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# Mining Engineering: What They Didn't Teach You at Uni!

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# MINING ENGINEERING: WHAT THEY DIDN'T TEACH YOU AT UNI!

**Joe Clayton**

## INTRODUCTION

I understand this is a technical conference but I'm not a technical person. I was thrilled when Naj asked me to present a paper at my old alumni but I explained that it won't be full of technical detail.

I have been in mining now for 38 years. I started as a "Fed" underground and am now a CEO of a mining services business, the SubZero Group. I have been made redundant five times. I have lived in Wollongong, Singleton and Muswellbrook in the Hunter Valley, Collie in South West WA, Gunnedah in North West NSW, Lihir Island in PNG, Melbourne, Perth, Adelaide, the Central Coast of NSW and Sydney. My kids went to eight different schools. I have managed mining operations in all the mainland states of Australia, New Ireland Province PNG, South Kalimantan, East Kalimantan and North Sulawesi in Indonesia. I have directly reported to Chinese, Japanese, American, Malaysian, Indonesian, English and Australian bosses. The Chinese boss did not speak a word of English. Mining is not for the fainthearted.

## THE EARLY DAYS

I was fortunate enough to do my degree all part time while working fulltime in an underground coal mine in Wollongong. I lived at North Beach and could ride my pushbike to work at Kemira Colliery, half way up Mt Kiera Road, and to Uni. Where else in the world can someone do that? Then I was silly enough to move away to Collie in WA when I finished Uni!!

I worked in Kemira as a "Fed" for 4 years and worked on every shift in every panel in an AIS Collieries cadetship. A fantastic grounding in dealing with shiftwork and people. It is so important that mining engineers understand the impact of their decisions on the workforce and the only real way to achieve that understanding is to spend time working on shift and operating equipment. It should be compulsory. Kemira still had a pit pony in 1976 and one of my first jobs was to build a stable underground while working in "Cocky's" outbye crew. A significant part of the old Coal Mines Regulation Act 1912 was devoted to management of horses underground. When the stable was completed a Mines Inspector came underground and carried out air speed and volume tests for the stable and decreed it did not meet the regulations and had to be removed. So we took the stable out and installed a crib room for the workers in the exact same spot. The same Mines Inspector came underground and passed it! Not good enough for a horse but suitable for men. I knew at that point I was in an interesting industry.

In those days man management was a skill passed down from the Undermanagers to the trainees and Deputies. I remember my Undermanager In Charge, Ron Peace, saying to me one day "We have set up a little test for you and will discuss how you handle it afterwards. Not telling you any more detail but you will know when it happens." As it turned out they set up a demarcation issue underground with the crew I was working with and the Union Delegate, who shall remain nameless, got pretty irate about what happened. I sorted out a mutually agreed solution which got the union delegate even angrier. At shift end he challenged me in the bath house to sort it out in the carpark. I kept a cool head and convinced him he was older than me and may not be up to it but also that we would both be throwing away our jobs over such a relatively minor incident. I was known at the time as being pretty volatile on the rugby field and wasn't used to taking a backward step. But this was work and was different. Ronny was very pleased with the outcome. The issue being, I could have thrown away my job and Ron was prepared to let me do that in the course of allowing me a great life lesson. Where does that happen in industry now? Are you prepared to allow your staff to grow in that way?

When I was 22 and a new father we had a fall in the main travelling road to the panel in which I was working. To recover the fall people would scramble up on the top of the fall and roof bolt the newly exposed roof then remove the fall material. We did all the tests for 'Baggy' roof and it appeared all was safe but, while passing equipment up to two operators on top of the fall, the lip gave way and buried me leaving, luckily, only my head exposed. Also luckily we were in a seam that had a coal roof. If it was rock

I don't think I would have survived the initial impact. All the tools were buried so the crew scratched me out by hand and had Entonox ready for pain relief. To everyone's astonishment I got up and walked away. The Deputy sent me back to the crib room to have a cup of coffee to which I protested loudly that I was fine and should keep working. He insisted. I made a coffee and when I went to drink my hand started trembling so much I couldn't keep the coffee in the cup. Shock had set in and the Deputy knew it would happen.

This episode made me seriously reconsider a career in mining. Over a week I did a lot of soul searching about where I wanted to go in life. I realized mining was really all about people, being able to operate in teams to overcome extreme, at times dangerous, work challenges. It is personally extremely rewarding. It builds life long bonds. It is the closest I have come to the camaraderie of a winning rugby team! Hence I am still in the game.

I stayed in for the people issues and the different experiences I would not have had in a conventional office job. This is an eclectic collection of those experiences.

## ETHNICITY

I am often asked the difference between Japanese and Chinese management.

Japanese senior management admit they like bottom up management so they don't have to make, or take responsibility, for any critical decisions. As an example, I needed a new fleet of 300 tonne excavators. I carried out a review of all excavators on the market in that class, short listed three brands, completed a detailed suitability review of each for capital and operating costs, selected one brand and negotiated terms. I did a paper to my boss explaining the process and the reason for the selection. The report recommendation stated an order would be placed in two weeks' time and if he was not happy with the recommendation he should inform me before the order was placed. I did not hear from him and placed the order and the payments were approved.

Whereas the Chinese do things by "consensus". The Chinese version of consensus is the boss is always right and do what you think he wants.

I was running an exploration program for a Chinese company and had to select a project management group to run the program. An Owner's Selection Team of eight people were appointed, five of whom were non-English speaking Chinese who had no idea what an exploration program entailed. We mutually agreed a set of weighted criteria for the selection. Of course, as with everything Chinese, the cost was the heaviest weighted criteria so basically the best price would win anyway. After five proponents were short listed and presented to the selection panel (with everything translated) two proponents were shortlisted. The final hurdle was a request for each proponent to take 20% out of their costs to win the work. One of the proponents said they could not work in the circumstances and pulled out of the race. All respect. Five people on the panel were astounded and three people completely understood. The company that won the contract was basically endorsed by Beijing Head Office and the local Chinese staff did everything in their power to appoint that company even though that company had never previously managed an exploration program. The result was an inordinately overpriced and problematic exploration program. The Project Management Company was cheap but, due to their lack of acumen in the field, they allowed cost and time over runs in all areas of the project.

Another good example of ethnicity is the difference between Australian and Indonesian equipment operators.

In Australia where you have a less experienced dozer operator the best way to lift his productivity is to put him alongside an experienced operator. The less experienced operator will do everything he can to lift his performance to the level of the experienced operator. A natural competitive Australian instinct.

Do the same thing in Indonesia and the experienced operator will slow down to match the less experienced operator because he doesn't want the other person to "lose face". It is based around the Muslim/Indonesian culture of respecting everyone and not standing out from the pack.

I was working for an Australian Contractor in Indonesia. The company put in place a new MD who wanted to rebrand the company and called the program "We Make a Difference". At my weekly senior staff meeting I talked about the program and suggested we could get some caps made up with the slogan in Indonesian and select an employee of the week to be awarded a cap. I was reasonably new in

Indonesia at the time and didn't yet speak Bahasa so I asked them to translate "I Make a Difference". A raging argument ensued. Eventually I asked the supervisor with the best English what was going on. He explained that in Indonesian culture people didn't want to stand out and they called people who did a very derogatory term that roughly translated in English to "You are different". He said I was proposing to select the best operator for the week and make him wear a hat that proclaimed "I am a Dickhead". Everyone at the table dissolved in laughter and the campaign was dropped on the minesite.

The campaign continued at the corporate level with every staff member receiving a multimedia DVD with an upmarket roll out of the new slogan and campaign in both English and Bahasa Indonesian. At that time half the workforce of the company, 2,000 people, were Indonesian. Surely the translator for the DVD would have alerted the production team to the problem? Such a waste of resources and energy.

I am lead to believe I broke a long held taboo and employed the first female operator in PNG. After a few months in the role she started losing a lot of time so I asked the human resource manager to sort it out. He asked me to attend the counselling session as I might not believe him when he explained the reason for her losing time. The operator told us straight faced that a witch doctor had been paid to put a hex on her by some jealous male operators. The hex made her very tired and she couldn't even accept food from her mother in case it had been hexed. When quizzed on what she was doing about it she had hired her own witch doctor to remove the hex but no-one could know as someone may hire another witch doctor to re-apply the hex. She committed that she would be hex free in a further 10 days. Sure enough she was in fact back in full swing in ten days.

The human resource manager was a national trained at university. He told me that all PNG nationals believed in witch doctors which made them real! Self-fulfilling prophets!

### **CAMBERWELL COAL**

My first role as Mine Manager was at Camberwell Coal in the Hunter Valley in 1990. Camberwell was the first mine constructed since the early eighties rush of coal mine construction. It was the first mine in the Hunter to have only one union, no seniority, pay by the number of skills not by the size of the equipment and eight and a half hour shifts. It was a break through operation with no seniority or demarcation. We trained operators and tradesmen in Targeted Selection and included them on employment selection panels, a first for the industry. We completed a full week induction for all employees and filled them full of management theory. In my previous roles I had found that workers didn't understand management "speak". To counteract this we taught the operators and tradesmen management theory and carried out role plays so they would understand what it was like to be a boss and to understand the pressures on their supervisors. We put the operators first by inverting the traditional organisation chart. The senior managers were at the bottom called the "Foundation Team". The supervisors were in the middle and called the "Support Team". Operators and tradesmen were on top and called the "Winning Team". The new approach was based on sound human resource principles of the two factory theory of Frederick Herzberg, Theory Z of Abraham Maslow, the ABC of Management by Elliott Jaques and Socio-Technical Systems of Fred Emery. Have any of you heard of these?

Camberwell had an "Open Store" without storemen. Anyone could enter the store and everyone was trained to book out stores stock to maintain inventory levels. Prior to the mine opening a pallet of port was in the store for two weeks and not one bottle was stolen.

We called our system "The Camberwell Way". In the first year of operation we were the lowest cost operator in the Hunter and won the Sentinels of Safety Award. My time at Camberwell is one of the highlights of my career. I still bump into people I worked with at Camberwell and invariably it is like catching up with family. No matter how long it has been we are immediately in tune. That is the magic of treating people like adults, setting the right work culture and entrusting people to do the right thing.

### **LIHIR GOLD MINE**

Lihir Gold Mine would be the most unique open cut mining operation in the world. The mine is in a dormant caldera. Not extinct just dormant! This produces ground temperatures of 150<sup>o</sup>C, noxious gas outbursts, boiling groundwater and old exploration drill holes producing geysers spewing Sulphuric Acid 50 metres into the air. On top of this 1998 produced over six metres of rain. This was the start of the mine so we were mining the soft leached oxides so there was no rock for road building. The island had plenty of suspended coral material which we used to build the roads. Coronus material is thixotropic so it

sets like concrete if let alone after being compacted into a road surface. But when driven on straight away it will never set.

We had an indigenous workforce of four hundred and fifty with about twenty expatriate staff/management. Fifty percent of the workforce were local Lihirians who had never operated mining equipment and many had never driven a car. We taught them to operate one hundred and fifty tonne trucks.

### **The stop work**

In my first month we had to retrench some troublesome souls and after setting it up with meticulous planning it all turned to trouble. I had a stop work meeting and about 300 Nationals in the meeting area at the mine looking for trouble. After 4 hours of talking, night shift drifted off to bed so I knew we were starting to get on top. An hour later day shift drifted off to work. We were left with a core of people who were being retrenched. I had a pay office there doling out the payout cash and people gradually started to take the money and leave. I was left with the last, and most emotional, 3 Nationals. Eventually they succumbed and took the money but had to be transported to the airfield 20 minutes away where an airplane was on standby to fly them back to Moresby. All Nationals have bush knives which are two foot long machetes with which they can inflict a lot of damage. They were leaving the island so they had all their possessions including their bush knives! I felt I couldn't delegate the risk to anyone else so I drove them to the airport myself. Immediately they were in the car I asked them all about their families and got them talking about their kids and their villages and told them all about my family and where I grew up. I kept them talking for the full twenty minutes all of which I could feel the sensation of a bush knife coming through the back of my seat and skewering me. One of the longest twenty minutes in my life! But at the airport they embraced me like an old buddy, said goodbye, got on the plane and I never saw them again.

### **The strike**

About six months into the role we had a project defining three week strike over an Expat being belittling of the same hexed female National operator in the story above. The workforce took over the mining camp as their stronghold and built a road block between the town and the mine and manned it and threatened to defend it with Molotov cocktails. Helicopters were hired to fly people over the roadblocks to work so the staff could keep the ROM crusher in work. Ten mercenaries were hired through the local police sergeant and I had them on a one minute alert on my two way. They were only a deterrent and never to be used. They cruised around in a blacked out police troop carrier so people knew they were in town.

Three weeks into the strike a meeting was called at the local Landowners' Group compound. The compound was U-shaped with tiered seating on one side the back of which opened onto a grass lawn that ran about 20 m back to a backdrop of dense jungle. The other two sides contained offices which included a barred window pay office. All my expats were looking extremely twitchy and nervous so I went to the meeting on my own. On arrival no-one was in sight but over 15 minutes about 250 people melted out of the jungle and filled up the seating with not a word spoken. It was absolutely awesome to witness. The meeting commenced and I was supported by about six senior National staff who were standing with me. During the proceedings a young sizable National got very agitated and started down the stairs next to seating while threatening me. My adrenalin started pumping and I was asking myself "If I hit him I will get wiped out and if I don't hit him he will clobber me". But he lost his footing and started to stagger into me, arms akimbo, so I just chested him off and he fell backwards onto the floor at which stage two of the senior Nationals got stuck into him, then half a dozen of the other nationals got stuck into them. The place just erupted. My senior Nationals surrounded me and managed to get us into the barred window pay office and locked the door and we had a window seat for the mayhem that was playing out in front of us. The Police Sergeant was screaming down the two way "Clayton do you need the guns?" and I was screaming back "No I am safe don't let them out of the troopy!" Eventually I made it to safe ground. My Expat staff couldn't believe I didn't have a scratch on me. They were standing about five hundred metres back up a hill looking into the meeting and saw the whole drama unfold and thought I was gone for sure.

That meeting actually ended the strike. We met again two days later at the same place and signed a mutual agreement to end the strike. It was like a football grand final. Everyone cheered and clapped and every worker stood in line and shook my hand. Over the next 12 months we increased the truck fleet productivity by 38%. Once sorted the workforce became extremely loyal and worked with me to improve the mining.

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## INDONESIA

Papua New Guinea is a soft landing for a first time Expat. Australia ruled PNG until 1975 and the locals remember that as a very prosperous time as they like and respect Australians. PNG has the same court systems, school systems, government institutions and banks as Australia. Indonesia has none of that and they dislike upstart Expats telling them what to do.

Java Man roamed Indonesia over a million years ago. Early Indonesians cultivated rice at 800BC and traded with India and China at 300BC. The Majapahit Dynasty ruled Java and were the first to beat Kubla Khan's army in the Thirteenth Century. Indonesians began trading with Europeans in 1512. They have a long proud history and do not take kindly to brash Australian engineers lauding it over their people. They are an industrious and complicated people who deserve respect and consideration.

### Illegal miners

The first mine I managed had an illegal miner problem. Within five kilometres of strike length ahead of the opencut mining operations there were 32 illegal 20 t and 30 t excavators stealing our subcrop coal. A security post at the main intersection with the highway and the mine access road counted the number of 8 t road truckloads of illegal coal hauled each day. Some days they hauled more coal than the mine. An illegal barge loading port was upstream of the mine's port. The illegals only used one tug to tow the coal barges (to our two) so routinely became stuck on the ever moving river delta at the mouth of the tidal river. We had to hire a third barge to tow the illegal barges off the river delta so we could get our coal through!

The line of demarcation between our mining operations and the illegal operations manned by our mercenaries, named Brimob, who were paramilitary hired through the regional General. The line consisted of ATCO huts, lighting plants and armed security 24/7. This was during the East Timor crisis and the mercenaries used to joke that the government hired them to shoot at Aussies in the jungles of Timor while Aussies hired them for protection in the jungles of Kalimantan! No problem. They worked for whoever paid and rotated between roles!

Every three months we would bring police from Jakarta to impound the illegal excavators in a police station three hours away by road. It would take the illegals two or three days to bribe the impounding police at the station and regain their equipment. In that time we would move the lighting plants, ATCO huts and guns a kilometre up strike and reclaim part of our mine before the illegal excavators moved back to site.

This was a contract operation and the illegal activity actually completely changed the mine plans on which the contract was costed. Because the illegals were dozing back overburden from on top of the subcrop coal then took the coal we had to move the same dirt but mined less coal. This accelerated the mining rate along the strike length to maintain the coal schedule which created a thinner operating pit and a longer waste haul. The main haulroad to the port was a regional logging road shared by us and the illegals. The local town residents would not let the illegals haul during the day to keep the dust down because the illegal port was on the other side of town. So at 8pm each night we would have 40 illegal haul trucks entering the haul road all at once and stopping us getting on the road for half an hour or more. We also had to maintain the haulroad. Haulroad maintenance is based on the number of axle loads. Higher axle loads, higher maintenance. To make our trucks run efficiently with good haulroads, the illegals were also running more efficiently and we were paying for it!

It is the one and only time I submitted a variation claim on a contract for illegal mining.

### Swamp mining

At another operation in Indonesia we mined coal less than 20 metres of mud in a swamp, below sea level on a small island with 3.5 metres of annual rainfall. Below the mud was 10 metres of rock which we treated like gold. Without this we could not operate. Large cells were built out of the rock in mined out areas of the pit adjacent to the operating face to create a two truck haul to the nearest edge of the cell to dump loads of mud. Long hauls to the far side of the cell were not necessary because the mud simply ran there and saved us haul trucks. It turned out to be a very low cost operation but quite complex waste haulage scheduling. The rehabilitation plan entailed allowing the rehabbed waste area to be inundated by the ocean. Areas were built up above the water level for birds to roost. A unique part of this operation

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was building a coal haul road with a water buffalo underpass! Also a ten foot python was caught behind the workshop.

### **COMMUNITY RELATIONS**

This has taken many guises. In Indonesia the locals struggled to accept Expats drinking alcohol in the camps. To compensate I implemented a fifty cents darg per beer. When enough money was collected we would buy equipment for the local orphanages. Every regional town in Indonesia has at least one orphanage. We made sure it was a media event so the locals knew we were helping. It allowed us to build relationships with the wonderful, selfless people who managed these institutions.

In North Sulawesi I convinced the local Bupati (Mayor) to donate rice paddies to the two local orphanages and we hired people to teach the kids how to grow their own rice and to grow pepper on the walls of paddies as a cash crop. It underpinned the independence of the orphanage from relying on donations as well it gave the kids life skills and self-respect.

Recently in Australia I was involved with a similar exercise but on a much bigger scale. In Gunnedah I had a Community Donation budget of \$1,000,000 per year for five years. We advertised for Community Fund Committee volunteers. Over sixty people applied and we chose ten people from a cross section of the whole community. I stepped back from the process leaving our Stakeholder Manager to facilitate the group. A Charter was developed by the Committee and advertisements were placed for community groups to apply for funding. In the first year over one hundred applications were received. The committee members then ranked these applications individually then came together and agreed a consensus ranking of the projects. The first fifteen projects managed to gain funding.

This was the community telling the mining company where the community funding was best needed. It wasn't wasted on football jumpers or pressure from council for projects. The community groups put together budgets, funding applications that sold their dream to achieve success and then managed their projects. They went from lamington drives and dreams to self-empowered reality. Strong resilient communities can be built on the back of the transitory mining industry.

### **CONCLUSION**

The mining industry can throw up some extraordinary and unique challenges. My challenges pale into insignificance with the great mining engineering and social feats achieved throughout the world. But they were my challenges. When some of the old buggers who have worked in these situations get that far away look in their eyes I hope I have given you a glimpse behind their thoughts.

There are people here yet to have their epiphanies and make the world a better place through their considered application of mining engineering. When that has played out for you, I hope you too get the opportunity to come back here and ramble on to the next generation. Thank you for this wonderful opportunity.