

great XPActations

VALUE THROUGH PLANNING

THE NEWSLETTER FOR MINING PROFESSIONALS

APRIL 2008



Tony Kinnane, Managing Director

The global financial markets stagger from crisis to crisis while the commodity sector continues to go from strength to strength. In such a volatile environment, growth and consolidation within the global mining sector is inevitable as is the increased demand for all

commodities, which underpins the value of the mining industry.

In this climate, Runge's initial public offering (IPO) process continues, with a high degree of interest being generated in our unique offering in the mining services sector. Our prospectus has now been lodged – more information on our website (www.runge.com) The market is validating that The Runge Group is a leader in the provision of mine planning and, more importantly, mining business planning. Runge's acquisitions over the past few years have built a global network of strong local teams capable of covering the full spectrum of mine-related services across all mining methods and commodities. Importantly, we believe we are independent of the commodity boom.

Against this backdrop, the visionary Mining Dynamics product further illustrates Runge's standing as the leader in mine business planning and technology. Mining Dynamics provides the next generational change in mining technology and its use in running a mining business. With the consolidation of many mining businesses, it is imperative that management make quick decisions based on accurate information about their operations. Mining Dynamics provides a synchronised planning platform which makes sense of all the complex data and offers up insight and information to assist critical business decisions.

Mining Dynamics is an example of the innovation that comes from Runge and the Mining Technology Services (MTS) hub in Brisbane. Queensland companies are

regularly punching above their weight on the world stage and solid foundations of mining technology companies are forming in the Queensland region. As we venture out to remote locations around the world, we are constantly impressed to see the presence of these Queensland businesses and proudly Australian companies.

Runge – promoting our industry

It is no secret that IT and Mining Professionals are in short supply. Runge has been looking at this issue for many years and we have found various ways to increase and retain our pool of talent. We are very proud of our employees and they are proud to be part of Runge. One of our longer-term approaches to this issue includes our sponsorship of The Engineering Link Group (TELG). TELG encourages high school students to take up engineering disciplines at university. Their track record over the past few years has seen an increase in engineering numbers at local universities. TELG's unique approach to this skills shortage problem is to foster a sense of fun and excitement about engineering and sciences, through a series of joint initiatives with the mining industry and the university engineering schools. This group's commitment to the development of future engineers comes from their own personal beliefs and teaching experience, and we are inspired by their achievements.

Additionally, as professionals who know and believe in the mining industry, we should all be proactive in reshaping community attitudes about our industry. Ask anyone who is not in the mining industry "what their images are" – 9 out of 10 will describe a picture of a dirty-faced miner in a hard hat with cap lamp. This is only part of the industry! There are many innovative and exciting jobs in our industry that would be attractive to people if marketed appropriately.

Golf Day

Another initiative that Runge is supporting is a Golf Series that will take place in

Central Queensland, the home of our earliest customers and our longest relationships. With our long-standing connection to Central Queensland, it is fitting that we throw our support behind an initiative that will attract quality sports people to play in remote areas. The Runge Mining Golf Series..... details coming.....

To sign off this issue of Great XPActations, I would like to congratulate Katherine Villalobos. Katherine has been appointed as Manager of our Chilean Operations and now embarks on a new facet of work within The Runge Group.

The Queensland Professional Golfer's Association (PGA) will be holding a pro-am golf series in Central Queensland in the May/June period. Runge has committed to provide lead sponsorship supporting this initiative. For more details please contact us.

In this issue

- Consulting Insights
- Software Systems
- Pincock Perspectives
- Runge Global News
- Keith's Kolumn

THE RUNGE GROUP



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www.minarco-mineconsult.com



ResEval is now part of The Runge Group

Our biggest news rolling into the new year is that the ResEval team in Perth is now part of The Runge Group. ResEval is a mining consultancy that provides resource estimation, due diligence investigations, mine design and evaluation for both open pit and underground mines in Australia and overseas. ResEval is now doing business as Runge. Paul and his team enhance The Runge Group capabilities in the metals geology and mine planning arena. They are already combining with consultants in our other regional and overseas offices on a number of projects. They have relocated and joined our Runge team in our new Adelaide Terrace Office in Perth. Please give Paul and the guys a call on +61 8 9482 0700 for any of your geology and mine business planning needs.

Trends

Other than the ResEval news, it's pretty much business as usual for us. Given the current status of the resource industry, one could be forgiven for

thinking that, as Robert Earl Keen so eloquently puts it in song, "The road goes on forever and the party never ends." However, the US subprime lending crisis and recent share market jitters have caused many to reflect on the future. Similarly, we are now seeing genuine and growing concern across the industry with respect to where operating costs have got to. We're not yet back to the "toe cutting" days of the late 1990s and early 2000s, but there does appear to be at least an equalling of focus on costs and expansion. It all serves to remind us that although many business fundamentals of the resource industry have changed in the last five to seven years, we are still subject to investment emotion and cycles. Although their lyrics were not induced by commodity market forces, Jerry Garcia and Rob Hunter spoke of this sort of confusion in the Grateful Dead's "Truckin" – "Sometimes the lights all shinin on me; Other times I can barely see; Lately it occurs to me what a long, strange trip its been." For the moment, all we can do is manage the things we do know, be prepared for changes, and "just keep truckin on".

SoftwareSystems



Brisbane office travelled to Balikpapan in Indonesia to provide Xact software training to five PT Leighton personnel.

PT Leighton needed a short-term scheduling system that could highlight scheduling issues and conflicts. They also needed a system that could:

- rapidly update and analyse any changes to the short-term plan
- minimise the hours to perform regular updates
- communicate the short-term schedule to a range of people.

PT Leighton chose Xact to meet their needs. One site is trialling the software now, and it will be rolled out to other sites in the future.

Xact is a software tool designed to manage short-term scheduling functions within the mining industry. Recently, John Hives from the

For information on Xact, please email John Hives on jhives@runge.com.au.

The Processing of Platinum Group Metals (PGM) (Part 1)

With soaring Platinum Group Metal (PGM) prices (platinum is currently sitting around AUD \$2000/oz and rhodium approaching AUD \$9000/oz), the Platinum Group Metals (PGMs) business is really booming, particularly in South Africa, Russia and North America. And so it is for Pincock Allen and Holt (PAH), who has assessed several PGM projects in recent years.

As an industry that is not very well known, this article aims to provide a brief background on PGM's, followed by a review of technical challenges faced in the processing of the South African PGM ores.

PGMs consist of a family of six greyish to silver-white metals with close chemical and physical affinities. Three of the PGM family, namely platinum (Pt), iridium (Ir) and osmium (Os), have high melting points, are extremely inert and are the heaviest known elements (~22 g/cm³). The remaining three, which are palladium (Pd), rhodium (Rh) and ruthenium (Ru), are much lighter.

Demand for PGM is primarily driven by the automobile market, with the manufacturers of autocatalysts consuming over 60% of platinum and palladium as well as 85% of the rhodium mined.

PGMs are principally extracted from two types of deposits, namely the platinum-rich layered mafic intrusions (e.g. the Bushveld in South Africa) and the palladium-rich nickel sulfide deposits (e.g. Noril'sk-Talnakh in Russia).

South Africa is the dominate player in PGM production, supplying more than 80% of the world's needs, however it is Russia who is the most notable supplier of palladium.

The ability of South Africa to dominate world PGM production arises from the massive resource base (133,000t of PGMs) contained in the Bushveld Igneous Complex (BIC), located 50 kilometres north of Pretoria (refer to Figure 1). Slow cooling has allowed the PGMs and base metal sulfides (BMS) to coalesce and concentrate into two main economic layers known as the Merensky and Upper Group 2 or UG2 Reefs. A third, considerably thicker PGM horizon formed in the Northern Limb, known as the Platreef.

The Merensky Reef was first mined in 1926 near Rustenburg on the Western Limb, which today has more than twelve operating mines producing 4.5 million ounces of platinum annually. The UG2 ores were first processed in the 1980s and PGM recovery from them remains an ongoing challenge.

The South African PGM industry is dominated by three major players, namely Anglo-Platinum, Impala Platinum and Lonmin, all of which are vertically integrated mining operations that produce pure PGMs. The opportunity for other mining companies to join

the profitable PGM industry within South Africa has just increase dramatically with significant changes occurring in local mining legislation. Most new developments are occurring on the Eastern Limb.

The extraction of PGMs can be broken down into four technically challenging stages; mining, processing, smelting and refining. Key features of the PGM business are presented in Table 1. It is worth noting that mining accounts for up to 75% of the total PGM production costs. This is because the Merensky and



Figure 1: The Bushveld Igneous Complex

Parameter	Mining	Comminution & Flotation	Smelting & Converting	Base Metal Refining	Precious Metal Refining	Total
Percent of Total Cost	65-75	9-12	6	7	4-5	100
PGM grade	4-6 g/t	100-600 g/t	640-6000 g/t	30-65%	>99.8%	-
PGM Recovery (%)	-	80-90	95-98	>99	98-99	75-85
Concentration Ratio	-	30-80	20	75	2	200,000
Processing Time (days)	-	2	7	14	30-150	Up to 170

Source : Lonmin website

Table 1: Key features of the PGM extraction business



Pincock, Allen & Holt is a consulting and engineering firm serving the international mineral resource industry. Your comments and suggestions are always welcome. Contact Pincock, Allen & Holt • 165 S. Union Blvd, Suite 950, Lakewood, Colorado 80228 • TEL 303 986 6950 • FAX 303 987 8907 • www.pincock.com Pincock Perspectives is published as a free information service for friends and clients.

Consultants for Mining and Financial Solutions

UG2 Reef layers are thin (0.45 to 1.2m thick) and need to be mined by underground methods. These ores are difficult to mine by bulk, mechanized methods, however progress is being made.

The processing of PGM ores poses several challenges due to the nature of the mineralogy and the subsequent smelting requirements. Merensky Reef ores are the easiest to treat, followed by Platreef ores and UG2 Reef ores.

The Merensky Reef (Figure 2) is characterized by high PGM grades (5 to 9g/t) and a high ratio of platinum (59%) to the other PGMs. The PGM mineralogy varies considerably, with Pt-Pd sulfides the most dominant (60%) (Figure 3), followed by tellurides and arsenides. The BMS content is around 1 wt.% and consists of pyrrhotite, pentlandite and chalcopyrite. The PGMs are coarse (20 to 150 microns), easily liberated and generally float quickly. The remainder of the ore consists of pyroxene and plagioclase with some talc and chromite.

During the processing of Merensky ores, the BMS and PGMs are recovered using conventional sulfide ore flotation practice to produce a bulk concentrate. The treatment strategy employs the Mill-Float-Mill-Float or MF2 approach where the ore is coarsely milled and floated and the flotation tailings further milled to a finer size and refloat. A Merensky Reef final concentrate has a grade of 130 to 150 g/t PGM, 2 to 4% Ni and 1.5 to 2.1% Cu, with typical flotation recoveries of 85 to 90% PGMs, 82- 85% nickel and 85% copper. The remainder of the concentrate is pyroxene and chromite (0.1%).

The UG2 Reef ores (6 to 7 g/t PGM) are dominated by chromite (60-90%) and a lower platinum (41%) however higher rhodium PGM ratio (9%) with a very low BMS content (0.07% Ni). There are generally more PGM sulfides than in Merensky Reef ores, however they are considerably finer grained (3 to 10 microns – Figure 4) and a MF3 circuit is employed. This approach attempts to minimise the over-grinding of the brittle chromite phase. Typically, a final concentrate has a grade of 400 g/t PGM and 3% Cr₂O₃ and a 87% PGM recovery. Some producers are exploring the potential of fine milling technologies such as the IsaMill to produce high grade concentrates (2000 g/t) that can bypass the smelting stage.

The Platreef ore (3-4 g/t PGM) has an equal platinum to palladium ratio and a substantial nickel content (0.36% Ni). The PGM mineralogy tends to be erratic however the dominant class is Pt-Pd tellurides. While the PGMs are coarser than those found in the Merensky Reef ores, they are encapsulated in the silicate gangue and only 70% are liberated. Like the Merensky Reef ore, it is a pyroxenite ore and a similar processing approach is employed.

To be continued . . .

Stay tuned . . . part 2 of Andrew Newell's article will be available in the next edition of *great XPACTations*.

For more information on this article, please email Andrew Newell, Senior Process Consultant, PAH Limited (part of the Runge Group) on andrew.newell@pincock.com



Figure 2: Merensky Reef ore



Figure 3: PGM (Braggite: (Pt,Pd,Ni)S)

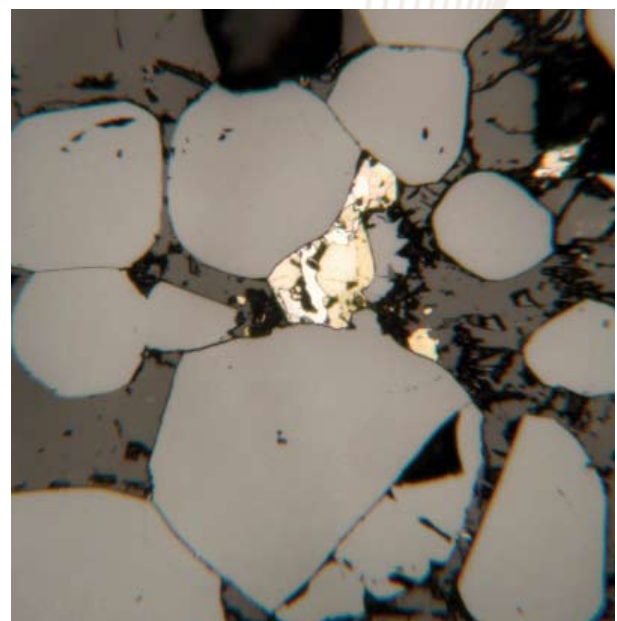


Figure 4: PGM enclosed by BMS surrounded by chromite grains

North America

Fraser Rowe



Welcome to 2008. This year seems to have started where we left off at the end of last year with our consulting, training and software support activities continuing at a brisk pace in our Calgary, Denver and Gillette offices.

Recently, our North American software implementation teams have been supplemented with several visiting Australian consultants. Thanks to Steve Power, Irfan Visa, Ben Hall, Ben William and Darren Rostron for helping out and giving up part of their Australian summers for our chilly (at times) North American winters.

The biggest news for us so far this year has been the commencement of a worldwide roll out of XERAS maintenance planning for Barrick. The initial model build and user acceptance at Barrick's head office in Toronto is now close to completion. In March the implementation and training team moved to Nevada to be followed by other Barrick operations in Australia, Africa and South America. To find out more about using XERAS in maintenance planning, contact Ben Hall (bhall@runge.com.au).

We continue to get great feedback on the use of Xact for short-term (day-to-day, week-to-week) scheduling with several of our clients now trialling the use of this exciting new product in their mines. Daniel Bales of our Gillette office can provide more information on Xact, email him at dbales@runge.com.au.

Some of the other interesting consulting jobs we have 'on the go' at the moment include:

- Rio Tinto Energy America – assistance with data room preparation
- A proof of concept autoscheduling model for Newmont's Phoenix gold mine
- XPAC Software training with De Beers Victor project, Newmont, AMEC and Syncrude
- Financial evaluation assistance for BHP Billiton Diamonds Ekati
- Budget financial model building for BHP Billiton New Mexico Coal
- Life of asset financial modeling for the Fort Hills project (Petro Canada)

Our software client base also continues to grow with recent software sales to these new and existing clients:

- Newmont Gold - XPAC Autoscheduler
- Prairie Mines and Royalties – Talpac
- Lafarge – Talpac
- Barrick – XERAS

That's the news from North America. Don't forget that the annual mining exhibition season is coming up. Look out for our booth at CIM; Edmonton in May 08.



UK

Jon Scott



Spring is in the air – well almost. Days in the northern hemisphere are getting longer and temperatures are slowly rising. Bring on summer and make it a good one this year (please).

The European office has been very busy over the last few months working on several of consulting projects across the globe with invaluable assistance provided from team members in the Brisbane, Perth and Belo Horizonte offices. We have also performed consulting tasks for mining companies in Western Australia, Queensland, Guinea, Bosnia and the UK. Over the next few months Runge will continue to work on many different consulting projects and focus on expanding our footprint and business relationships in the Europe.

A special thanks to Tony Savva, Esmond Van Niekerk, Shaun Bydwell, Tim Fairbanks and Pete

Forbes for their input into developing projects in the region and for their willingness to travel great distances in the pursuit of expanding The Runge Group's globalisation goals.

Since Runge's first Professional Development course in Moscow (refer to the December 2007 issue) our Russian partners, Manzana, have continued to forge relationships with several of leading Russian mining companies. These relationships will target the expansion of software sales, consulting, and professional development, whilst looking after their major clients. We are confident of seeing more leads develop in Russia and the CIS soon.

Prospective leads for the next quarter are likely to see return travel to Croatia and Bosnia, with visits to new destinations including Dubai, Norway and Poland.

If you ever get to London I can recommend a Brazilian restaurant near Bayswater Tube station called Rodizio Rico, however it's for the non-vegetarian only.

RungeNews

UltimateFrisbee

In December 2007, Kristen Nott, a Runge (Brisbane) geologist, brought back a bronze medal from the World Beach Ultimate Frisbee Championships (Ultimate) in Maceio, Brazil.

The weather in Maceio was hot, humid and windy, but Australia came out strong and played hard. Spectators were entertained by the many dramatic grabs and dives.

The women's team held their own, only being beaten by Great Britain and the US, to secure the bronze medal.



In Ultimate there is another prize named 'spirit of the game', which basically means that a team did not make any bad calls, played with intensity and without nastiness, and were basically a pleasure to play against etc. The Australian women's team earned themselves the spirit prize for their division.

The Australian men's team lost only one game in the pool games, then beat the strong Philippines team in the grand final, earning gold medal for their efforts.

Ultimate is a player-funded sport and without the help of sponsors, like Runge, many teams are unable to make it to events such as the world championships. The Australian women's team is very grateful for the support of Runge helping them win bronze for Australia!

For more information about Australian Ultimate see the AFDA website www.afda.com

Professional Development

Skill Shortage Generates Increased Demand for Runge Training

The skills shortage has resulted in an increased demand for Runge Professional Development and Software Training Courses. The beginning of 2008 has seen a significant increase in the frequency of courses and the number of attendees.

In addition, Training Services has added a range of public Software Training courses due to the increased demand for XPAC7 Standard and Xact training. These have been well received by the mining industry, with the courses being booked out as soon as they are scheduled.

Evidence of our expanding global training footprint can be seen by the recent requests for Runge's Training Courses in Japan, Singapore, Middle East, Morocco, Korea, India and Brazil.

As well as our public courses, Runge provides

the customised courses that can be tailored to client's specific needs and held on-site, or at our offices in Brisbane, Sydney or Perth.

As part of our commitment to provide high quality and professional training services to the mining industry, we are always updating our course offerings and identifying new course opportunities. A potential new course we are currently reviewing is a one day "Introduction to Minerals Processing" focusing on common techniques used for Minerals and Ore Types as well as an overview of the processing stages.

Please email Margaret Calder (mcald@runge.com.au) to register your interest for this course. We would also be interested to hear of any other topics that you feel should be included in our range of courses.

Take the time to visit the Runge website (www.runge.com/en/learning_solutions) for the latest schedule of courses. The current schedule to July 2008 is included below.

2008	Mining for Non Miners (Coal)	Mining for Non Miners (Metals)	Mining for Non Miners	Mining Economics	Truck and Loader Systems	XPAC7 Standard Training
APRIL	16th Brisbane, Australia 23rd Johannesburg, South Africa 30th Witbank, South Africa					30th April to 2nd May Brisbane, Australia
MAY				13th-14th Brisbane, Australia 15th-16th Santiago, Chile	12th-14th Santiago, Chile	
JUNE	3rd Brisbane, Australia 19th Johannesburg, South Africa 25th Sydney, Australia 26th Witbank, South Africa	18th Perth Australia	19th-20th Calgary, Canada	19th-20th Perth, Australia		11th-13th Brisbane, Australia



Runge's software newsletter has hit the mark for our current customer base. We have received very positive on the style and content. The newsletter is published every two months, and emailed out to our customers. It is also available on our website at

<http://runge.com/newsletter>.

If you wish to be added to this list or provide comments, please email Anne Horvath (ahorvath@runge.com.au)



Keith Merkley is a Chief Analyst Programmer at Runge Brisbane

Keith's Kolumn

Although it has been around for more than 20 years, flash memory has recently become hugely popular as storage for portable devices. Flash memory works differently to the RAM in your PC and its main advantage is that it is non volatile. That is, it holds its contents when the power is turned off. This makes it ideal for storage applications in digital cameras, MP3 players and as portable storage devices (USB thumb drives).



Flash memory is also extremely robust. It can be dropped, submersed in water, heated to high temperatures and subjected to high pressure and still operate. This is an enormous advantage for portable devices as anyone who has dropped their iPod will tell you.

Flash memory comes in several forms. Each has its own way of interfacing to the flash memory inside the card.



The most widely used is SD or MMC cards. They are used in digital cameras and MP3 players and come in several sizes: SD, Mini SD and Micro SD, but this is merely packaging and adaptors are available to allow you to use one of the smaller forms in

an SD card slot. The USB key has a USB client built in.

Flash memory does have limitations. While it almost matching RAM for read speeds, it is quite slow to write. Some of you may have experienced the annoying several second delay between taking pictures when using



a cheaper digital camera.

The most serious limitation is that it can be written to a limited number of times. This can be over 100,000 times and for many applications this is not a problem but when they are used in a PC as a disk drive, such as the way you might use your USB key, the disk index (File Allocation Table) can be frequently updated and you can certainly get up to the limits of the device. The software has to compromise between updating the tables frequently and ensuring the index matches the contents, while trying to minimise writes. If the device is removed when the table has not been updated, the files might have been written to the memory but you can't see them because the index has not been updated. That is why it is so important to always click on the "safely remove hardware" icon before removing any memory card. That option forces an update of the index and any other writes that might be pending.

What this means is that any flash memory device should be backed up. USB keys do fail regularly and sometimes a re-format will restore them to working order, but not their data.



As flash memory capacity increases, it is becoming possible to replace the hard drive in notebooks with a flash memory drive. Of course the problem with limited number of writes has to be minimised but it means the portable PC can suddenly become much smaller, lighter and more robust. ASUS have brought out the Eee PC with a small flash disk which is proving to be a huge success with travellers. It has lots of compromises but is robust, fast enough, and low-priced so it is finding its niche and succeeding where other small PCs have failed. It has created a whole new class of PC and other manufacturers are frantically trying to create their own version to capitalise on the ASUS success.

For more information go to http://en.wikipedia.org/wiki/Flash_memory

