Development and implementation of the self-directed work team concept at Kopanang Mine

FJ Fourie – General Manager

Synopsis

"Adapt or die" is the adage for survival under changing circumstances. It is especially applicable to mature gold mines of which Kopanang is one. In response to the need to maintain profitability, one of the strategies adopted by Kopanang was an organisational development intervention to achieve labour productivity improvements. Although greater benefit would accrue from improvements in labour efficiency in the stoping activity rather than in the development activity, in order to accommodate the former, the additional face length required meant that the initiative had to be started with the development crews. Following completion of training of the stoping crews, it has been extended into all underground production and support activities in the mining discipline. Having overcome the initial widespread scepticism, the rate of its introduction has only been constrained by the availability of training resources. So keen were crews to participate in it that demand exceeded supply. Built on the experience of earlier attempts at other mines, and including the additional element to which is attributed Kopanang's ability to succeed to a degree previously unmatched, the approach is categorised as the self-directed work team (sdwt) concept. Kopanang's version became known as the "Power team" approach. This change in performance did not take place in isolation, and associated process modifications and organisational changes, some of which were necessitated by it, and others which were made possible as a result of it, are briefly mentioned. Kopanang's success in achieving continuous improvement over the last four years is reflected in a doubling of the expected life of the operation.

Introduction

Innovative approaches to the stoping operation involving the sdwt principles, with or without multi-skilling and multi-tasking, were applied with some success at mines which were part of the Anglo American (later AngloGold) stable during the 1980s and 1990s. Noteworthy among them were Elandsrand, Free State Saaiplaas and Freddies. With few exceptions (eg Tshepong, previously known as Freddies No 1) these ventures failed due to a combination of cultural and organisational reasons. A serious shortcoming that had been experienced at most sites was the inability to translate the improved performances outside the given milieu of supervision. Kopanang is their successor and beneficiary of their efforts. It is also special in that it is the only mine to have achieved mine-wide implementation of the sdwt concept.

Three strategic goals are recognised as being of paramount importance to Kopanang, and they are:

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

- minimisation of the serious injury rate
- maximisation of the m²/direct employee costed
- minimisation of the Rand/m² cost

To this end, experiments on continuous stoping techniques (previously reported in a separate paper by MP O'Hare) had been conducted at Kopanang. Unfortunately, results from the experiments were unsatisfactory, and strategic planning outcomes were showing that without an urgent and successful response, Kopanang would be unable to remain profitable beyond about halfway through the first decade of the new century.

By this time, that is over the years 2001 to 2003, a number of factors combined to create an opportunity for Kopanang to revisit the sdwt concept with a better than average chance of success. Among them were:

- a stable labour force which provided for an experienced core in each production crew
- societal changes since the 1994 election which by this time were manifesting themselves in increasing demands for greater control over personal development and earning ability
- the existing involvement of workers in decision-making processes affecting them which had naturally led to their inclusion into the production planning process

The executive team recognised that if the sdwt concept were to be successfully introduced at Kopanang, it would be necessary to identify the key elements of the process and the reasons for previous failures before these potential advantageous circumstances could be utilised. Common to the earlier interventions were the aspects of supervision and empowerment. At Kopanang, the author introduced a third entity, namely enablement. From analyses of some of the failed implementations, it was felt that a major contributory factor to the lack of transferability of previous performances had been the inherent leadership skills in the successful proponents, which were lost when they moved away. It was felt that by formalising the effect of good leadership in the enabling activity, the dependence on strong or charismatic leaders was reduced, and chances of success were likely to be enhanced. Put another way, there appeared to have been an oversight in previous interventions, the result of which was a failure to cement the changed behaviours, or to equip the participants with the means and knowledge to continue in the more productive mode. Enablement was the term chosen to describe the hitherto "missing" element, and the results achieved at Kopanang speak for themselves. Kopanang is now able not only to look at an extended profitable life, but also to consider some possibilities for expansion.

Contributing to the result were strong commitment, leadership and sustained involvement by senior management, together with reinforcing behaviours at all

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

levels within the organisation. The turnaround has been achieved through a concerted effort and a coordinated approach involving not only the sdwt concept, but also the associated changes required sustaining and maintaining the different behaviours and complementary changes to the infrastructure and processes that were either required for, or enabled by the sdwt concept.

A reduction in the stoping cost, achieved mostly through improved in-stope labour efficiency has been achieved. Not all changes have in themselves resulted in cost reductions. For example, explosives now constitute a larger proportion of the unit stoping cost. Nevertheless, the overall impact has been to materially improve the return on expenditure in this aspect of the business.

The structure of the paper follows the historical development of the sdwt concept intervention. Contextual information about Kopanang Mine is provided together with details of the profitability situation that pertained. A description of the approach and development of the "Power team" process follows, and this incorporates salient points from the crew training programme. Associated organisational and process changes that had a bearing on the results are noted. The process has been in progress for over three years, and successive sets of objectives have been designed to ensure that the vision was realised. Key parameters (see Appendix 4) have been selected to demonstrate the results that have been achieved.

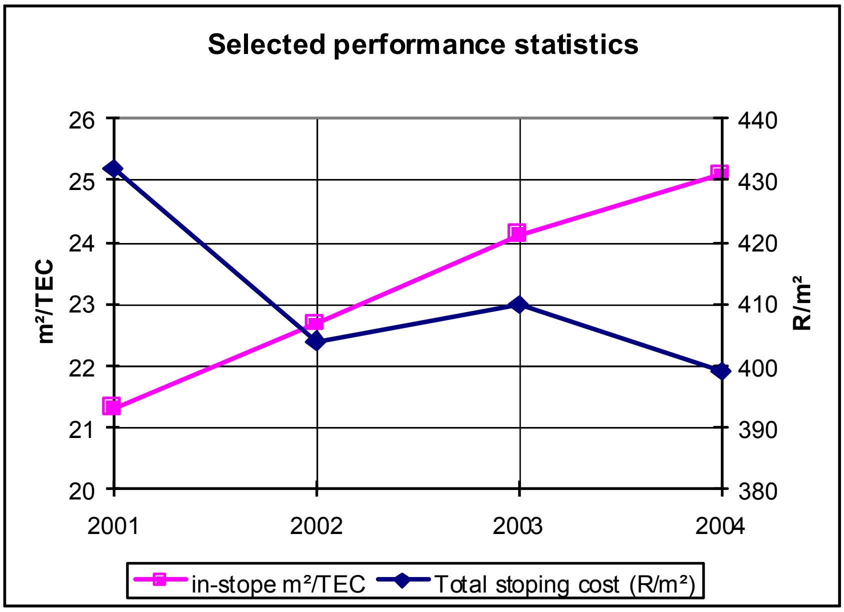


Figure 1: Selected performance statistics

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

Background details of Kopanang mine

The name of the mine is a word in the Sesotho language which means "a place where people come together" implying somewhere pleasant and comfortable where good fellowship and mutual respect is shown. Kopanang Mine has lived up to its name by demonstrating that it is adept at harnessing the strengths of its 5 400 strong workforce to remain among the front-runners among AngloGold Ashanti's stable of South African Mines (see Appendix 3).

Located about 160 kilo metres southwest of Johannesburg, near the towns of Orkney and Klerksdorp in the North West Province of South Africa, the mine originally formed part of the Vaal Reefs Exploration and Mining Company as its No 9 shaft. Shaft-sinking in the South Vaal lease area, began in 1978 and proceeded to a final depth of 2 240 metres. The first gold was produced in 1984. The modern-day Kopanang Mine comprises 15 levels of which 10 are fully operational production levels. Mining takes place at an average depth of 1 770 metres below surface, and approximately 226 000 tonnes of rock are hoisted per month. Because Kopanang's ore body is geologically complex, a scattered mining method is applied to ensure optimal gold production. Access to the orebody is obtained through footwall tunnelling on a regular grid pattern with crosscuts at about 180 metres interval on strike, and raises on the dip of the reef. About 2 100 metres of development is carried out each month. Stoping is performed on strike, from panels of about 24 metres in length. The production rate is measured in square metres owing to the narrow, tabular nature of the orebody, and averages about 41 000 square metres per month. The monthly production of gold is about 1 250 kilograms.

Ore is treated at the Kopanang Gold Plant, which is situated next to the mine. The milling and treatment process uses semi-autogenous grinding and carbon-in-pulp technology. Kopanang feeds one of the two plant streams with predominantly Vaal Reef ore while the other stream is fed exclusively by Ventersdorp Contact Reef from AngloGold Ashanti's Tau Lekoa Mine. The metallurgical process is augmented, for both streams, with low-grade ore from waste dumps. The plant's throughput capacity is 417 000 tonnes per month.

Kopanang has access to an estimated gold reserve of 15.1 million tonnes at 8.09 grams per tonne, which equates to 6.07 million ounces. The mine's resources are 24.5 million tonnes at 18.73 grams per tonne, which equates to 14.8 million ounces.

The effect of the profit squeeze on Kopanang

The strategic planning analysis performed in 2001 showed that the intersection of the forecast cost curve (based on 8% annual increase) and the forecast revenue curve (based on 4% annual increase) would occur in 2004. Mindful of the responsibilities to the stakeholders, that being continued employment for employees and profitability for shareholders, the executive

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

committee undertook a strategic planning initiative to identify an intervention to postpone this event. Despite achieving a cost reduction forecast from 2001, a fall in actual revenue negated the gains, and the associated strategy (shown

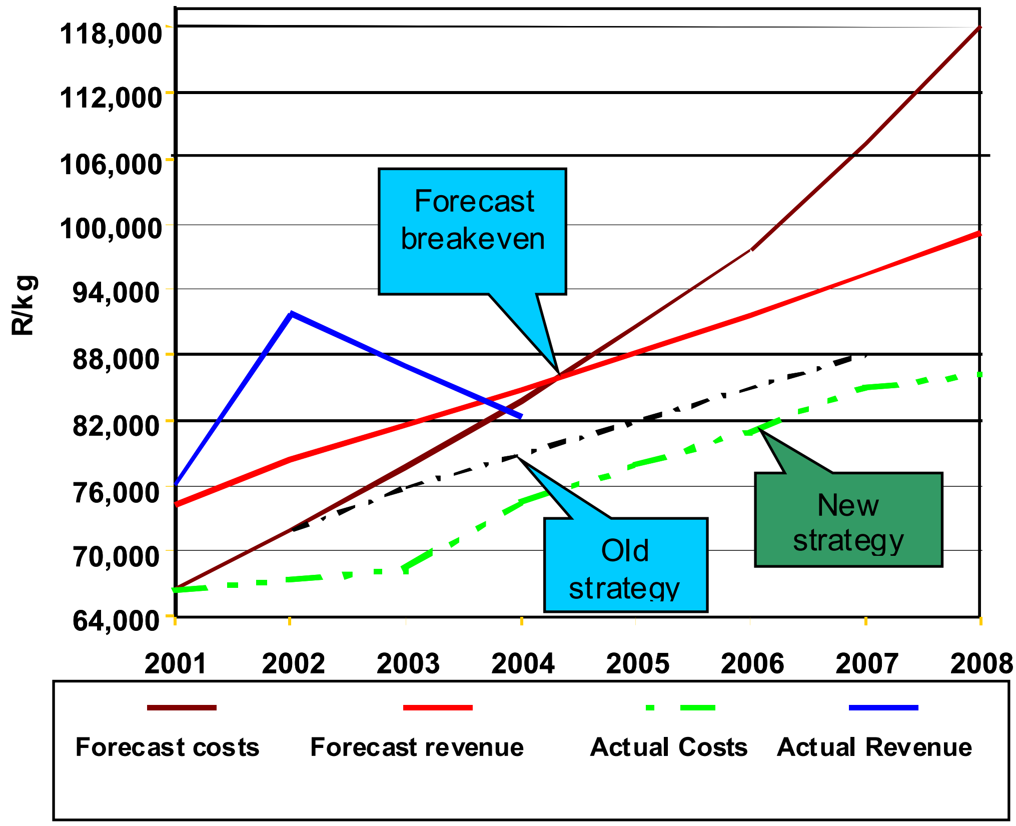


Figure 2: The effect of the profit squeeze on Kopanang

as "old") in the graph above was unlikely to make any material change to the forecast breakeven date.

An iterative approach was thus likely to be ineffective as a solution to Kopanang's problem. Radical change was indicated, and the decision to rejuvenate the core activity was taken.

Development of the sdwt concept into Kopanang's "Power Team" approach

Empowerment of motivated crews within an enlightened supervisory structure has been the basic sdwt concept model applied at various mines. Initial success has been variable, and sustained success has been limited. In many

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

of the failed implementations, circumstances dictated that it was easier to revert to traditional methods than to persevere with change. These responses to adversity arose as much from attitudes as from logistical and organisational shortcomings. What makes the Kopanang organisational development intervention different is the incorporation of a third element, namely "enablement". At Kopanang, the management team was prepared to change processes and procedures to allow the "power teams" (a term that was not specifically coined, but which came into general use when it was seen that improvement in the core activity would give Kopanang the "power" to control its destiny) to operate effectively. The consequent changes were not restricted to the production activity, and they included standardisation of support media, blasting and fragmentation developments and improvements in the rock transport process efficiency. (Details of this work will be the subjects of later papers).

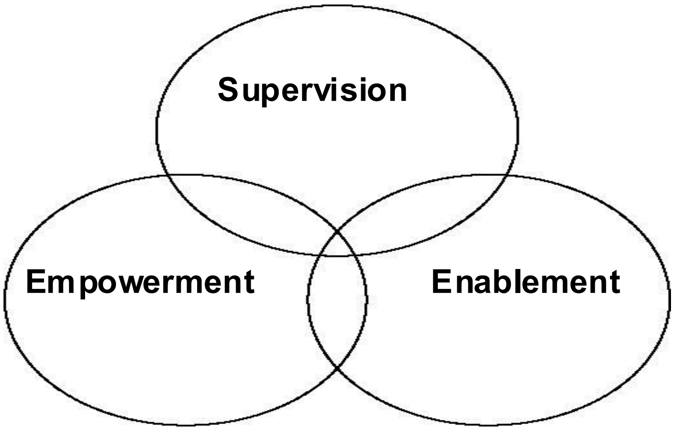


Figure 3: Interlocking elements of the Kopanang intervention

From personal experience and utilising programmes that had been implemented at Elandsrand Gold Mine, Mponeng Gold Mine and some platinum operations, the structure of a crew training programme was developed by the author assisted by the training expert on Kopanang. A task group determined its complete form and content. As noted above, the particular aspect that made the Kopanang approach different was enablement, and the activities that were encompassed by this term were identified during a strategic planning workshop held in 2002. For clarity of understanding, the empowerment activities and enablement issues are listed in the tabulation below.

The items listed in the "enablement issues" column reflect a number of the problems and inherent inefficiencies in the Kopanang infrastructure and organisational responsibility structure that were to be addressed as part of the intervention. For the benefit of readers, it must be noted that a list such as this would be unique to each site at which the intervention was intended to be

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

implemented. Its contents must be developed from an analysis of the operational bottlenecks, shortcomings and other inefficiencies.

Empowerment activities	Enablement issues
• Training • Team building • Communications • Problem Solving • Meeting • Understanding culture • Finance • Bonuses • Measurement • Cost • Cyclic mining • Standards / procedures • Efficiency	•"Ring-fenced" areas of responsibility for Mine Overseers •Measuring cycles •Shaft times / cycles / schedule •Vent change-over •Construction of F/walls / haulages •Automated bonus system •Watergel explosives •Lamproom ergonomics •Layouts •NX Holes •Interlevel ore passes •Big Mamma (high-speed, high-tonnage loco) •Compressed air and water services •Waterjets to assist stope face cleaning •Battery-charging bays •Hopper and loco fleets optimisation •Chairlift •Man carriages •Reduced number of options for permanent support •Reduced number of options for temporary support •Power Plates for pre-stressing •Material car stacking optimisation •Standardised blast initiation •Reduced number of options for monorope pulleys •Drills for ventilation curtain installation •Shackles and pins standards •Timber bays •Robots for traffic control •Pumpsumps

This particular list is only directly applicable to Kopanang as things stood at the time; more details of the items are provided below. The changes were based on the need to improve efficiency, reduce cost, improve quality, guarantee safety and combinations of these factors.

- Prior to rationalisation, Mine Overseer sections overlapped each other and there were interdependencies that had become potentially counter-productive. The so-called "ring-fencing" not only provided for autonomy and independence, but also resulted in a reduction in the required number of Mine Overseer sections. Section Managers were provided as far as possible with dedicated service personnel, and were thus in a position to reinforce the team concept within their independent areas of responsibilities without interference and congestion.

- The item "measuring cycles" refers to a change from a thirteen period annual measuring schedule to a standardised length "month" and a twelve measuring periods per year based on an

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

11-shift fortnight. In this way production periods were better balanced. This change was accompanied by arrangements for working on Saturdays whereby the feed to the plant was smoothed; half of the workforce worked alternate Saturdays.

- Ventilation constraints were reflected in the relatively high temperatures in panels arising from resistance to flow and low available quantity. These were countered by creating intakes below the working areas and by reducing the extent of the areas being mined. Currently the average temperature is 28,5°C. Humidity control was enhanced by haulage footwall construction and a piped drain water reticulation system incorporating NX holes.

- Transport of broken rock was improved by the provision of a dedicated orepass for each panel and by the development of interlevel orepasses sited at the "centre of gravity" of the workings. These were themselves served by a high-speed high-tonnage rock transport system. Congestion was further reduced by the separation of man-, material- and rock-transport activities.

- The service water reticulation network was upgraded, and a reduction in consumption was achieved through assistance for scraper cleaning of stope faces being provided by waterjets.

- Battery charging bays were relocated nearer to the workings in the interest of increasing the availability of locomotives. The fleet of locomotives and hoppers was scrutinised and standardised to identify excess rolling stock, and these items were removed from the workings.

- The average distance from the shaft to the workings is 4 kilometres. By replacing man-carriages with chairlifts for part of this distance, and transporting development crews with the man-carriages, reductions in travelling time have been achieved, thereby increasing the effective shift time.

- The permanent support standard was changed from a 75cm composite unit to a 45cm Lexus unit, specially developed for Kopanang. This not only provided for a support regime with improved resistance characteristics, but transport of support material is more effective; fewer units are required to build a pack. Greater consistency of pre-stressing of packs is achieved by the use of power plates pumped with water.

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

- Flame-free sequential firing has been achieved through the use of handidets™

- Standardisation on only two types of monorope pulleys has enabled more consistent quality of installations as well as a cost reduction

- To assist in improving in-stope ventilation, curtains are suspended from supports inserted into holes drilled into the hanging wall thereby improving their effectiveness

- Shackles and pins for rigging have been standardised

- Re-usable "M-props" have been introduced as temporary support, providing reductions in transport requirements and improvements in labour utilisation and flexibility

- Timber storage bays have been provided for each stope

- Traffic control by means of robot signals has been introduced to reduce congestion

- Lamproom ergonomics were reviewed and in addition to improvements in the flow of people through this facility, controls have been added at turnstiles to ensure that supervisors have the required instruments in their possession and that they have properly tested them

- Simplification and automation of the bonus system has enabled payments to be processed within 48 hours with a concomitant reduction in associated industrial relations problems

- Watergel explosives, specially developed for Kopanang, have resulted in improved fragmentation and MCF; cleaning, mud generation and belt transport are more efficient.

Management of these changes and the issue of resistance to change was consciously addressed by selection of the sequence of associated innovations. For the direct stoping activity, the sequence was firstly, standardisation of permanent support, followed by that for temporary support, then the change to emulsion explosives (an intervention to address a problem of low MCF and as such not a topic within the scope of this paper) and lastly the blast initiation system.

To address the concerns of the miners arising from the proposed change to the method of remuneration from a contract basis to a bonus, a series of combined workshops was held with them and their representatives. Initially misgivings and uncertainty were expressed, but the sessions were successful

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

in achieving agreement to try the scheme, and since then it has been accepted. An element which has contributed to its acceptability has been the increased level of crew bonus earnings; this aspect produced more requests for training to participate in it than the training infrastructure was capable of accepting. Production line supervisors initially viewed the proposals with healthy suspicion, but their resistance was overcome through a similar mechanism to that employed for the miners. Convincing the senior management team and the executive committee occurred at a financial presentation and strategic planning process; the rapidly approaching end of profitable life for Kopanang was obvious to all of them, and approval was given to the author to build a detailed crew training programme and sequence for the "Power Teams". It could be said that in the light of the stark realities of an imminent lack of employment possibilities, the matter did not take too much effort to convince the various interest groups, but it was a vital step in minimising resistance to change, and to show management's bona fides. The production crews were subjected to an organisational climate study, the purpose of which was to determine the areas of dissatisfaction, and to prioritise corrective steps. They were not specifically incorporated into the change management strategies mentioned above.

The major motivator has been that the crews are enabled to measure their own performance, and plan their own level of income in a simple way.

Members of production support activity crews such as vamping equipping, rigging, tramming, transport, haulage maintenance also participate in the training. These crews serve as a feedstock for production crews, and thereby the possibility of higher bonus earnings is an incentive for good performance in these activities. Details of the training programme appear in the next section.

Discipline in a crew is their own responsibility, and they are entitled to request that a member be replaced. Subject to the Mine Overseer's approval, a "demotion" to a production support crew may take place, and someone from a support crew will be "promoted" to replace the person so removed. The immediate effect on the demoted individual is a reduction in potential bonus earnings, and the possibility of such action serves effectively as a deterrent. An alternative disciplinary measure is available which is less drastic, and that is a bonus cut of up to 20% of earnings for an under-performing individual. The crew may make such a request to the Mine Overseer, and it must be accompanied by a motivation. Changes in crew strength are determined by the team themselves, together with specific nominations for the people who are to be added or removed. Human Resources department officials may make no unilateral changes; the crew Team Leader has to first be consulted, and has final say.

Target-setting begins with a meeting between the crew and their shift overseer at which an indicated goal is discussed. The crew members translate this into a commitment together with a resource requirement

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

covering their labour and equipment. For a planned output of 400m², the crews themselves decided to reduce the labour requirement from 24 people to 17. Those released were utilised to form additional production crews. Experience has shown that it is more likely that the crew target may have to be adjusted downwards than in the opposite direction; the incentive for optimal bonus earnings provides the motivation.

Unplanned events and treatment of unexpected problems are the main focus of the shift overseer's and Mine Overseers' activities.

The bonus scheme is an integrated structure, the key element of which is the stoping crew's earnings. For labour efficiency achieved above a threshold, an amount of money is payable in proportion to the number of shifts worked by each crew member. Support crews earn reduced percentages of the amount; supervisors earn consolidated amounts of their crews' payments. Details of the bonus scheme are provided in appendix 2.

By the third quarter of 2004, all direct and production support crews had passed through the 'Power team" training process.

Details of the "Power team" training and development

Diagrammatic representations of the three-week training programme, and of the administrative processes supporting it, are included as an appendix 1.

Three crews begin training at one-week intervals; each led by a specific training officer. An additional training officer is concerned with on-the-job follow-up on crews that have completed the course. On completion of the training, a crew returns to the working-place from which it came; it has to have been properly supported to ensure that it does not deteriorate during their absence.

On the preceding Thursday, the crew is given details of the three-week course they are about to begin, and are assured that a "bonus" payment will be made to ensure that they will not be financially disadvantaged during the period.

The course itself is always opened by the General Manager, and the closure event is attended by all members of the executive committee. In this way, senior management commitment to the ideals and aims of the programme are visibly demonstrated to the crews. The programme follows the classic behaviour modification process, viz:

- unfreeze existing behaviours,
- provide information about new desired behaviours,
- refreeze the changed state.

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

Instruction takes place through the medium of game-playing. Training officers provide a facilitation role as well as a training function for some of the topics. However, service department managers provide instruction in their areas of responsibility, and equipment providers are utilised to make presentations on their specific equipment items. The Mine Overseer and assistant personnel officer respectively show the crews how to carry out 3-month production and manpower planning.

Crews begin the training process by establishing their own values and rules of conduct. Commitment to these rules has had a noticeable bonding effect on the crew members, and appears to have a self-sustaining effect that is demonstrated by rising levels of output. The need for change is the first element of the unfreezing process, and a version of the graph included above to demonstrate the profit squeeze is used. The first week also includes skills transfer in the areas of conducting meetings, problem-solving, leadership styles and discipline. New knowledge on subjects such as economics and taxation is tied into a business game and its effect on earnings.

During the second week of training, the major elements of changed technologies (the enablement issues) are introduced to the crew, and for many of the sessions representatives from the suppliers or manufacturers of the equipment make the presentations. Later in the second week, topics pertinent to gold economics are covered, with specific reference to what the crew can control and contribute towards the achievement of the mine's strategic goals. An opportunity is provided for the crew to air any perceived grievances they may have. It should be noted that the timing and management of this session requires care to ensure that it does not result in unjustified negative outcomes.

The third week includes the practicalities of measuring and plotting and perhaps most importantly, the "high rope" exercises which serve to simultaneously promote the senses of individual achievement and mutual trust that are vital for team cohesion.

Follow-up to confirm that the training is being utilised, and to identify any shortcomings is undertaken at increasing intervals. This is shown in the Power Team Process diagram in appendix 1.

Experiences and results achieved

During discussions on the programme and bonus scheme, one crew volunteered to be the first. This fact had the effect of removing a lot of the initial scepticism, and contributed to the rapid reduction in resistance to the change. Initially, there was a dip in production caused by the absence of crews from their working places for the duration of training. This has since been more than made up for by the enhanced performances being achieved.

Deleted: 14/07/2005

Inserted: 14/07/2005

Deleted: 03/06/2005

Inserted: 03/06/2005

Deleted: 26-May-05

Total stoping cost (real) improved from R432/m² in 2001 to R399/m² in 2004. This represents an 8% improvement over the period. It is equivalent to cumulative savings of R38,5 million. The single biggest contributing element to this has been the improvement in labour productivity, as evidenced by the efficiency and labour cost R/m² statistics in appendix 4.

By having a crew volunteer to participate, no special incentives were required to initiate the Power team concept. The only significant modification that has been made to the original programme sequence is that the "gatkrap" (grievance airing) session has been rescheduled further into the course than its original location near the beginning. Ongoing motivation utilises the current status of the data shown in the graph of the profit squeeze that appears above.

Key parameters are included in the tabulation in appendix 4 to show the effect that the Power team concept has had on Kopanang over the last four years. It has made a major contribution towards the three strategic goals listed in the introduction.

Future development (Phase II)

The next phase of the intervention is to improve the output of each crew through increasing the rate of face advance and/or MCF. In the long term, a reduction in total face length mined, with a higher rate of advance is the desired aim. The second wave of the intervention will involve improved explosive efficiency and cleaning in a different cycle of activities, that is performing cleaning and support at night, and restricting dayshift activities to drilling and blasting. The distance of workings from the shaft is increasing, and this will be accommodated by the shorter cycle. In-stope manufacture of watergel explosives will be introduced. Employee numbers will continue to be reduced purely through natural attrition.

Acknowledgements

Continuing commitment and support from all the employees of Kopanang has brought the mine to the position of strength in which it currently finds itself, and from which it will be able to grow. The author is grateful to them for their efforts, and to the senior management of Anglogold Ashanti's South African operations for their assistance, and also for kindly giving permission for the publication of this paper.

Deleted: 14/07/2005

Inserted: 14/07/2005

Deleted: 03/06/2005

Inserted: 03/06/2005

Deleted: 26-May-05

Appendices

Appendix 1

“Power team” training programme and process diagrams

Appendix 2

Bonus scheme conceptual details

Appendix 3

Ranking of Anglogold Ashanti’s South African gold mines

Appendix 4

Selected performance statistics for Kopanang.

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

Appendix 1
"Power team" training programme

DAY 1

7-8	Opening and registration
8-9	Facilitator and trainee introductions
9-10	Course norms/name/objective
10h30-11	Why Kopanang needs change
11-11h30	Exercise
11h30-12h30	Handling conflict
12h30-13	Rational thinking
14-15	Communication

DAY 2

7-8	Recap day 1
8-9	Team name/song
9-10	Meeting skills
10h30-11h30	Problem-solving skills
11h30-13	Creating initiatives
14-15	Exercise

DAY 3

7-8	Recap day 2
8-8h30	Economics
8h30-15	Business game

DAY 4

7-8	Recap day 3
8-8h30	Leadership styles
8h30-10	Discipline
10h30-11h30	Super predators video
11h30-12h30	Power team concepts
12h30-12h30	Team values

DAY 5

7-8	Recap day 4
8-13	Bonus and tax
14-15	Exercise

DAY 6

7-8	Recap week 1
	Contractors' training
8-9	Camlok
9-10	Board drilling/SECO
10h30-12	HIV/AIDS
12-15	Handimaster™

DAY 7

7-8	Recap day 6
8-9	Khuluma gahle meeting
9-11	Practical measuring and plotting
11-13	Hot chair
14-15	Safety lecture

DAY 8

7-8	Recap day 7
8-9	Exercise
	Contractors' training
9-12	Lexus packs
	Lazer metal pressing
	Comec mono pulleys
	Duraset packs
	Safe-T-pack mono pulleys
13-15	Exercise

DAY 9

7-8	Recap day 8
8-9	Gold video
9-13	Gold economics
	geology
	sampling
	survey
	costing
13-15	Rock engineering

DAY 10

7-8	Recap day 9
8-9	AEL
9-10	Cost awareness
10h30-11	Stoping width
11-11h30	Shiftoverseer budget
11h30-12h30	Hostel
12h30-13	"Gatkrap"
14-15	Exercise

DAY 11

7-8	Recap week 1 & 2
8-13	Practical measuring and plotting
14-15	Exercise

DAY 12

7-8	Recap day 11
8-10	Practical measuring and plotting
10h30-13	Standards
14-15	Stop-start procedure

DAY 13

7-8	Recap day 12
8-13	High ropes
	- climbing wall
	- catwalk
	- wild woozy
14-15	Exercise

DAY 14

7-8	Recap day 13
8-10	Planning
10h30-12	Leave planning
12-13	Role clarity
14-15	Exercise

DAY 15

7-10	Final overview
10h30-12	Speech preparation
12-13	Final team exercise
13	Closure and team certification

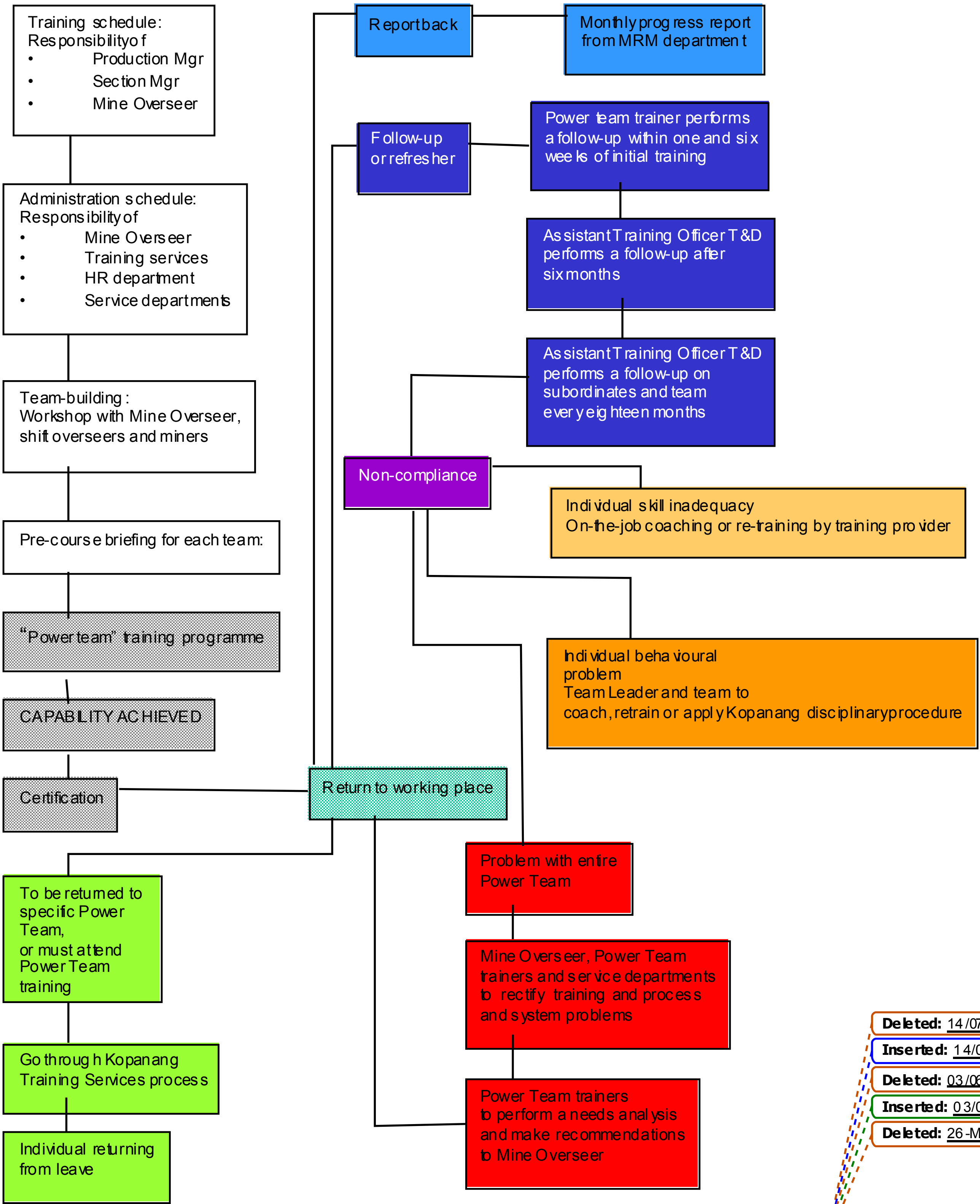
Unfreezing - To make the team ready for change

Changing – Team ready to learn new patterns of behaviour

Refreezing – Fitting new behaviour naturally into the team individual's personalities

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

“Power team” training process



Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

Appendix 2

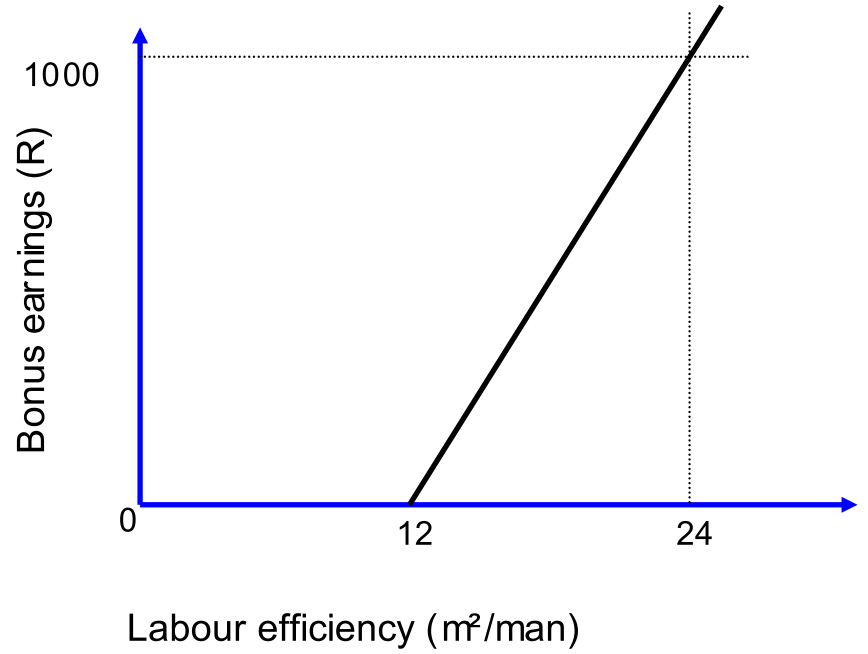
"Power team" bonus scheme concepts

A base of acceptable performance was determined from direct labour efficiency averages across the industry. In the case of stoping, a figure of 12m²/man was determined, and that for development was 3m/man. Performances below these thresholds attract no bonus payment.

The cost to the company of an employee was calculated to establish a basis for the reward to be paid for performances above the efficiency thresholds.

The third step in the bonus design process was to determine how the notional "saving" arising from the volume-related efficiency performance should be shared.

The result of these calculations provide an amount of money in which the crew members share according to their relative contributions as determined by the number of shifts they attended at work. Actual payments are subject to reductions for unsafe and unsatisfactory quality work. To cater for safety performance, a penalty is applied to reduce the crew earnings for injuries to members of the crew. Quality control is addressed by means of a penalty applied to the crew earnings for non-standard sweepings. Uncondoned absenteeism results in a reduction in the earnings of a specific crew member.



Simplified bonus payment schematic

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

To illustrate by way of an example, assume that the cost to company of a stoping employee is R3000 per month. If an achievement of 24m²/man is achieved, that is 100% more than the accepted output performance, then the cost of one equivalent man has been saved, ie R3000.

If the selected shares are equal among the employee, the investor and the employer, then R1000 is due to the crew members before any penalties are applied. This is shown on the schematic above, and the line provides the basis for determining the amount payable for any efficiency achieved above the minimum payment threshold.

In practice, this data is provided to the crews in a stepwise tabulation which is simpler for them to use to calculate their own earnings. There is no upper limit to earnings.

Integration of bonus earnings for supervisors is achieved by paying them multiples of the crew bonus calculated as shown in the above example. Miners are paid 400% of the crew member amount, to which a premium or penalty for stoping width control (another element in the programme to improve MCF) is applied. The traditional stoping "contract" has been replaced by this method of remuneration. Officials receive an amount based on the sum of the averages of the crew member payments, to which a penalty may be applied for cost performance; safe working is separately rewarded. An amount is calculated for the Mine Overseer, and shiftbosses receive 65% of that amount. Service crews are rewarded by a percentage of the payment received by the crews they serve. For example tramming crews earn an amount equal to 60% of the bonus paid to production crews that they serve, rigging and equipping crew members receive 30% of the production crew amounts. This method reinforces the career development aspect of labour allocation.

Separate schemes exist for development, construction crews, vamping crews, the MRM department, horizontal and vertical transport teams, and employees serving the business unit in its entirety.

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

Appendix 3

Ranking of Anglogold Ashanti's South African gold mines as at 31 December 2004 in terms of cash operating profit

	Cash operating profit ($ million)	Total cash costs ($/oz)	R/m²	R/kg
Great Noligwa	38	231	2751	47820
Tau Tona	18	245	3187	50531
Kopanang	16	281	1833	58220
Mponeng	10	322	2784	66437
Tau Lekoa	2	370	1610	76428
Savuka	-2	455	2749	94036

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05

Appendix 4

Selected performance parameters for Kopanang Mine.

	2001	2002	2003	2004
In-stope labour efficiency (m²/TEC)	21,32	22,67	24,13	25,11
In-stope labour efficiency improvement over 2001		6,3%	13,2%	17,8%
Workmen bonus cost (R 000s) - Nominal	9127	7759	11645	12403
Bonus R/m² - Real	19.8	16,1	23,5	25,6
Bonus R/man/month - Real	423	365	567	632
Labour cost R / m² - Real	288	234	241	230
Labour cost R /m² improvement over 2001		19%	16%	20%
Total stoping cost (excluding equipping & vamping) (R 000s) - Real	15,159	14,863	15,981	15,929
Total stoping cost (excluding equipping & vamping) R/m² - Real	432	404	410	399
Stoping cost R / m² improvement over 2001		7%	5%	8%
Annual saving over 2001 (R mill)		12,42	10,24	15,90
Cumulative saving over 2001 (R mill)		12,42	22,66	38,56

The positive trend continues into 2005 with the year-to-date in-stope m²/TEC at 25,3.

Deleted: 14/07/2005
Inserted: 14/07/2005
Deleted: 03/06/2005
Inserted: 03/06/2005
Deleted: 26-May-05