RAPID RESULTS SUCCESS

KNOWLEDGE AND TECHNOLOGY TRANSFER COLLOQUIUM
BRANDRILL TORREX – RESULTS ACHIEVED WITH SMALL ENERGISED TEAMS

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Introduction

The South African mines have reached a major turning point. The Impalas, Harmonies, Rasimones, Klipspringers, Arms, President Steyns and Petmins of the industry have driven down overhead costs on their operations to the extent that these mines shine once again and the Rand price of their commodities is making them shine even more.

All of this was achieved by doing things differently i.e. the "Harmony Way". Structures changed, procedures changed, workplace culture changed and many more things changed to achieve the performances mentioned above. But the pressure is not yet off. South African mines are still expensive in cash cost terms compared to the international companies. This is mainly due to the fact that not much has been achieved in drastically reducing the operating cost to ensure long-term sustainability of these mines.

The South African mining industry is renowned for their resistance to change. It is then no wonder that we find ourselves in a downward spiral. Inexorable pressures for performance are increasing from all sides, the international market, unions, shareholders and the DME are pushing to accelerate change initiatives, which result in greater disruption, which makes it more difficult to change, which builds the pressure for performance, which leads to more initiatives ……

As a result leaders find themselves on the horns of a dilemma. Their companies need to change faster and faster, yet their employee's energy for change is becoming exhausted. As employees suffer from change fatigue and yearn for less disruption, executives are driving for ever greater change.

Mining companies in South Africa have to compete on their ability to change faster and more effectively than their rivals internationally. Whether the innovation is in strategy, processes, products, services, or organisation; whether the innovation is implicit or an advertised differentiator; whether the company knows it or not, aggressive and accelerating innovation is the leitmotif of the twenty first century.

The Fortune 500 companies are currently spending twice their profits on change. Yet they are satisfied with only half the results.

This is not the only problem as South African mining men/women are not only resistant to change, but also very resistant to assistance.

The first part of this paper will look at why the mines are so resistant to change and how one can accelerate change by energising small teams within the organisation, rather than trying to teach old thoroughbreds new tricks. The organisation has its own ingrained culture and the culture in the mines has been doing things the same way for the past 100 years. These case studies will hopefully show how a new culture can develop in a separate team inside the organisation without being hampered by the inherent culture of the organisation.

Old Thoroughbeds, new tricks; an example

The South African narrow reef mining industry has been breaking rock in the same manner since narrow reef mining started: using explosives. This industry still uses safety fuse and igniter cord in over 80% of its operations. This is technology first used in the late 19th Century.

Since then shocktube based systems and electric/ electronic detonators have appeared in the last 20 years. There have been great successes achieved with these new systems and explosives companies have been trying to roll out these systems for the last 10 years and failed.

The reason is quite simple: If one has been using the same initiation technology day in and day out one perfects the problems encountered with this system through innovation born from experience. It is this comfort level of experience that allows the user to try something different as he knows the limitations. This innovation is transferred as knowledge to other users that have been using that same system, as they are also aware of the problems associated with that system, due to the comfort level reached through their.

Along comes a completely new initiation technology that gets connected up differently, looks different, works differently and is peddled by guys in white coats. The resistance barriers of the experienced users go up. The white coats have achieved their comfort level with the new technology, but have no common platform from which to share with the experienced users of the "old" technology. No comfort level will be reached by the experienced users, as they do not have the experience of the new technology to fall back on. Typical catch 22. These barriers in the mining industry are inherent due to the nature of the beast. The narrow reef mining industry fires in excess of 800,000 holes every day. They have been doing it the same way for the past 100 years. They cannot answer the question: Why do we have to do it differently? As they have been doing it the same way for 100 years.

Pyramids versus Spheres

Lets try to assign some practical structures to the different organisations.

The resistant to change mining industry can be symbolised by a pyramid. Pyramids maintain stability in an environment of incremental innovation, following a strategy of slow adaptation and occasional avoidance. A pyramid is the most difficult structure to move. It sits solidly on its broad base and is difficult to rock. The only way to move it is by nudging it along, but there is a lot of resistance. It is hard, perhaps impossible, to move it very fast.

The ever changing white coats can be compared to a sphere. Spheres reduce disruption amid incessant innovation by developing the maximum number of options, then selecting the most stable. The sphere is relatively easy to move in any direction and can be steered as it is rolled. Change the direction as often as you like. Compared to the other structures, it is highly mobile. Yet, like other structures, the sphere can not be moved up and down – so it is not fully mobile.

Here you have two very different structures that handle innovation and change in very different ways. Pyramids do things the same way and will only gradually change if a strategy of slow adaptation is followed. Spheres need constant change so that the right answer can be found from the maximum number of options. Neither of these structures are right as the nature of the business of either dictates the strategy to be followed when encountering change.

The South African mining industry has been forced by the pressures mentioned before to look at how they are going to deal with change and that a quantum leap is required to remain sustainable.

The two following case studies should illustrate that small energised teams within an organisation can lead the way to acceptance of change and be able to transfer the knowledge gained by changing.

CASE STUDY A: THE KLIPSPRINGER SUCCESS STORY

Introduction

Brandrill Torrex has grown tremendously during the past 18 months and the experience and knowledge transfer that took place with every new project has proven to be very successful. From the planning to the execution of the project, BTX focused on where to adjust and improve, all at a very quick pace.

The objective of this paper is to share information on one of the BTX projects where the input and output formed part of the corporative knowledge base that contributed to the companies' growth. A model will be used to illustrate the BTX way of ensuring that corporate knowledge is transferred and updated.

Klipspringer the BTX way

Klipspringer Diamond mine is situated 20km east of Potgietersrus, Northern Province. The scope of work was to sink 2.27 km of decline and associated level development at a dip of 8,5o and dimensions of 5 meters x 5 meters. Multi-blast conditions apply and the total project team consists of 30 employees including the site manager, services, mining crews and engineering.

Originally there were two teams working two shifts per day. This was changed later in the project to the 3-week cycle where one team is working 12 hours day shift; the second team 12 hours night shift and the 3 shift being 1 week off. This gave teams enough time to rest in between the 2 weeks, 12 hours shifts.

The project duration was planned for 17 months which starting on the 19th March 2001.

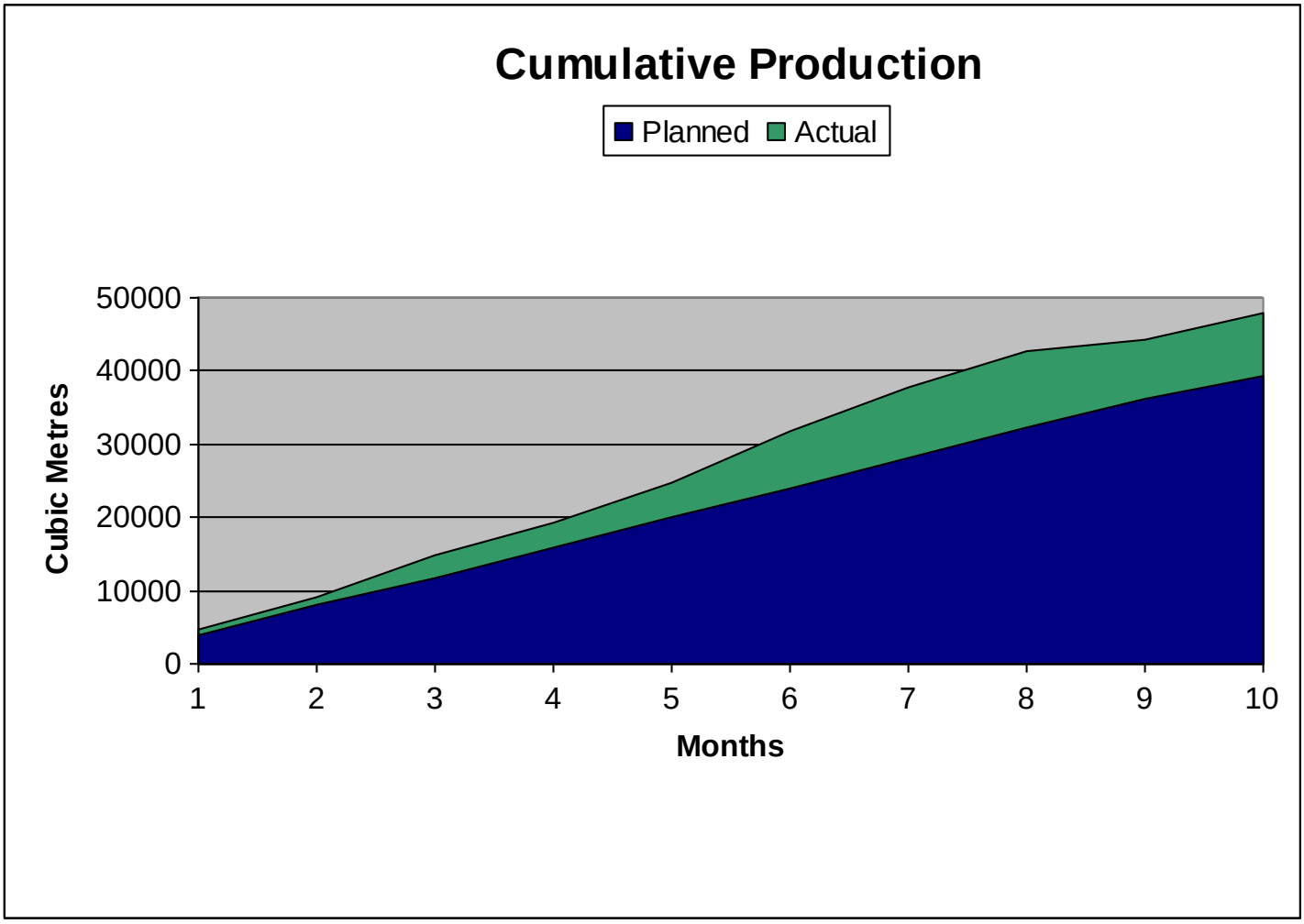
Equipment utilised:
1 x Twin Boom Atlas Copco Rocket Boomer, 1838 Drifters
1 x 12.5 Ton Toro LHD
1 x Bell B40 CM Dump truck
1 x Manitou Utility Vehicle
1 x AEL Emulsion charge up cassette

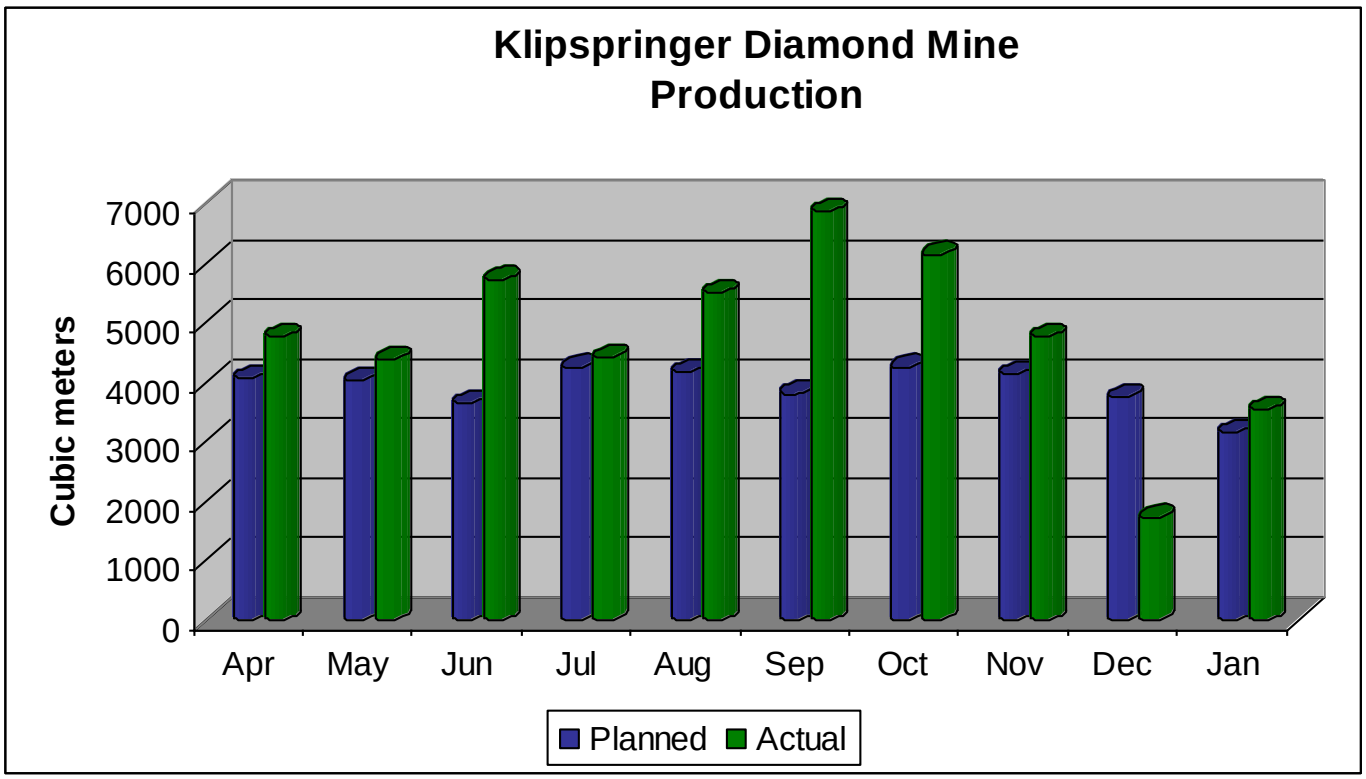
Performance against plan:

- Development achievements that is better than Australian and Canadian achievements – world standard.
- Advance of an average of 240 meters in one month, in a single heading.

	M/month	**m3/month**	**m3/man/month**
Planned	156m/month	3 900 m3	130 m3 / man
Actual	213m/month	5 325 m3	177.5 m3 / man

- Total project labour force inclusive of management - 30 people.
- Project completion currently 2.5 months ahead of schedule.





Experience and knowledge transfer – model

To explain the BTX way a metaphor with the mining cycle in a trackless mining environment, will be used. As the processes of the mining cycle are used to extract ore from a mine, so does there exist a change process to extract people's potential and to implement lessons learned.

Drilling

To achieve the best face break the most important factor is to have a drill pattern and to ensure that one drills 100% according to that pattern.

The drill pattern (plan) for the project was engineered around the following principles:

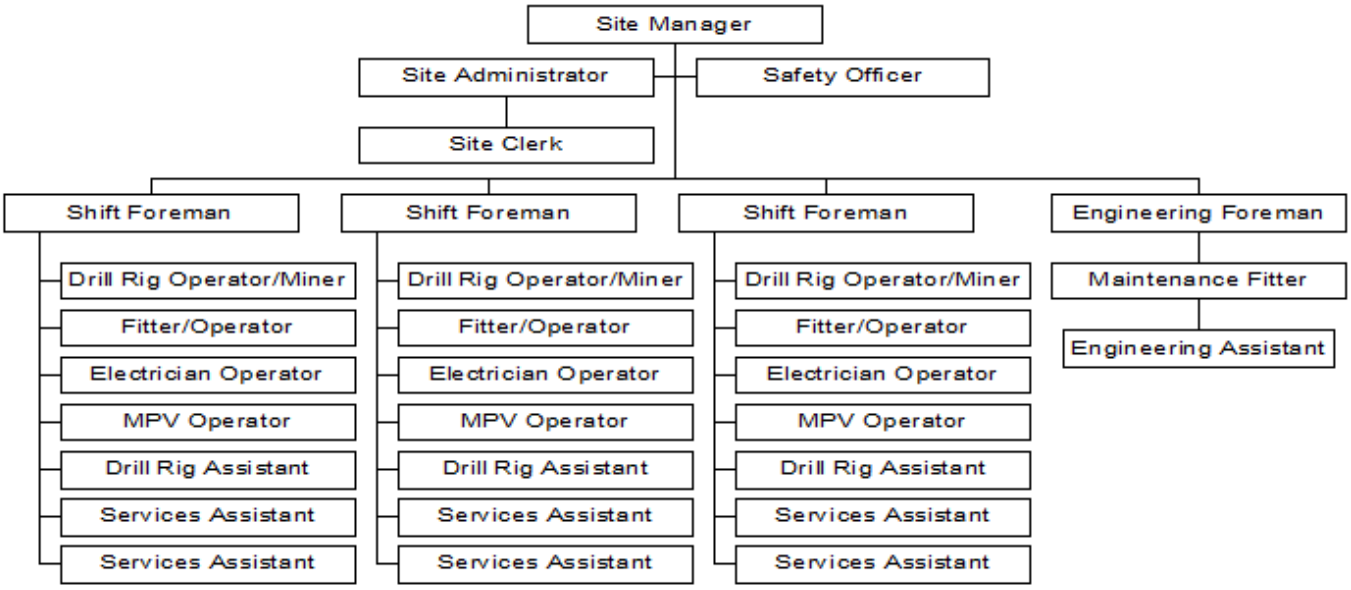
- Mining schedule – A tough but realistic schedule was drawn up with the prerequisite that the right people and the right equipment are utilized with a mining method that would allow for a fully mechanized system.
- Team composition – For the first time the plan was to use very small teams, 8 people that where totally multi-skilled. The flat layer of responsibility would ensure quick decision-making and every employee being held responsible for his actions.
- Equipment selected – The equipment selected was to ensure the best-suited machines within the project scope. What make the difference is the people operating and maintaining the equipment.

Blasting

During the blasting process it is important to charge-up correctly and to use the best suited explosives for this application.

In terms of the model, blasting is a metaphor for the kind of people recruited and the way they are "charged-up".

The Klipspringer Team



- The site manager selected is an extremely experienced person that believe in discipline and communication.
- Most team members had been BTX employees that worked with the Site manager before.
- Some are multi-skilled and those not were trained by the Site Manager and senior team members at the start of the project. The concept of multi-skilling was taken further than what is normally understood. Every team member, including the Foreman can and does operate the entire fleet of equipment. The Engineering team forms part of the mining crew and also operate machines.
- As a result of the teams' small size (8 people per shift), everyone knows what all the others were doing and every team member have to throw in his total weight in order for the cycle to work.

The success of the "blast" phase depends on the kind of people recruited (explosives used) and the way they are "charged-up" through the team structure.

Support

All efforts up to this point can come undone without the correct and efficient support.

That can't be truer for any project and herein lays the heart of knowledge and experience transfer. Support is the management or people systems that are utilised to ensure transfer of knowledge and the quality of results derived from the transfer. The following "people systems" are utilised with great discipline and enthusiasm at Klipspringer project:

Training
Teams had to be multiskilled in order for the mining cycle to work with the number of people per team. Training was therefore a crucial part of every day life. The senior members mostly did training during operations and the Site Manager was frequently present to assist and share his experience. Outside assistance, Australian trainers, were also used and provided team members with knowledge, based on world-class mining operations.

Supervision
There are only two levels of supervision, the Site Manager and Shift Foreman, which makes communication quick and effective, and responsibility clear and understood. The management levels form part of the team and play a supportive and practical role (The Shift foreman is part of a multi-skilled team and operate machines).

Communication
Communication forms the backbone of the operation at Klipspringer. Shift handovers are done very intensively and on every shift change, the whole team is present. The Foreman and Drill rig operator/Miner are involved in the daily planning sessions. During this planning clear daily targets are set which are communicated to all team members, in a manner that everyone clearly understand what should be achieved for that day.
Employees are also involved with the costing. The system requires every order that is placed to include the price of the items ordered, to ensure that all team members know the cost of every item or consumable used. This ensures that no wasting occurs and adding operating cost as a parameter to the remuneration system, enforces it. Employees are informed and responsible for costs, which also impact on their risk payment..

Reward system
Two types of reward systems are used on the project:

- The formal remuneration system which determines that an employees salary consist of a fixed portion and a variable/risk portion. The risk portion varies per level between 30% and 50% of the employees' total package.
- Although the risk portion forms a large part of an employee's total package, employees are given the responsibilities and have the ability to directly influence the parameters against which they are measured. A monthly target is set for development meters to be achieved and the risk portion is calculated prorata against this target. From this a Rand value calculated, money is added or deducted for quality, safety and costing targets that are clearly identified and measured monthly.
- The informal reward system is the initiative of the site manager to reward the teams for achieving results above the set targets, by organising social events, for example a "braai" or family functions.
- Both these systems result in increased levels of team co-operation, increased levels of motivation and ultimately achieving results higher than set targets and equal in world standards.

Cleaning

Cleaning blasted rock away and delivering it to surface is the end result of all the planning done and quality with which each process is executed.

The result achieved during this project is confirmation and reward for a change process successfully executed. The spin off of the Klipspringer process has been echoing far beyond Potgietersrus and has influenced the operations on other BTX projects and the minds of BTX management.

The spin-offs for the Klipspringer team was and is:

- Higher energy and motivational levels that is driving them to even better results.
- A close knitted group of people for whom people systems are a part of daily operations.
- Team members are determining the quality standards and a new member have to participate 100% or are otherwise not accepted as part of the team.
- The project team, including the Site Manager was transformed from "conventional thinkers" to change agents in the company.

The spin-offs within the company:

- The Klipspringer project created new benchmarks for other BTX projects.
- Other project teams were energised to find ways of achieving better result.
- A domino effect is created where-in teams are in constant competition within sites and between projects to outperformed the latest best achievements.

Conclusion

We have learned a lot from the Klipspringer experience and the knowledge and experience gained at this as well as other projects, has become part of new Corporate Knowledge. The process provides a framework within which new knowledge can be integrated to ensure the transfer of corporate knowledge to new and existing projects.

The Klipspringer project is an important tonic within BTX's growth and the energy created there has been spiralling upwards ever since and given momentum and speed to the change process within BTX. The BTX way has become a way of continuously stretching the norms using past experience and knowledge to dream about new realities.

CASE STUDY B: TRIAL STOPING WITH PCF™ TECHNOLOGY

Introduction

Trial mining at President Steyn's 1A Shaft will be carried out over a six month period using PCFTM Technology in stope faces. The project is a Joint Venture between Brandrill and the Mine, with the intention of proving the technology to a point where progressive rollout into the Mine's current production activities could be contemplated, both on technical and commercial grounds. The Case Study describes the concept of a Super Team being created and how they managed to deal with change during the R&D phase to achieving results when compared to a production team.

PCFTM Technology

The fundamental principles of the technology have been proven, and current research and development (R&D) focus is to establish a full operational Continuous Mining System in the workplace. The President Steyn Gold Mine (PSGM) trial mining project is representative of this R&D focus, directed at deep level, tabular, narrow vein hard rock mining environment in mature mines.

Project Scope

The original project scope involved PSGM making available two areas available for stoping, one on the "A" Reef, the other on the "Basal" Reef, both accessible from the 27 Level of the recommissioned 1A Vent Shaft. In terms of the Joint Venture agreement, revenue received from gold produced would be offset against the project costs, and anticipated loss shared between the two parties. Each stope would be manned on a 3 by 8 hour shift basis. The Super Team included all members of all three shifts in the one stope. The Super Team was given the objective of achieving 100% breaking with the PCF™ technology to the extent that production efficiencies would outperform conventional mining methods.

Knowledge Capture and Storage

PCFTM Technology components in themselves possess little value unless integrated within an operational Continuous Mining System. Progressive development of this system to optimise the utilisation of the components therefore represents important Knowledge, which requires data capture and storage. In an environment where, for a number of reasons, primarily related to the conditions under which work is carried out and workforce literacy limitations, initial recording of pertinent information is difficult.

At PSGM, the preferred input document, the "Inventors' Pocket Book", is of necessity complemented by a combination of Miner and Shiftboss daily reporting, codes of practice, risk assessments, supervisory work instructions, DME permissions and concessions etc. Each knowledge record is entered into an MS Access database, which contains the necessary cross-referencing to paper or other electronic records, and forms a base document for transfer of knowledge beyond the project itself. Integration of this database with similar databases being generated by other Brandrill operations is an important further step to ensure that once roll-out is achieved knowledge from all operations is captured and available to all.

The Super Team Concept

Supervisory staff per Shift Stope Crew x 3
- Shift Boss
- Miner

Production Labour per Shift Stope Crew x 3
- Rock Drill Operator (2 no)
- Machine Assistant
- Charge & Stem Operator (2 no)
- Support Personnel (2 no)
- Face Cleaning Operator
- Gully Cleaning Operator

Note that the unusually heavy complement of supervisory staff was deliberate for the trial mining phase, but would progressively reduce to normal supervision levels during roll-out. Overall project supervision was provided by a full time Site Manager, reporting to the Mine Shaft Overseer. In addition, a full time IP Developer was employed, and comprehensive training support provided both by Brandrill and TMTI (the PSGM Training School) personnel.

For the team to operate as a team, it was decided from the start that team-based training would be implemented to allow the team to choose their own destiny and to ensure that the team dynamics were built around self-directed principles.

The concept for team-based training is as follows:

- The Shift Supervisor is to recruit and select his miner/s. The Miner and Shiftboss then select the crew needed. This assists in the moral and the supervisors cannot blame others for poor selection of the team.
- The entire team is then employed and starts work as a team.
- Theoretical training is completed in a training centre. The team works out realistic cycles and cycle times. These are then practiced in the training centre or in a non-production underground stope. They must understand the principles of pre-planning the tasks that lay ahead to complete the production cycle.
- Once the team is familiar with the cycle and the related times the team is then placed in the production environment. The team must be kept together and not split up into other teams or shifts. Planning for the next task in the cycle is crucial in the team based concept.
- Careful selection must be made in which categories of work multiskilling will be done. The machine operator is to remain a skilled person. Multi tasking should be done in the ranks of winch drivers and assistants.

Multiskilling in this sense means, each trained to carry out any of the stope crew functions, and thus fully interchangeable. In order to maintain multiple skills, systematic rotation of crew functions was required.

Performance of Super Team

Although an R&D trial the emphasis was on achieving measurable results that could be compared to conventional mining methods. The trial will be completed in February and to date the achievements can compare to the conventional mining system in use.
The Super Team has shown that a new technology can be embraced by a focused team and that by applying knowledge learnt and communicated by all in a self-directed way results can be achieved. It is important to note that the Super Team was responsible for the development of the system and responsible for the results achieved through applying the changes.

Leasons learnt from energised teams

- New Technology can lead to successes when implemented in the correct manner.
- Modification of teams to comply with, and take practical advantage of, workplace changes made possible by the South African National Skills Development framework, and establishing close liaison with the Mines Qualification Authority (MQA), for example expanding the proposed Level 3: Rockbreaking qualification to include a NQF recognized Level 3: PCFTM Rockbreaking qualification.
- Implementation of the Self Directed Work Team (SDWT) training concept, to improve crew teamwork and motivation.
- Establish collective ownership of safety and health issues.
- Extension of stope crew teamwork into SMME enterprises.
- Mechanisation such as Novatek stope drills.
- To provide a framework within which new co-operate knowledge can be integrated to ensure the transfer of co-operate knowledge to new projects
- Replacement (partial or complete) of scraper cleaning with high pressure water jets and/or vacuum machines

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