the concentrator spins. The water washes lighter particles down the spiral concentrator into a bucket while denser particles, including gold, are carried by the spiral grooves toward the hole in the center of the concentrator.

After this process is repeated multiple times, the operator is left with a high grade concentrate, and often liberated gold. Spiral concentrators are relatively easy to operate but do represent a larger capital investment than panning or sluices.

## Vortex Concentrators

Vortex concentrators use a rotating flow of water to separate lighter materials from a concentrate and remove them via a raised drain hole.

A vortex concentrator is a circular tub with water input on the side of the tub and a raised drain in the center. The tub is filled with water until it reaches the level of the drain hole. Then concentrate is added in a thin layer around the bottom of the bowl. Water is then pumped into the side input, creating a rotating vortex of water that drains in the center. The vortex pulls lighter material up from the bottom of the bowl and out the drain hole. Dense materials such as gold remain in the bottom of the tub. After the miner sees only gold left on the bottom of the bowl the water source is turned off and the gold is ready to be removed.

Miners must pay attention to the amount of water flow going into the tub. If it is too great the velocity of the water will carry gold particles out of bowl and this will lead to losses of gold. When vortexes are operated correctly, the result is a fine gold concentrate that is usually very high grade. Vortexes are easy to operate and are good at capturing fine gold that is hard to extract through other methods.

## Centrifuges

A centrifuge is a vessel that rotates about a central point. It is used to separate materials in a mixture by density. To separate gold particles from a concentrate, concentrate is fed into the centrifuge through a pipe at the top of the machine in a slurry of around 60-75% water and 40-35% solids. The material collects in a vessel in the center of the machine where high speed rotation

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creates force that moves the material up the sides of the vessel's walls. As the material is pushed up the sides of the bowl's wall, denser material like gold is caught in ridges while lighter material is ejected from the vessel. Centrifuges operate in cycles that can be preprogrammed or determined manually depending on the equipment and the material processed. After a cycle is completed, the miner can then extract gold from the ridges of the centrifuge vessel. For small scale centrifuges, cycles usually last around 0.5-2 hours.

Operating a centrifuge takes skill as it must be tuned to the material it is processing. This is accomplished by adjusting feed grain size, rate of feed, rotation velocity, and cycle duration. Centrifuges can be more effective at concentrating gold than other methods of gravity concentration but are generally more expensive.

## Other Concentration Methods

### *Magnets*

Magnets can be used to remove magnetic minerals such as magnetite from concentrate. They can be used after or in conjunction with other method of concentration. One technique for extracting magnetic minerals is to place hand held magnets on the bottom of a pan containing dried concentrate to separate metallic from non metallic material. Care must be taken to avoid losing gold particles during the separation. It can be helpful to cover the magnet with a piece of paper. After magnetic minerals are attracted to the surface of the paper, it is removed to easily discard the metallic material.

**Flotation** - Flotation is usually used by large

scale miners but can also be applied in small scale operations. It is a process that works best for processing complex ore types, especially ores that are difficult to process using gravity methods. In flotation, a mixture of slurry (crushed ore and water) and frothing agents are added into a flotation machine. A tube releases air into the tank of the machine and an agitator creates air bubbles at the bottom of the tank.

Minerals that are hydrophilic, such as gold, attach to the bubbles' surface and are brought up to the top of the tank. Other minerals fall to the bottom of the tank and are discarded as tailings. Bubbles containing gold and other hydrophilic minerals accumulate at the top of the water level as froth. This froth is then scraped off to create a concentrate of gold and other hydrophilic minerals. Flotation creates high quality concentrates and is good at capturing fine gold. Flotation usually requires a substantial amount of capital investment. There are a variety of possible frothing agents. Depending on the chemical, specific precautions must be taken when employing the method to protect human health, and waste materials must be disposed of appropriately.

## **Gold Recovery**

### *Direct Smelting*

Separation methods, like the ones described above, if employed properly, should yield a high-grade concentrate with a large proportion of gold relative to other materials. However, this gold still needs to be separated from the other remaining minerals before it can be sold. At this point in the process, direct smelting can often be employed as the final stage of gold recovery.

In direct smelting high-grade concentrate is heated until the gold melts. The liquid is then

cooled to form a solid mass of gold dore, a semi pure gold alloy, that can reach upwards of 95% purity.

To perform direct smelting, a miner, community mining consortium, or processing shop employs a crucible, a high temperature bowl designed for smelting. Gold concentrate is combined with a flux, such as borax or other materials of mixtures, in the crucible. The flux acts to decrease the melting temperature and viscosity of non-gold minerals in the concentrate so they are more easily separated from the gold during the cooling process. Small amounts of concentrates, usually around 50 to 100 grams, are used in direct smelting.

Concentrate and flux are heated in the crucible to the temperature at which gold melts, 1065 degrees Celsius. Miners usually use a blow torch to generate heat. After this temperature is maintained for some time the material in the crucible will melt and can then be poured out of the crucible to cool and harden into gold dore.

If concentrate is of poor quality (low gold percentage and high amounts of other minerals) the melt may need to be poured into another structure, such as a cupple, to separate the impurities from the gold. When melt is poured into the cupple, gold and other metals will sink as silicates and other minerals rise to the top, forming slag. When these materials harden the gold can be easily separated from the slag. The slag frequently contains addition gold that can be recovered through reprocessing.

### *Chemical Leaching*

Chemical leaching makes use of the chemical properties of gold to leach it from ore, concentrate, or tailings. This process is mostly used in large scale mining operations but has been increasingly adopted in small



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