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**KEMACH** 

A BLAST FROM THE PAST

ASPASA – MORE THAN A TOUGH CAMPAIGNER

TRANSFORMATION – BEYOND THE EQUITY SCORECARD

IN THIS ISSUE

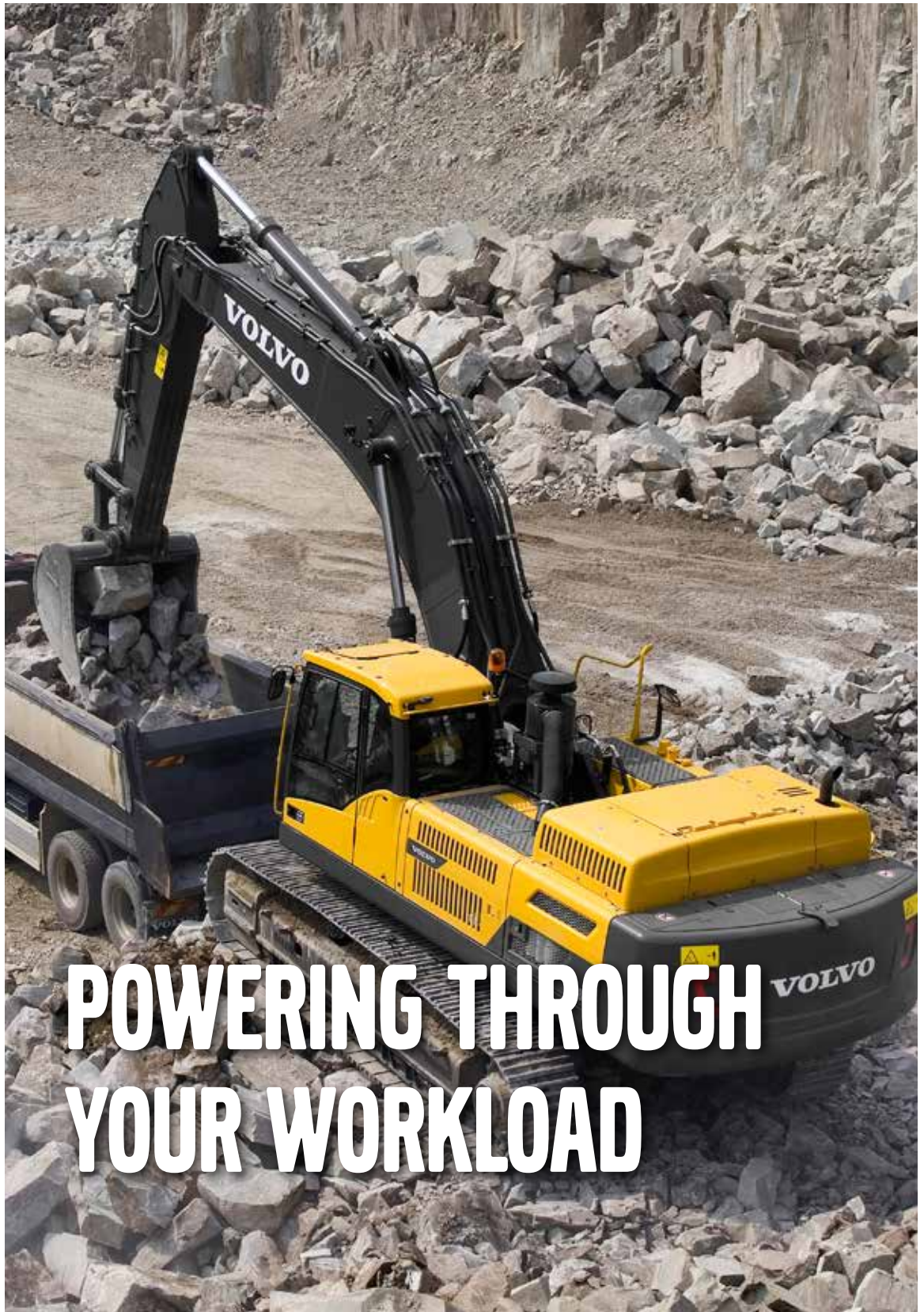


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In this regular Aspasa feature, we discuss the forthcoming GAIN meeting, which is being held in April in Somerset West. The formation of this body was driven by the conviction that international sharing of experience and best practice promotes an efficient and sustainable aggregates industry globally.

#### 40 BLAST FROM THE PAST

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JCB, represented solely in SA by Kemach JCB, has launched its new 5,5 t payload wheel loader in Latin America, the Middle East, and the African and Asian markets. The premium specification JCB 455ZX machine is powered by JCB's Tier 2 six-cylinder Dieselmix engine, delivering a fuel efficiency benefit of more than 15% against leading competitors, in early testing. The cover story on page 10, outlines the unit's key features.



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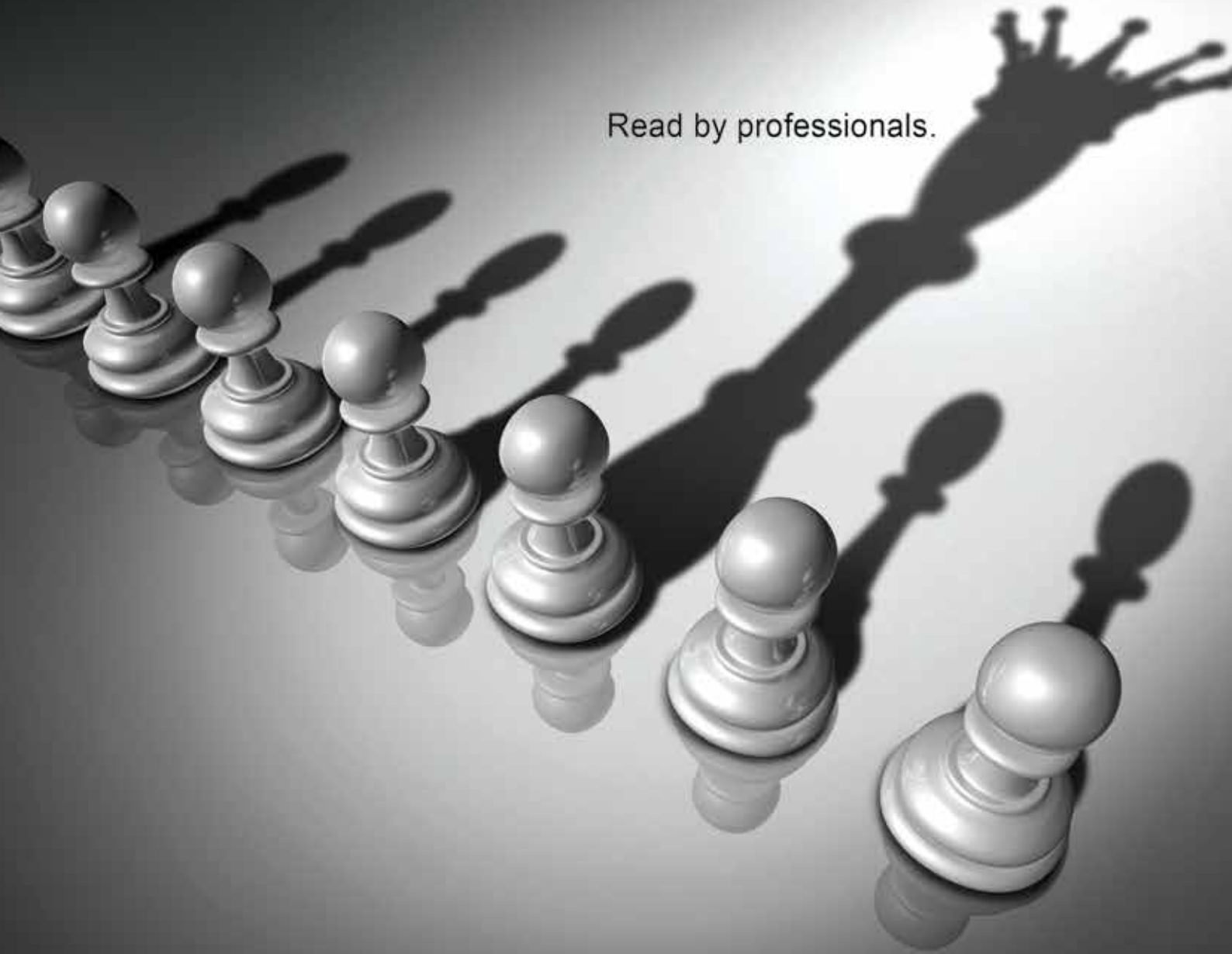


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## 'Plenty of scope for future development'

When one looks at the quarrying industry today and compares it to 30 years ago, there are many similarities, not least of which is the fact that the industry is still dominated by several large companies.

In the early 1970s, the industry was pretty fragmented with a large number of small quarries under private ownership. A decade later, there were a few companies that dominated the industry, a couple of smaller operations and in the 'country areas' some even smaller operators.

At that stage, Hippos Quarries, which was Anglo-Alpha owned, was the largest by far and represented throughout the country. Then there was Darling & Hodgson, Murray & Roberts and the Tarmac-owned operations also situated in most provinces. Grinaker at that stage had a substantial representation in the Richards Bay area. Wearnes, which was considered one of the smaller groups, had operations on the West Rand, the Free State, what was then Northern Transvaal. WG Wearne is one of South Africa's oldest suppliers of materials to the building and construction industry. Established in 1910 as a construction concern, the company was initially involved in the sand and stone business in Carletonville, near Johannesburg, with establishment of the readymix division in the early 1970s.

Blasting & Excavating had quarries in the various provinces, with its focus mainly on road construction contracts. This company was founded in 1972 as a drilling and blasting entity in the Eastern Cape. It launched itself into the mobile crushing arena in the mid-1970s, disposed of its interest in Construction Quarries Ltd and formed a mobile and static crushing division, which later became B&E International. In 1996, B&E International and Blasting & Excavating parted ways, becoming independent operators. In 2008, the company was acquired by Raubex, and is a strong and focused crushing, mining and mineral processing company.

The old well-respected Hippo group of companies became Anglo Alpha, then Holcim and finally AfriSam – which is a highly respected organisation.

Lafarge in South Africa embodies two companies with proud histories tracing origins to a small lime works, started in 1833 in southern France. Blue Circle, which has its origins in the UK, had been providing innovative products and services to the South African construction industry since 1914. The local company was taken over by Lafarge in 1998 and, in 2001, Lafarge took over Blue Circle (UK) together with the rest of its international

operations.

One has to also consider Afrimat's journey to the present. Prima was established in 1963; Lancaster in 1965 and in 1973, Lancaster Precast was established. In 2006 Afrimat was formed through a merger with Lancaster and Prima, and a year later it acquired the Malans Group together with Denver Quarries. Blue Platinum Quarry was a further acquisition in 2009 and in 2001, the group diversified into industrial minerals with the purchase of Glen Douglas dolomite quarry. It moved into the clinker market with the acquisition of SA Block in 2012 and in 2013, took a majority stake in Infrasons Holdings. Its latest acquisition is that of Cape Lime, which has roots dating back to the 1940s. Afrimat has acquired both of Cape Lime's operations, in Vredendal and Robertson in the Western Cape.

There are several other historical operations I haven't mentioned, but the point is that some 30 years on, there are still mergers and acquisitions and a continued rationalisation of the industry.

Education and training, which was a special concern all those years ago is still a problem today. To my mind, the Institute of Quarrying was very proactive in training and developing courses all those years ago, and one has to be thankful today to Monty Montgomery for his ongoing commitment to training up this industry through the auspices of Xtract.

In the early 1980s, there was a call for regulations to be applied equally to all quarry operators and today that has become a major problem and something for which Aspasa is very vociferous and passionate about.

Sadly too, as it was then, record keeping by the Department is still abysmal; one has to only look at the DMR's official list of quarries to find that the list is grossly incorrect, outdated and incomplete.

However, what our quarrymen of yesteryear would be extremely proud of is the fact that today, we have many, many operations that are rated among the best in the world in terms of environmental and safety and health legislation. And what Sir Rupert Bromley said 30 years back still applies today – we have a strategically important niche in the overall economy, and there is plenty of scope for future development.



*Cate Kelly*

# CESA maps out a sustainable path

*This year CESA is focusing on how the organisation can support the industry to deliver more with less; form strategic partnerships; remain active and vigilant advocates for the industry; and focus on transformation of the profession.*

Consulting Engineers South Africa's (CESA) president Lynne Pretorius, recently presented her presidential message and theme for the year at a function held at Hyatt Regency, in Rosebank, with the theme of 'Mapping a Sustainable Path for Consulting Engineers amid Growing Economic Challenges'.

She began her presentation with an overview of the ever-growing challenges being faced that are having a significant impact on consulting engineers and their role in society: "Our country is challenged by social instability, ever-increasing unemployment, failing economic infrastructure and a depreciating rand. All of these external influences have a profound impact on society at large and with all of these constraining elements, it appears as if consulting engineers have to do more with less."

Referring to the recent CESA Infrastructure Indaba which discussed the current South African outlook negative sentiments, low GDP and load shedding curtailing economic growth, she says that a backlog of R850-billion planned infrastructure spend over the next three years and a further R4-trillion required over the

next 15 years as well as a lack of good governance, labour strikes and water restrictions are challenges facing the SA economy.

However, it was stated that all is not lost. "The country is making strides in the achievement of the National Development Goals with significant infrastructure investment to date planned in key sectors such as Transport, Power, Water and ICT," Pretorius confirms.

Although the South African government has accomplished much in the last few years, there is not enough money to meet the growing infrastructure challenges. At CESA's Indaba, three possible avenues were explored to meet these challenges:

- Private sector should increase its investment in public infrastructure development.
- Maintenance of existing infrastructure to ensure that the existing infrastructure remains serviceable for the duration of its design life and beyond.
- Addressing inefficiencies in the Supply Chain Management system and more especially as it applies to consulting engineers and built envi-

ronment professionals in general. However, with the recent Moody's downgrading of South African bonds to levels just above junk status, SA's economic sustainability is also being questioned. Hearing of service delivery protests in various parts of the country has become commonplace and the recent water shortages is a growing concern. Critical municipal infrastructure such as dams, pump stations, pipes and roads are failing due to lack of timeous maintenance and investment, at critical periods, in the elements of economic infrastructure.

"Within this environment, can SA's vision encapsulated in the National Development Plan, actually be delivered? It is, however, extremely important that government remains on the path that has been mapped out by the NDP, as steering away from the targets will seriously diminish its credibility and further weaken domestic and foreign market sentiment," Pretorius warns. Looking briefly at the state of affairs, she says that there is good news and bad news for consulting engineers. The economic outlook, coupled with limited technical skills, appears to be crippling and stifling the economy but the project pipeline looks good. The profession is aging, but there is also significant growth in the number of young engineers.

"We have to ask ourselves if things can get worse." The influence of local government elections in 2016 will have a significant impact on service delivery priorities in some municipalities. In such a constraining economic environment, infrastructure development and the associated job creation opportunities become more critical.

"The critical role that the engineering industry, in particular the consulting engineering profession plays in the functioning of SA's economy cannot be underestimated. The current economic outlook and concerns about the public sector's ability to finance and undertake massive infrastructure investments, requires the



*The consulting engineering industry represents a particular skills-set that is required to further the country's social and developmental goals.*



profession to assess its skills set and ability to meet the challenging environment.

In meeting the development challenges of our country, Pretorius states that CESA has to partner with government and key industry roleplayers. "Unlocking opportunities identified, requires us to partner with government as its trusted advisor. This is particularly relevant in developing an improved procurement environment for the consulting engineering profession."

CESA's partnerships with the International Federation of Consulting Engineers (FIDIC), as well as the regional block of the Southern African Development Communities and the rest of Africa, is of utmost importance to further ensure quality and uniformity in engineering consulting practice and creating a conducive business environment for working within Africa. Although a significant emphasis is placed on partnering with government, CESA is the voice of consulting engineering and will continue

to play an active advocacy role in the larger built environment profession. CESA has to continue to identify corruption, blow the whistle and work with authorities towards eradicating it.

"One of the strategic goals of our country is the economic transformation of previous marginalised groups," Pretorius says. "As consulting engineers, we practice in the construction sector that has the potential to significantly contribute towards the transformation and economic empowerment agenda of our country. CESA, as part of the construction sector, is currently involved in follow-up negotiations to update the scorecard. The transformation of business and our sector in particular, is of strategic importance. Adherence to BBBEE is the way we do business in South Africa and CESA and its members are positioning themselves to meet this opportunity.

"We need not view transformation, rightfully so or wrongfully so, as a loss of business but how we do business in South

Africa. At CESA we are clear about our role as the voice of consulting engineering and being a trusted advisor to our clients. We know what we have to do. Going forward we will ensure that we, as consulting engineers, contribute towards South Africa's social and economic growth."

CESA's membership, currently representing 537 firms employing just over 24 366 staff, who collectively earn a total fee income of R23,4-billion/year, is well-positioned to respond to this challenge.

[www.cesa.co.za](http://www.cesa.co.za)



(CESA)  
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## Electra Mining set for record attendance figures

UFI audited figures for Electra Mining 2014, confirm that Electra Mining Africa is still the best attended trade show in Southern Africa. As the biggest mining, industrial, machine tools, electrical and power trade show in Southern Africa and ranged as one of the world's largest mining shows, it's long history and credibility has ensured that it has consistently attracted over 34 000 visitors at each of the past five shows, including two record years of 41 000 and 38 000 visitors.

More than 70% of exhibition space has been sold to date for the 2015 show, which takes place from September 12-16 at the Expo Centre in Johannesburg. Indications point to being fully sold out across Halls 5, 6, 7, 8, 9 and 10, all outside precincts and the additional marquees at the 2016 show. Pavilions have been confirmed for China, France, UK and Turkey.

[www.electramining.co.za](http://www.electramining.co.za)



Electra Mining Africa has consistently attracted over 34 000 visitors at each of its past five shows.

## Bringing safety awareness to the fore

The recent Grayston Drive bridge collapse has, once again, highlighted the fragility of life and brought home the fact that danger potentially lurks around every corner.

"Keeping up to date with current occupational health and safety (OHS) legislation can be tedious and finding the right supplier is generally a lengthy and frustrating process for many. Even once a supplier has been identified, how can you be certain that their products are manufactured in compliance with minimum standards and regulations?" says Joshua Low, A-OSH EXPO event director at Specialised Exhibitions.

Now in its fifth year, A-OSH EXPO 2016 has earned its reputation as Africa's largest and most targeted occupational health and

safety exhibition. The event, which takes place from May 24-26, 2016, at Gallagher Convention Centre, last year saw 85 exhibitors plying their trade and 2 445 visitors reviewing and sourcing products and services. Low says that stand bookings for the 2016 show are brisk and visitors can look forward to the widest variety of OHS products and services available in one venue over a concentrated three-day period

A-OSH EXPO will again be co-located with Securex, Africa's leading source for security and fire products and services. The exhibition covers all aspects of security and fire risk analysis and alleviation and for the first time will include a conference that addresses cyber security.

[www.aosh.co.za](http://www.aosh.co.za)



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## New SAIMM Fellow

Simon Tose, global mining optimisation manager at AEL Mining Services, has been accepted as a Fellow of the South African Institute of Mining and Metallurgy (SAIMM). This is the latest honour bestowed upon Tose, a highly-regarded industry expert, following his election as a board member of the Institute of Quarrying (IQSA) in April 2015.

Thanking the SAIMM for the recognition of his work within the mining sector over the last 30 years, Tose says he wants to take the opportunity of giving back to the industry, especially with the youth. "I see my role now as developing and empowering the next generation of people who are passionate about mining and I want to get them involved in taking the industry to the next level.

"The SAIMM is the perfect forum for this because it provides a platform where you can share ideas and get input from a

variety of industry experts in order to find solutions to some of the challenges facing the mining sector."

Tose plans to run a blasting workshop this year, which will include the involvement of university students, in order to provide insights and expertise around the developments within the blasting processes. Furthermore, he will assist his colleagues with their involvement in major mining events this year, including the SAIMM's symposium on automation in mining in February and the Diamonds Still Sparkling 2016 Conference in Botswana in March.

In order to be accepted as a Fellow of the SAIMM, a person has to meet certain criteria. These include being over the age of 35 years, demonstrating contributions to the industry and actively participating in educational initiatives such as conferences and symposia. A person has to be nominated by at least two SAIMM Fellows and then undergo an evaluation by the



AEL's Simon Tose has been accepted as a SAIMM Fellow.

Institute to determine whether the nominee meets the requirements.

Tose has published several ground-breaking papers and has represented AEL at several international key symposia, conferences and colloquiums over the years, including the hosting of a workshop at the 41<sup>st</sup> Annual Conference on Explosives and Blasting Technique in New Orleans, USA, in February 2015.

[www.aelminingservices.com](http://www.aelminingservices.com)

## Do groundwork now, urges SRK

The last years of the commodity boom were littered with mining projects doomed to failure by their champions' headlong rush to fast-track them into production; but as the slump drags on, time and skills are available to do the job right first time, according to global consulting engineers and scientists SRK Consulting.

"Frankly, a great deal of money could have been much better spent by not rushing projects into existence quite late in the commodity cycle," says SRK partner and principal consultant Andrew van Zyl. "We can look back and see mistakes made, which contributed to many projects failing to come on stream on time or on budget."

He says there were several examples of miners over-paying for their projects and under-delivering to their shareholders – often due to taking short-cuts in key processes of due diligence, technical studies and strategic planning. "When companies are in a hurry, they can make mistakes. If drilling and sampling is rushed, for example, it could result in lower confidence in the resource and you don't get optimal value from your investment."

Bypassing a prefeasibility study – and going straight to feasibility stage so that construction can be hastened – can preclude a full understanding of all possible options for a project, he says. The result could be a sub-optimal project size or design that falls short of generating the best possible return. "Among the constraints during boom times is the skills shortage, making it difficult for developers to assemble the right people in the right place at the right time.

"By contrast, in the current market mining companies can get good advice and good staff more readily. Now is the time that a mining company can go through a proper scoping study

and pre-feasibility study, optimising their projects and weeding out those that don't align with their strategic focus and are likely to deliver sub-optimal returns.

"Ideally," he adds, "companies need projects they can 'switch on' when there are signs of an improvement in commodity prices. At the switch-on stage, miners need to be comfortable that they've understood and optimised the project – and are technically confident to declare both a reserve and an associated level of return. They need to be able to avoid those many and varied costs associated with overly rushed projects – both in terms of time and money."

He highlights the growing complexity of mine planning in Africa and globally, as a result of growing competition for key resources like water, energy and land; this was forcing companies to navigate a space where they are not guaranteed the basic resources they usually need in order to operate. "Mines and governments alike will often need assistance through this process – negotiating with stakeholders like local communities who see mines as a competitor for scarce resources. Processes like this also need time, as well as the input of experienced local experts who understand legal regulations, power relations and cultural nuances."

[www.srkready.co.za](http://www.srkready.co.za)

SRK partner and principal consultant, Andrew van Zyl.



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## Hillhead visitor registration goes live

Registration to attend the 2016 Hillhead Quarry Exhibition is now live and visitors to the show can pre-register for the free ticket by visiting the Visitor Pass Registration section on the Hillhead 2016 website.

Major players including Terex Group, Volvo, JCB, Komatsu, Case, Sandvik, Hyundai, Bell, Liebherr, Doosan, Atlas Copco, Bomag, Wirtgen and McCloskey are all rebooked, as well as a host of other Hillhead regulars and plenty of new and returning companies.

Interest in the 2016 show has been extremely high and visitors are advised to preregister to avoid queues on the day. Registration is quick and simple via the new mobile-friendly website. You can choose to have your badge sent to you two weeks before the show or select an e-badge which you can print out yourself and take with you.

[www.hillhead.com](http://www.hillhead.com)

*The Hillhead show takes place from June 28-30 June at Hillhead Quarry, near Buxton, Derbyshire.*



## Global 100 status for Atlas Copco

Atlas Copco, a leading provider of sustainable productivity solutions, has once again been recognised as the world's most sustainable machinery company by the prestigious annual Global 100 list.

The list, presented at the World Economic Forum in Davos, Switzerland, ranks companies that prove they are increasing productivity while using less resources. Atlas Copco is ranked 34<sup>th</sup> overall, and is the only company in the machinery industry included on the list. It is the 10<sup>th</sup> time that Atlas Copco appears on the list.

[www.atlascopco.com](http://www.atlascopco.com)

*Atlas Copco has once again achieved recognition as the world's most sustainable machinery company.*



## Afrimat enhances product portfolio

Afrimat has made its largest acquisition to date in terms of Cape Lime, which has roots dating back to 1946. The group is in the process of acquiring both of Cape Lime's operations, located at Vredendal and Robertson in the Western Cape.

The total consideration for 100% of the shares in Cape Lime, which is to be settled by a combination of cash and Afrimat shares, amounts to R276-million. The sellers are private owners and the empowerment group is Dormell. Current operational management, who are well versed in the industry, will remain in place.

According to Afrimat CEO Andries van Heerden, Cape Lime is known for exceptional quality mineral products supplied to various niche markets such as manufacturing industries producing chemicals, filler, glass, paint and food products. Its products are also used for water purification, soil treatment, effluent treatment, building and construction.

"The mineral deposits are among the best quality of its kind in South Africa," he says.

[www.afrimat.co.za](http://www.afrimat.co.za)

## Call for no mining at Groot Marico

The Groot Marico River and Catchment is again directly under threat by a number of prospecting and mining applications, says a report from the Marico Action Campaign.

Golder Associates on behalf of De Beers now made an application to prospect in Vergenoeg and other farm portions which form part of the heart of the strategically vital and sensitive Groot Marico River Catchment that provides water to many thousands of people, including towns, farms and traditional communities. No activity which has the potential to impact on this system, within a water scarce region, should be considered.

Further, the Marico Action Campaign states, Vergenoeg and Wonderfontein are key eco-tourism areas within the catchment and prospecting and mining activities would be in conflict with this.

[www.maricoeco.org.za](http://www.maricoeco.org.za)



*The Groot Marico Action Campaign is objecting to mining prospecting near the Groot Marico River Catchment.*

# Powerful and fuel efficient wheel loader sets the benchmark

*JCB, represented solely in South Africa by Kemach Equipment (Pty) Ltd (Kemach JCB), has launched its new 5,5 t payload wheel loader in Latin America, the Middle East, and the African and Asian markets. The premium specification JCB 455ZX machine is powered by JCB's award-winning Tier 2 six-cylinder Dieselmix engine, delivering a fuel efficiency benefit of more than 15% against leading competitors in early testing.*

**K**emach JCB was established in 2003. The company is a joint venture between the shareholders of BH Botswana and Muscat Overseas in Oman. Both these companies are the sole JCB dealers in their respective countries and locally Kemach JCB supplies equipment to the mining, construction, quarrying, building, central government and plant hire industries.

Key features of the new JCB 455ZX wheel loader include:

- a six-cylinder JCB Dieselmix engine;
- proven ZF transmission and drive axles;
- fuel efficient and responsive load sensing hydraulic system;
- top of the range modern JCB cab; and

- excellent ground level service access.

JCB's Dieselmix 672 engine delivers a powerful 221 hp (165 kW) with an incredible 1 000 Nm of torque available from just 1 500 rpm. This ability to produce maximum torque from such low engine revs, combined with JCB's EcoMAX lean burn combustion technology, contributes to incredibly low fuel consumption, up to 15% better than leading competitive machines in testing.

The Dieselmix engine is equipped with high capacity multi-stage fuel filtration, for reliable operation in territories where fuel quality cannot be guaranteed. The cooling pack is also laid out in a single stack, without the need for a complex multi-stack layout, making it easier to keep clean and to provide superior cooling in dusty conditions. In addition, cooling fan speed is automatically adjusted as required, reducing noise and cutting fuel consumption further.

The 455ZX is equipped with the durable and responsive ZF 4WG190 automatic powershift transmission, with Clutch Cut-Off as standard. This limits tractive effort in truck loading applications, allowing maximum engine power at low travel speeds for optimum loader arm speed and control. Drive is transmitted through ZF axles with limited slip differentials, oil-immersed hydraulic disc brakes with

*The premium specification JCB 455ZX machine is powered by JCB's award-winning Tier 2 six-cylinder Dieselmix engine, delivering a fuel efficiency benefit of more than 15% against leading competitors in early testing.*



wheel speed braking, providing reduced maintenance and improved braking performance.

Twin variable displacement piston pumps deliver a maximum hydraulic flow of 226 ℓ/min, with load sensing delivering increased fuel efficiency and responsive distribution of hydraulic power. A single servo joystick controls the main hydraulic services, with transmission kickdown and disconnect buttons in the lever head, plus a directional control allowing the operator to work without having to take their hand off the controls.

Optional auxiliary hydraulic circuits are electronically actuated with proportional thumbwheel controls on top of the joystick. Loader detent controls for boom float, kick-out and return to dig reduce operator effort and fatigue and increase productivity in repetitive loading operations.

As far as comfort and control are concerned, the 455ZX uses a brand new ultra-modern cab. With a low internal noise level of just 74 dB, the cab provides maximum operator space with unrivalled visibility, thanks to large windows, a sloping rear bonnet, carefully positioned mirrors and lower windscreen panels. Tinted glazing and a heating and air conditioning system with a three-speed fan are standard.

A central LCD dash display provides all-important machine operating data, alerting the operator to any potential faults. A second screen can be supplied in the right corner of the cab for an optional high resolution reversing camera.

The 455ZX has twin gullwing engine canopy doors, providing easy ground level access to all regular service and fill points. There are remote greasing points and the batteries are located at the rear of the machine with all fuses and relays out of harm's way behind the operator's seat in the cab. A lockable tool box under the right hand steps includes an engine oil drainage hose, making it easier for maintenance technicians to ensure that there is no contamination of the ground when changing oils.

The JCB 455ZX is available with a large range of options, to suit different customer needs. The standard machine is equipped with BKT XL cross-ply

tyres, a heater

and air conditioning, limited slip differential axles, two-spool hydraulic valves, a 3,1 m<sup>3</sup> bucket with bolt-on teeth, a flashing beacon and 12 V in-cab electrics.

A wide range of optional equipment is offered from the factory and by local dealers to allow customers to tailor the machines to their jobsite. This includes BKT XL radial tyres, additional working lights, a programmable reverse fan, the reversing camera and second in-cab screen and a three-spool hydraulic valve block allowing an auxiliary service to be added to the machine.

The JCB 455ZX offers customers superior performance with unbeatable economy. The proven driveline components deliver power and efficiency, while hydraulic pumps from Rexroth and proven Parker valve blocks ensure durability and reliability. Excellent service access and an operator's cab that provides new levels of comfort, low noise and superior visibility will boost productivity and reduce operator fatigue.

The 455ZX will be supplied as standard with a two-year factory warranty and three years of LiveLink telematic support, providing peace of mind for the customer and maximising their return on investment.

JCB Kemach's national office is in Gauteng, with regional offices in Johannesburg, Pretoria, Middelburg, Rustenburg, Durban, Richards Bay, Bloemfontein, Kimberley, Cape Town, East London, Port Elizabeth and George. Distributors and service dealers are strategically placed in Botswana (Francistown and Gaborone), Windhoek, Nelspruit, Swaziland, Polokwane, Upington, Schweizer Reneke, Maputo and Lusaka.

This network gives the company the ability to effectively support its customers the length and breadth of South Africa, Namibia, Mozambique, Swaziland, Botswana and Zambia.

Equipment on offer, which includes the world number one backhoe loader, ranges from skidsteers, wheel loaders, excavators, telescopic handlers, rough terrain forklifts, mini tracked excavators through to a range of compaction equipment.

Kemach JCB distributes the full range of JCB parts, which is supported 24/7/365 by skilled field service technicians and product support engineers. Kemach JCB is a focused dealer that puts the customer at the heart of its business.

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# Aspasa

## – a professional body realising its dreams

*'It is a long-held adage in the industry that the oldest profession in the world is that of a quarryman – because without a road to parade up and down – the lady of the night would not have been able to ply her trade. Not a road, not a railway, not a harbour, nor a building of any kind larger than a grass hut, could have been created without materials supplied from the quarry industry.'*

**I**t is a truism that no developments in South Africa, or for that matter any other country, can take place without a quarry'. This is taken from a paper presented at an industry event in 1994, under the title *The South African Quarry Industry – Who are We?* It follows with: 'And yet, because of the nature of quarrying, it is not a favoured industry among the general population. It tends to be regarded as dusty, noisy and a blight on the landscape. The nimby (not in my back yard) syndrome is more strongly applicable to quarrying than probably any other human endeavour'.

So what has changed since 1994?

The industry has changed significantly with major mergers and acquisitions with a concentration of producers – legal and illegal. But it still has high and low volumes, ongoing skills shortages, good times and very difficult times. Most importantly though, it has raised the bar. Once called the 'cowboys' of the mining industry, credit must go to the Aggregate and Sand Producers Association of Southern Africa (Aspasa), which, since its early beginnings as Agfed (Aggregate Producers Federation of SA), has worked tirelessly to get to this point.

The founder and previous director of Aspasa and the Institute of Quarrying (IQSA) Sir Rupert Bromley, is a man

much respected to this day. Some time ago, he told *MQ* about the early days of the Association where, in the 1960s, the need for an industry association and a professional body became an issue. "The Transvaal was the first to form an association, and in 1969, the South African branch of the Institute of Quarrying was born in Durban. Other associations followed around the country and it was in the early 1970s that Agfed was formed.

"That body tried to make up issues on behalf of the industry and to coordinate industry opinion, but its weakness was that its officers were all full-time employees of one or other of the quarrying companies. For that reason, it could not claim a full-time commitment of any one person or group of people and its credibility with the authorities was somewhat doubtful."

He says Agfed was aware of these weaknesses and in March 1990, called a meeting of the captains of the industry at the Institute of Quarrying conference in Durban. "Out of this meeting, a steering committee was nominated to investigate

AfriSam's showplace Peninsula Quarry, October 2015.



the function of a new body with permanent staff. "The steering committee met three or four times, and Aspasa was formed on August 23, 1990."

Sir Rupert was appointed as acting full-time director and the appointment was confirmed some nine months later. "Aspasa had a fairly wide regional foundation," he recalls. "The first meeting to discuss the concept was in Durban. The constitution and feasibility study was created in Stellenbosch and in Cape Town, and the final decision to go ahead was taken in Johannesburg."

The role players in this period included: M Doyle (Anglo Alpha); E Leo (Ready Mix Materials); T Woodhead (RMM); G Jordaan (RMM); D Rawland (Stone & Allied); P du Plessis (Grinaker Holdings); A Wearne (WG Wearne); D Ward (Lancaster Quarries); K Spence (LTA Construction); AP Pappenmeier (Record Crushers); N Danoher (Blasting & Excavating); and D Pattle (Hippo Quarries).

By the late 1990s, there was major restructuring of the industry through mergers and acquisitions. Sir Rupert says statistics became an important issue. "The captains of industry were also keen that we got to know senior people in government, the provinces and the local municipalities. Also coming up in the pipeline were issues of standards, and I got to know the SABS people very well. The other obvious thing that was starting to rear its head because we were getting legislation attached to it was the environmental side."

At a special general meeting held in Johannesburg on August 23, 1990, Agfed was changed to Aspasa, and a new constitution was proposed.

### Thirty years ago

In January 1986, some 30 years ago almost to the day, Sir Rupert wrote the following report, handed to MQ from the Aspasa archives:

'Prior to 1979, there were various regional associations of quarry owners in the Transvaal, Natal and Western Cape, but the industry was fairly fragmented with a large amount of small quarries under private ownership. The advent of price control of quarry products and rapid inflation, together with the formation of joint marketing companies in the main urban areas, brought about a rapid rationalisation process within the industry.

'There are now a few companies dominating the industry, one or two smaller companies with more than one quarry, and some smaller operators particularly in country areas. The Anglo Alpha-owned Hippo Quarries group represented in most areas of the country is by far the largest. Darling and Hodgson, Murray and Roberts and the Tarmac-owned groups of quarries are situated in most provinces, with Grinaker having a substantial representation in the Richards Bay area.

'One of the smaller groups, Wearnes, operates on the West Rand, Orange Free State and Northern Transvaal and Stone & Allied – a subsidiary of the Anglo

American Corporation's gold division – is mainly in the Orange Free State. Blasting & Excavating also has quarries in the Transvaal, Natal and Cape, concentrating mainly on road construction contracts.'

'In earlier days, much of the quarrying activity in country areas and the larger municipalities was undertaken by local or municipal authorities. In addition, the SA Transport Services was also a major quarry owner. SATS operates very few quarries now, and only Bloemfontein, Pietermaritzburg and George of the large municipalities, still operate their own municipal quarries.

'These tend to be somewhat frowned upon in the industry as a whole, because it is felt that they often infringe on the interests of private enterprise. The provincial Roads Departments still have mobile crushing plants for undertaking roadwork in country areas and most of the civil engineering roads construction companies keep mobile plants for out-of-the-way areas. The Water Affairs Department also usually uses its own equipment for crushing.

'However, the vast majority of major construction jobs are now supplied by members of Agfed, and almost all the large requirements of SA Transport Services are supplied by public enterprise.'

### Price control

Price control was a major inhibitor in those days. Sir Rupert's report continues: 'One issue peculiar to the quarry industry, including those companies quarrying for



The Moregrove operation in 1996 (courtesy Sir Rupert Bromley).



Peak quarry in 1996 (courtesy Sir Rupert Bromley).

cement production, was price control. Price control was imposed on the quarry aggregate industry in December 1964 and only lifted in March 1981.

'In the early days of price control, inflation rates were so low that prices were not frequently increased. Then, as cost inflation became a factor, neither the quarries nor the Department of Commerce and Industry which administered price control, were very sophisticated in their approach to applications for price increases.

'The record-keeping systems in most quarries were not geared to producing the type of records which the Department required to justify a permission to increase selling prices, and a number of applications were turned down in those early days. This caused a rapid re-evaluation by the quarries of their cost records, and a greater cooperation between the quarry owners in the various regional associations of Agfed. Many discussions were held with the Department in Pretoria and a general system was developed which, in the fixing of increased selling prices, took account not only of actual increases in input costs but also of the replacement value of items of plant.

'Nevertheless, many of the larger companies found the price control system restrictive in that with the percentage return allowed on their investment of 15%, development and reinvestment was not an attractive proposition; especially when in 1976, by a policy decree of

local government, the 15% was reduced to 10% in an effort to combat inflation. However, as double digit inflation became the norm, particularly in the capital cost of new plant, the allowance for replacement value became a significant factor in price increase applications.

'Both the industry and the Department became more skilled in handling applications, and by the time price control was lifted in 1981, there were mixed feelings in the industry as to whether it was a relief or a burden. In fact, some of the larger areas where marketing companies have been formed to sell stone on behalf of a number of quarries, the price control system of evaluating return on investment has been maintained to prove to the Competitions Board that the quarries are not making excessive returns on their investment.'

### Inflation

Dealing with inflation at that time, Sir Rupert says: 'The extent of inflation, not only costs of consumables, but particularly of the capital costs of equipment, has been a major factor in every part of the mining industry. This is nothing new to all sectors of life in South Africa and elsewhere, but it is well to remind ourselves from time to time of the actual extent of capital equipment cost increases, particularly of plant which still has to be imported with the rand in its present state of weakness against other currencies.

'For instance, a Cat 980 front end loader which cost R55 800 in 1972,

costs R550 000 in 1986, and a Cat 769 dumper which cost R67 700 in 1970, costs R741 000 in 1986 – in each case a tenfold increase of which nearly half occurred in the last 18 months.

'The escalation in cost of crushing plant, which is largely manufactured locally, was not nearly so great. A 25 x 36 jaw crusher which cost R27 800 in 1974, costs R91 100 in December 1985. A 36S gyratory moved from R23 300 to R86 600 over the same period; increases of between three and fourfold. These prices are, of course, for original equipment. The cost of spares for fixed and mobile equipment is an even greater source of complaint among quarrymen. This has meant that no longer is it easy for an entrepreneur to open and operate a small quarry close to a particular market.

'Quarrying has become an occupation for a company with substantial resources and sophisticated methods of control. In turn, this has led to a greater sharing of information across the industry both through the activities of the Institute of Quarrying and Agfed. It has also resulted in the substantial rationalisation of quarries referred to earlier where the industry is now dominated by four or five large groups.

'Each developed market in the country now has one or more large quarries of greater size and capacity than in previous years. One thinks of such quarries as Eikenhof near Johannesburg, Coedmore in Durban, Moregrove in Port Elizabeth and Peak and Peninsula in Cape Town, Natal Crushers in Pietermaritzburg and Ferro in Pretoria.'

### Rehabilitation

'With this emphasis on the larger operations, another issue has arisen which has had a major impact on the quarry industry as a whole, as well as the rest of the mining industry – ecology and rehabilitation. Gone are the days when quarrymen or other miners could open up deposits more or less at will, develop them as they saw fit and close them again,



*Sir Rupert and Lady Cilla Bromley  
photographed at their beautiful home  
in Glencairn, in the Cape.*



leaving an eyesore in the countryside with a wire fence around. The development of the Departments of Physical Planning and of the Environment has as in other parts of the world, led to a new approach towards the maintenance of the ecology of the country.

'While the new regulations regarding rehabilitation and restoration of the countryside have been, and are, a considerable cost to the industry, they have been generally welcomed by all responsible quarrymen. Long-term planning of quarrying is now 'a must' and the Mines and Works Act and Regulations, which control the activities of all mines and quarries, stipulate that before opening a new quarry, a restoration plan showing how the deposit is to be developed, must be submitted together with a general idea of how the site will be restored at the end of the quarry's life.

'This has led to the springing up of many firms and individuals whose function it is to concentrate on landscape architecture and rehabilitation. The Institute of Landscape Architects was formed as a professional body in 1984 and produces an excellent quarterly magazine *Landscape SA*. Many of these landscape architects are employed by the quarrying industry.

'As has happened in other parts of the world, the quarry industry here sometimes suffers from over enthusiasm on the part of self-appointed ecologists and even from some of the government departments. It is greatly to the credit of the Government Mining Engineer and his inspectorate that he has been able to steer a middle course between the two opposing factions and has encouraged a practical approach to rehabilitation on the part of the industry; at the same time discouraging plans which would lead to unnecessary expense and sophistication.

'The main complaint of the industry is that, while it is happy to abide by the existing regulations, it believes that they should be applied equally to all quarry operators. At present, quarrying carried out by government departments and provinces, does not fall within the scope of the restoration provision of the Mines and Works Act and Regulations. Quite frequently, these privileges are extended to private contractors working for such authorities. Agfed has taken up this matter with the Government Mining Engineer and some action has been taken in respect of private contractors'.

### **Education and Training**

'Education and training has been a special concern of the Institute of Quarrying for the past 12 years. The majority of skilled personnel working in the quarry industry have come from another sector of the mining industry. As quarrying has become more specialised, the necessity for personnel trained in particular quarrying skills has increased.

'Starting at the lowest technical education level, a course for open pit mining supervisors at N2 and N3 levels has been set up and is running at the Pietermaritzburg Technical College. The first candidate passed out a N2 level in 1985. Although this course is intended for the whole open pit mining industry, there has been no support for it to date from the coal mines and the large base metal mines, all of which played an active part in the setting up of the course. This has been a disappointment for the Institute, but part of the reason is the fact that the course does not qualify the successful candidate for government certification. This was



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specifically agreed by the industry with the Government Mining Engineer for good reason in the early stages of arranging the course.

'The next course to be designed, that of open pit mining manager, which will be taken at Technikon level, is, however, intended to lead to a Government certificate at the end of it. The setting up of this course is being actively pursued.'

### Quality and specifications

'In line with the educational facilities, the industry has been concerned with the quality of its products. Agfed and its regional associations spend considerable time looking at the standard of products of the industry, and at present, are working on the updating of the SABS 1083 which is the basic SA Bureau of Standards quality specification for concrete and roadstone.

'There has been little problem with this specification for concrete stone and only a few minor changes are being contemplated. But the aggregate industry and the users of roadstone, the National Transport Commission, Provincial Roads Department and the consulting engineers designing roads, have been unable to come to any agreement on the specifications for roadstone and base course.

'On the one hand, the aggregate industry has been unwilling to expend the capital and redesign its working schedules to produce materials which are

not only small volume offtake, but which necessitates the slowing down of major sections of its production plant; at least without some recompense for so doing. On the other hand, there is a tendency to design roads with sophisticated aggregate materials without any consideration of the cost and difficulty of making them, and to expect them to be sold to the road-makers at standard prices.

'At the same time, many different specifications are in use. Every province has its own specification and consulting engineers also often design their own specifications. This is most inconvenient for the aggregate industry and efforts are being made – under the auspices of the SA Bureau of Standards and the National Institute of Transport and Road Research – to bring together the various parties to produce agreed and universal specifications for the various products required.

'The aggregate industry wants to produce what its customers require. But the customers need to have some understanding of what is involved in producing aggregate to non-standard specifications. In other words, some education of customers by the quarry industry is required. The Agfed sub-committee concerned with the SABS 1083 is tackling this problem.'

Ending his report 30 years ago, Sir Rupert writes: 'The quarry industry, as in all countries, is still a small part of the country's industrial complex. But without

it, not much construction, the infrastructure of development, can take place. As has been indicated, considerable progress has been made over the past 15 years in the modernisation of the industry. Contact is maintained with quarrymen in other countries and no doubt the next 15 years will see a great deal of further development.

'South Africa is likely to go the way of other countries in creating larger units, making use of economies of scale to control unit costs. The greatest hindrance to this is the distances which the finished product must be transported. But there is scope for the development of the rail system as has taken place elsewhere, with special trucks and depots where stone can be stockpiled.

'This is a young industry with an interesting niche in the overall economy, and plenty of scope for future development' – *Sir Rupert Bromley, January 16, 1986.*

### About Face RSA

Looking back on the establishment of the About Face RSA beautification programme, Sir Rupert reminds *MQ* that this was a programme initiated by the National Stone Association (NSA) of USA "and we sought their permission to use the name, logo and programme, suitably amended to take account of our local operations.

"Now there were many things to be done to set up this programme," he says.



The then Alpha-owned Peninsula Quarry, photographed in 1997 (courtesy Sir Rupert Bromley).



Ridgeview photographed in 1997 (courtesy Sir Rupert Bromley).



"We had a marking sheet and concentrated on three of four things – the first of which was the legal requirements. This was in the early days when you had to produce an EMPR, which was an entirely new development for industry. Then we looked at the quarry and its impact on the environment and how it might be improved. We looked at the plant in the same way and also the overall environmental situation.

"Then we needed certificates and shields. We decided to use the Fish Eagle because that was a South African bird and we obtained permission from the John Voelcker Trust (publisher of the Roberts Birds of Southern Africa) to use the Fish Eagle pictured in their book, and we designed shields for the appropriate number of Fish Eagles.

"The top award was the Showplace Award, and over the years quite a few quarries reached that status," he says.

"Otherwise they got a 1, 2, 3, 4 or 5 Fish eagles, and we had an interim one right at the beginning for those quarries that really hadn't a clue but were willing to try."

The About Face programme was "very gingerly ventured into in 1993, with one of the earliest judges being Arnold Jubber, who had retired as CEO of Hippo Quarries. "To set a standard, I tried to get someone from the Nature Conservation Department and they were tremendously helpful, and also from the Natal Parks Board and the Parks Board in Gauteng. They were wonderful in providing people to come around the quarries," Sir Rupert recalls. "Most of them had never seen a quarry, but they knew something about the environment and that was the idea."

A representative from the Department of Mines was also included, whom, according to Sir Rupert, was "mostly clueless, but they found it interesting to be around people who weren't actually

mining. However, we also had to make sure that they didn't notice things that shouldn't have been there so that they wouldn't have a go at the quarries afterwards, in terms of legislation," he adds.

"The whole idea was for us to talk about the environment and not about the nuts and bolts legislation in a quarry plant. I also tried to have someone from the local municipality and if there was any particular environmental person available, I latched on to them as well. Arnold and I travelled many thousands of miles around the country, staying in funny places, and we picked up these teams as we went along."

Interestingly, in 1993 there were 39 quarries that participated in the About Face programme, which increased to 44 and remained close to this figure for several years.

*Report and photographs unless otherwise accredited, by Dale Kelly.*



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# Drying shrinkage of concrete made from recycled materials

*Does concrete composed of recycled concrete aggregate suffer from higher shrinkages and lower densities and strengths compared with concrete composed of virgin aggregates? In this article Bradley Whiting, Timothy McCarthy and Eric Lume describe the methodology and outcomes of trials undertaken on a commercially available recycled concrete aggregate.*

*Bradley Whiting, Timothy McCarthy and Eric Lume are based at the School of Civil, Mining and Engineering, Faculty of Engineering, University of Wollongong, NSW.*

**T**his paper describes the procedure and results of a range of experiments conducted on a commercially available recycled concrete aggregate (RCA). The work quantifies the effect RCA has on the drying shrinkage of new concrete mixes, termed recycled aggregate concrete (RAC). The RCA product was characterised by analysing thin sections, particle shape

and texture, particle size distribution, percentage of solid contaminants, water absorption and particle densities.

Three concrete mixes were prepared and tested for seven and 28-day compressive strengths and 112 days of drying shrinkage. The mixes include a 40 MPa conventional aggregate mix and two equivalent RAC mixes, one utilising 30% fly ash as a partial cement replacement.

Due to the adhered mortar found on the aggregate particles, the RCA had rougher particle textures, increased water absorptions and lower densities than conventional aggregates. As a result, the RAC mixes suffered lower compressive strengths and higher drying shrinkages than the control mix.

## Reducing C&D materials

One area that has been the subject of much research and investigation in recent times is how to reduce the quantity of demolition and construction waste sent to landfill. According to the Australian Bureau of Statistics (2007), the construction and demolition industry contributed 42% of the solid waste produced in 2002-2003. Of this, only 44% was recycled in some form, with the remaining waste sent to landfill.

While landfill can result in some positive outcomes, such as reclaiming land from disused quarries, a report prepared for the Department of the Environment, Water, Heritage and Arts by Hyder Consulting (Pickin, 2009), has found many regions throughout Australia are reaching their landfill capacities.

The paper argues that the reliable supply of landfill is a scarce resource that should be used conservatively (Pickin, 2009). Continued studies investigating ways to encourage the recycling of construction and demolition waste materials

*Studies are showing that improvements are still required in the performance of structural concretes that incorporate recycled aggregates.*





are valuable to reduce the percentage of waste going to landfill and to create a more sustainable future.

The key issues facing any recycled product are that they need to be safe, perform well and be economical. There are many concerns regarding the performance of concrete made from RCA. Use of RCA has been reported to provide a loss in most fresh and hardened properties of concrete (Poon et al, 2007). Essentially, this is due to the presence of less dense and more porous mortar adhered to the RCA rock particles (Montgomery and Sturgis, 1996).

CSIRO's Guide to the use of RCA in concrete proposes RCA can be used in low-grade concrete applications such as pavements. It further recommends only replacing 30% of the virgin coarse aggregate with high quality RCA (CSIRO, 2002). One of the main reasons for this low percentage of substitution is to control the high drying shrinkage of concrete made from RCA (CSIRO, 2002; Poon et al, 2007; Sagoe-Crentsil et al, 2001).

### Experimental programme

This paper outlines an experimental programme that investigated the drying shrinkage of RAC incorporating effectively 100% RCA as a replacement for natural coarse aggregate. If more RCA could be used in a mix, the greater the theoretical demand for the product, and thus less waste could be sent to landfill.

It was reported by Poon et al (2007) that fly ash as a 25-35% partial cement replacement can reduce the drying shrinkage of RAC. This has been opposed by results from other studies such as Corinaldesi and Moriconi (2009). This paper details a series of experiments aimed to test this finding by Poon et al (2007).

Identifying ways to improve the performance of RCA could increase its use, and therefore eventually reduce the amount of waste sent to landfill, allowing for more sustainable practice. One way to achieve this is to examine in depth the properties of RCA and the concrete it is used in.

### Materials, aggregates

A commercial 20 mm nominal size RCA was sourced from a western Sydney recycling plant. This aggregate was characterised by a range of aggregate property tests and

was used in two concrete mixes tested in this study. Local 10 mm and 20 mm nominal sized crushed basalt aggregate was used as a control aggregate for both aggregate property testing and concrete testing. A fine Kurnell sand and coarse Emu Plains sand were used in the concrete mixes.

The RCA and 20 mm control aggregate were tested and analysed for particle shape and texture, particle size distribution, percentage of solid contaminants, water absorption and particle density. Selected rock particles from the RCA were prepared into thin sections to gain

a qualitative understanding of the types of rock present in the RCA product used in the aggregate and concrete testing. A total of 21 aggregate particles were prepared into thin sections and analysed.

### Binders

A general-purpose cement was used in the concrete mixes. One mix incorporated a low calcium fly ash as a 30% partial cement replacement. The properties and composition of this fly ash are shown in Table 1.

### Mix compositions

Three concrete mixes (shown in Table 2) were prepared and tested for slump, Vebe time, seven and 28-day compressive strength and 112 days of drying shrinkage. The recycled aggregate mixes were designed to be equivalent to a well-established 40 MPa control mix. This concrete grade was chosen because Poon et al (2007) tested a 40 MPa concrete in their experiment program.

The particle size distribution was determined for the aggregates to AS 1141.11.1. While both the control aggregate and the RCA complied with the AS

Table 1: Fly ash properties and composition.

Properties/composition	(%)
Fineness	89,00
LOI	1,20
SiO <sub>2</sub>	64,20
Al <sub>2</sub> O <sub>3</sub>	25,50
Fe <sub>2</sub> O <sub>3</sub>	3,92
CaO	2,27
K <sub>2</sub> O	1,24
MgO	0,69
SO <sub>3</sub>	0,20

Table 2: Concrete mix proportions. \*Initial prediction for water required with SSD aggregates.

Material	Control (kg/m <sup>3</sup> )	RAC (kg/m <sup>3</sup> )	FARAC (kg/m <sup>3</sup> )
Cement	350	350	279
Fly ash	0	0	119
RCA	0	940	940
20 mm crushed basalt	720	0	0
10 mm crushed basalt	280	60	60
Coarse sand	563	563	563
Fine sand	280	280	200
Water*	182	182	179
Pozzolith 370C	1 050 ml	1 050 ml	1 194 m

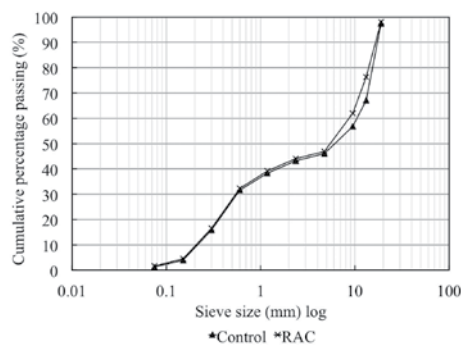


Figure 1: Overall grading of control mix and RAC mix

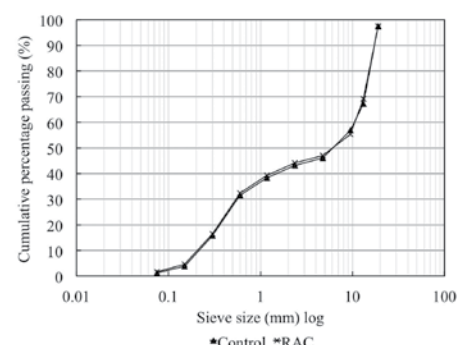


Figure 2: Overall grading of control mix and RAC mix after aggregate proportion adjustment.





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2758.1 grading requirement for a nominal 20 mm one-sized aggregate (see *Figure 5*), it was found that the RCA had significantly more 5,0 mm and 10 mm particles. To avoid differences caused by the variations in grading, less 10 mm nominal basalt and more RCA was used in the RAC mixes, until they had an overall aggregate grading equivalent to the control mix. The same mass of coarse aggregate was used in all mixes, as shown in *Table 2*. *Figures 1* and *2* present the overall aggregate particle size distribution of the control and RAC mixes before and after the aggregate proportion adjustment.

The proportion between the cement, fly ash, pozzolith 370C and fine sand for the fly ash (FARAC) mix with 30% fly ash partial cement replacement is provided in *Table 2*.

### Concrete mixing and fresh concrete testing

The mixes were prepared for equivalent slumps rather than equivalent water to cement ratios. This approach was adopted because literature reports (Abdelfatah and Tabsh, 2008) that RAC mixes require more water than equivalent mixes incorporating conventional aggregates to achieve and maintain a practical workability. Further, the amount of water in a mix influences the compressive strength and, more importantly in this study, the drying shrinkage of the hardened concrete (Neville, 1995).

The concrete mixes were prepared and sampled to AS 1012.1 and AS 1012.2 respectively. Slump tests to AS 1012.3.1 were used to determine the water content required to be added to the mixes. The Vebe tests were undertaken after equivalent slumps were achieved to AS 1012.3.3, in an attempt to provide more information about the workability of the mixes.

### Compressive strength testing

Three 100 mm diameter by 200 mm tall cylinders were prepared to AS 1012.8.1 for each mix, for both seven day and 28 day compressive strength testing. These cylinders were left to dry in their moulds for 24 hours before being de-moulded and placed in lime-saturated water until tested.

The concrete specimens were tested to AS 1012.9 as closely as possible. The

cylinders were capped with gypsum plaster on the day, after being removed from the curing tank.

One significant variation from standardised testing in this portion of the study was that the compressive strength cylinders were moist cured in lime-saturated water at a temperature of 13°C, rather than the 23±2°C specified by AS 1012.8.1. This would have notably affected the seven-day compressive strength results.

### Drying shrinkage testing

Three concrete drying shrinkage specimens were prepared for each mix, as closely to AS 1012.13 as possible. These specimens were left in their moulds for 24 hours before being demoulded and placed in lime-saturated water in a controlled environment, with the water temperature maintained at 23±2°C.

After seven days of moist curing, the specimens were surface dried and the initial length of the specimens was measured using a vertical comparator five consecutive times, until the measurements were within 0,001 mm of the mean of the measurements, before being placed on a rack in a controlled environment. Each specimen was measured at one, two, seven, 14, 21, 28, 56 and 112 days after being removed from the moist curing tank. The specimens were measured three times at each drying period to check continuously the validity of each measurement, and an average was taken for the shrinkage measurement for that specimen at the appropriate drying time. The orientation and placement of each specimen was kept constant throughout the 112 days of testing. The specimens were kept in the controlled drying room at all times. The drying environment conditions were maintained to the requirements specified in AS 1012.13.

### Aggregate property tests

#### Particle shape and texture

Most RCA particles were observed to have similar angular shapes as the crushed basalt control aggregate. The surface texture of the RCA, however, is somewhat rougher than the basalt aggregate, due to mortar adhered to the particles. This rougher surface has the potential to increase the amount of water required

for a practical workability. Therefore, this property also has the potential to increase the drying shrinkage of the concrete it is used in.

#### Types of rocks in sample

Through the analysis of thin sections under a microscope, the following rock types were found to be present in the RCA product: chert, vein quartz, quartzite (*Figure 3*), tertiary basalts (*Figure 4*), altered basaltic breccia/sandstone, dacite porphyry, slag and monzonitic porphyry. These are common rock types found in quarries surrounding Sydney. This analysis was qualitative, as it was not possible to determine the relative proportions of each rock type.

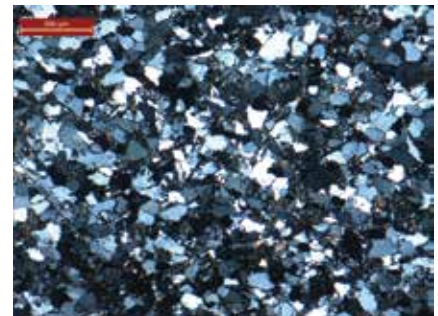


Figure 3: Thin section microscopic photograph of quartzite.

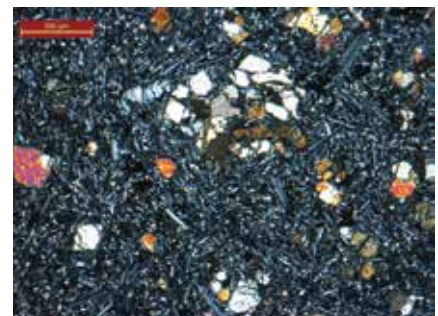


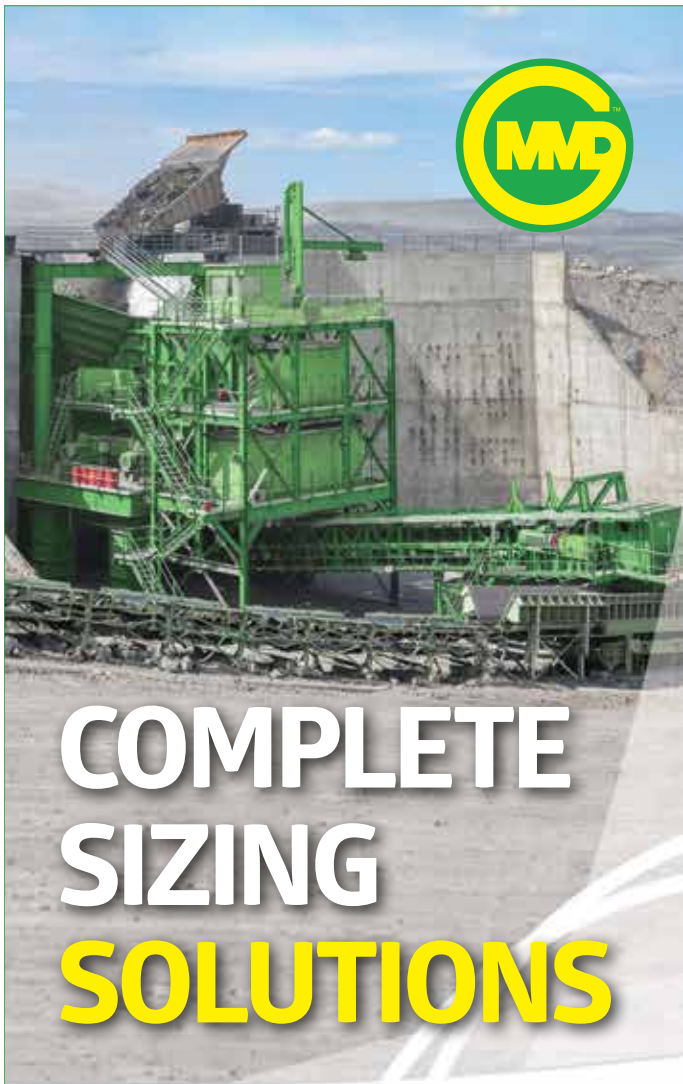
Figure 4: Thin section microscopic photograph of basalt.

#### Particle size distribution

The particle size distribution of the RCA product and the control aggregate was determined following AS 1141.11.1. As shown in *Figure 5*, both of these aggregates were found to satisfy the grading requirements of a 20 mm nominal sized aggregate outlined in AS 2758.1.

#### Solid contaminants

Throughout the experiments, a range of solid contaminants were observed in the commercial RCA product. These included



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porcelain, asphalt, wood, masonry and other ceramics. However, the product clearly had a negligible quantity of these contaminants. A sample of 15 kg was found to contain only 0,4% solid contaminants by weight (Table 3). This very low solid contaminant level has been achieved by strict feedstock separation at the recycling plant, where incoming clean concrete waste is both stored and crushed separately from the rest of the incoming material.

Table 3: Aggregate property results.

Property	Crushed basalt	RCA
Nominal size (mm)	20	20
Solid contaminants (%)	0,0	0,4
Water absorption (% AS 1141.6.2)	1,92	4,69
Apparent particle density (kg/m <sup>3</sup> AS 1141.6.2)	2 799	2 739
Dry basis particle density (kg/m <sup>3</sup> AS 1141.6.2)	2 656	2 359
SSD basis particle density (kg/m <sup>3</sup> AS 1141.6.2)	2 707	2 498

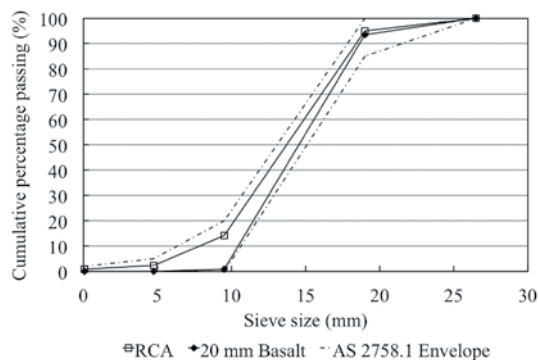


Figure 5: Particle size distribution of RCA and control aggregates within the AS 2758.1 20 mm nominal size grading requirements.

### Water absorption

The water absorption of the RCA and the 20 mm control aggregate were determined to AS 1141.6.2. Two samples were tested for both aggregates and the results averaged. As shown in Table 3, the RCA was found to have significantly greater water absorption than the natural crushed basalt aggregate. This is due to the porous nature of the mortar adhered to the particles of the RCA. To overcome concrete workability issues, it is therefore important to maintain the RCA in the saturated surface dry condition before mixing. If a mix was prepared with the aggregates below the saturated surface dry condition, the mix would require more water to maintain a practical degree of workability. This could increase the drying shrinkage while decreasing the compressive strength of the concrete.

### Particle densities

The apparent, dry basis and SSD basis particle densities were determined using the pycnometer method (AS 1141.6.2). Two samples were tested for both the RCA and the 20 mm control aggregate, and the results were averaged. The RCA can be considered a normal weight concrete aggregate based on the definition in AS 2758.1.

Table 3 shows the RCA has a significantly lower SSD basis and dry basis particle densities than the control aggregate. As these densities consider both the impermeable and permeable voids, the



results show the RCA particles are more porous and less dense when considering the complete volume of a particle.

It is likely that the higher porosity/lower density means the RCA particles are less rigid and have lower elastic moduli than conventional aggregates, due to the presence of adhered mortar. The elastic properties of coarse aggregates have a great effect on the drying shrinkage of concrete. While concrete dries and the adsorbed water is lost from the hydrated cement, tensile strains are induced in the cement, causing the aggregates to go into compression. The higher the elastic modulus or rigidity of the aggregates, the greater the restraint against these shrinkage strains can be provided, thus decreasing the drying shrinkage of the concrete (Neville, 1995). Therefore, low elastic properties found in RCA could provide one reason for the high drying shrinkages found in RAC.

#### Fresh concrete properties

The final slump test and vebe test results for each mix are shown in Table 4.

Table 4: Consistency testing results.

Consistency test	Control	RAC
Slump (mm AS 1012.3.1)	80	77
Vebe (sec AS 1012.3.3)	1,6	1,47

While all the slumps are similar, the FARAC required significantly less Vebe time, although it is of the same order of magnitude.

#### Compressive strength

The seven-day compressive strength tests indicated the mixes were adequate and the experiment could continue. All the control mix specimens achieved compressive strengths greater than 40 MPa at 28 days of curing, as shown in Figure 5, indicating the mix was successful in achieving a 40 MPa grade mix.

Figure 6 shows the RAC mix was unsuccessful in achieving a 40MPa concrete mix. This could be due to the following reasons:

- Higher water content for slump, due to rougher aggregate surface textures and some possible action from the higher water absorption, as it is hard to maintain/provide SSD condition.
- Lower strength and density of RCA particles, due to adhered mortar on surfaces.
- Lower overall strength of RCA rock particles.

The FARAC mix achieved significantly lower compressive strength results than the control, due to the pozzolanic nature of fly ash. This mix would gain strength at a slower rate.

#### Drying shrinkage

As shown in Figure 6, the RAC mix was measured to have a significantly greater drying shrinkage than the control mix throughout the experiment, with a 25% average increase in the 112-day drying shrinkage. The FARAC mix had only a 7,0% average increase in the 112-day drying shrinkage compared with the control mix. This result supports the finding by Poon et al (2007) that fly ash as a partial cement replacement can reduce the 112- day drying shrinkage of RAC.

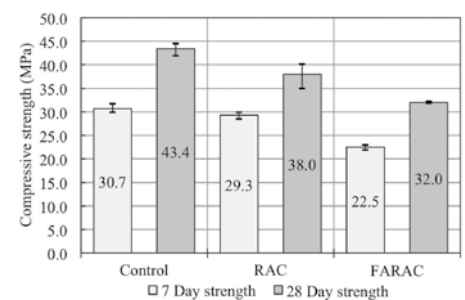


Figure 6: Average compressive strength results with maximum and minimum results.

#### Conclusions

The following was found/concluded following this study:

- The RCA was a high quality product with negligible solid contaminants. This was achieved by effective recy-



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cling procedures, where incoming clean concrete feedstock is identified at the gate, then stored and crushed separately from the rest of the feedstock materials.

- Despite being a quality product, the RCA had inferior aggregate properties compared with the control aggregate and the majority of conventional concrete aggregates. This is primarily due to the presence of adhered mortar on the aggregate particles. This mortar produces rougher particle surface textures, higher water absorptions, higher porosity and lower particle densities.
- The analysis of thin sections indicated the sheer variability of materials that can be found in one sample of an RCA product produced in western Sydney.
- The compressive strength testing indicated that RAC suffered decreased compressive strengths compared with an equivalent mix incorporating conventional aggregates. For this reason, lower percentages of RCA to conventional aggregates would be valid.
- The low moist curing temperature applied to the specimens would have affected the seven-day compressive strength results.
- RAC has significantly greater values of drying shrinkage compared with an equivalent mix incorporating conventional aggregates. When effectively utilising 100% RCA as a coarse aggregate in a '40 MPa' concrete, this increase can be to the extent of 25% at 112 days of drying.
- The increase in drying shrinkage could be due to lower elastic modulus of the adhered mortar on the RCA particles, the rougher texture of the mortar affecting the amount of water required in a workable concrete, the varying types of rock in the RCA, and the high water absorption of the RCA particles requiring more water when the aggregates are not perfectly in the SSD condition.
- The FARAC mix drying shrinkage results support the results of Poon et al (2007), where the drying shrinkage of RAC was reduced by the addition of fly ash as a 30% partial cement replacement. The addition of fly ash to reduce the drying shrinkage of RAC



may be applicable for low concrete strength grade applications such as pavements.

- For RAC applications requiring higher compressive strength grades, concrete consisting of lower levels of RCA substitution for conventional aggregates would likely be more practical. Improvements are still required in the performance of structural concretes that incorporate recycled aggregates. This work indicates that using 100% recycled coarse aggregates results in a small loss of strength when compared with a virgin basalt aggregate. More tests are needed to compare with other rock types. The presence of a range of rocks within the RCA will result in concretes being similar to those made with the weakest aggregates.

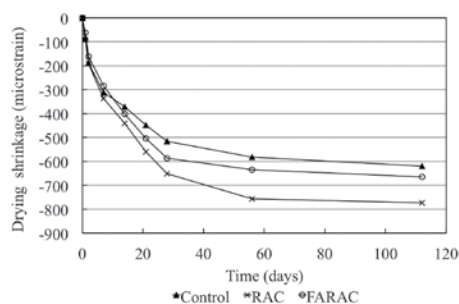


Figure 7: Average drying shrinkage results.

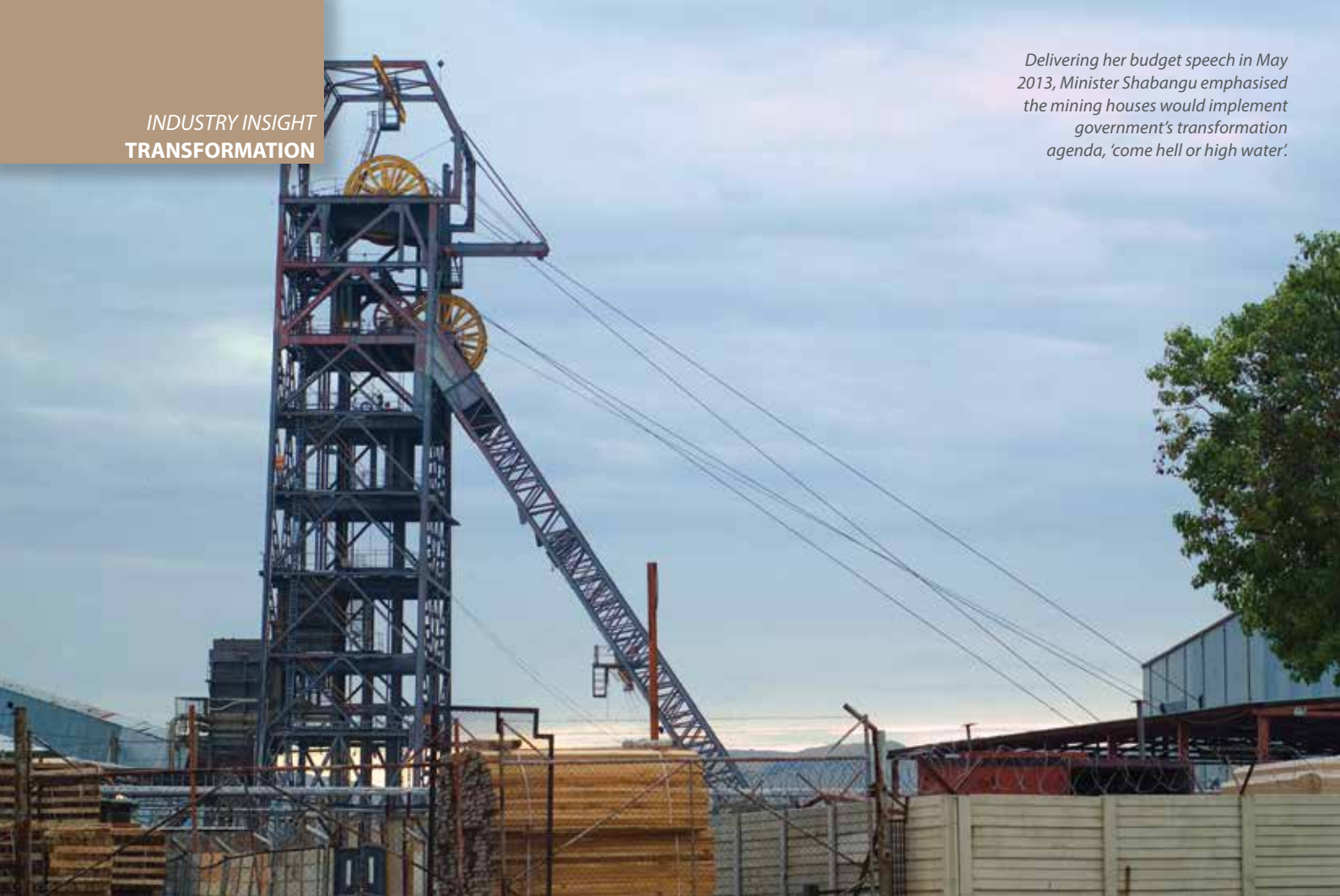
Through the experiments, a range of solid contaminants were observed in the commercial RCA product, including porcelain, asphalt, wood, masonry and other ceramics.

This paper was first presented at the 22<sup>nd</sup> Australasian Conference on the Mechanics of Structures and Materials, ACMSM22 UTS Sydney, December 11-14, 2012. For references and further reading, please contact MQ directly.

#### Acknowledgements

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# Transformation beyond the equity scorecard – Part I

*Going beyond transformation claims contained in employment equity scorecards and industry compliance reports, this paper which will be published in two parts, in the February and April issues of **MQ**, provides qualitative insight into the initiatives employed and challenges experienced by mining companies in a quest to transform the mining industry. Perceptions expressed during in-depth interviews with 10 senior executives, show that the assumption that mining companies are reluctant to transform, is erroneous.*

*by: NV Moraka and M Jansen van Rensburg, University of South Africa*

**‘W**e need a mining sector that works. Mining employs over 500 000 people. It is the biggest earner of foreign exchange in our country, contributing

about R20-billion directly to tax revenue. Mining also makes a far larger contribution as a buyer of goods and services, and a supplier of inputs to other sectors of our economy and other economies around the globe’ – President Jacob Zuma, 2014 State of the Nation address.

However, despite apparent commitment from government, enforced compliance with social and labour plans, regulations and Mining Charter targets, the South African mining industry is slow to gain local and international investor trust (Deloitte & Touche, 2013; Mashego, 2013).



Industry players acknowledge that the context has changed – creating various challenges (Davis, 2014). In the past few years, such challenges included subdued commodity prices, increased working costs, constrained infrastructure, and high labour costs, coupled with poor levels of productivity, strained labour-management relations, an uncertain regulatory environment, and the inevitable maturation of the industry (Deloitte & Touche, 2013; Davenport, 2014). Mining-affected communities also became more cognisant of their rights, and politicians more vocal in their expectations from the relationships with the mining giants (Davis, 2014).

One of the main issues that contributed to the difficult operating conditions was claims from organised labour and Minister Shabangu that this industry is too slow to transform. Specific claims were made in terms of employment equity, fair salaries and wages for mine-workers, housing and living conditions, health and safety issues, and general working conditions (Limpitlaw et al, 2005; Miningmx, 2013; Shabangu, 2010).

These claims were followed by what Reserve Bank governor Gill Marcus explained as ‘unprotected strike action that has escalated into an uncontrolled, violent and unlawful landscape led by a mob mentality in the absence of formal and recognised leaders’ (Mavuso, 2013).

In light of the stern warnings from government that 2014 is the deadline for mining companies to improve housing and living conditions of mineworkers and to achieve a number of targets (Miningmx, 2013; Zuma, 2014), the purpose of this article is to provide insight into the status of transformation in the mining industry. Specific attention will be given to current initiatives undertaken to drive transformation, challenges experienced, and finally to identify the barriers to transformation. The scope of this article goes beyond transformation claims contained in employment equity scorecards or the findings presented in industry compliance reports (see, for example, Mitchell, 2013 for a review).

Instead the article will report current initiatives and qualitative perceptions about the challenges experienced in

the quest to transform the industry. The literature review will focus on relevant transformation regulation and legislation to set the legislative context. Progress on transformation in the mining industry reported elsewhere will also be considered. The literature review is followed by a description of the methodology used to explore the status of transformation and then the results and findings are presented. Finally, conclusions are drawn, which aim to set recommendations for industry stakeholders.

### Transforming the mining industry

The Mining Charter is the policy instrument to effect transformation of the South African mining sector (Department of Mineral Resources, 2009). Despite being considered a priority by government and industry, the evidence on the extent of transformation in the mining industry is, at best, unreliable (Mitchell, 2013). This is curious, as industry stakeholders including the Chamber of Mines, the South African Mining Development Association, and the National Union of Mineworkers negotiated and signed the Mining Charter. This charter is further complemented by relevant legislation for mining of mineral resources, listed in *Table 1*.

*Table 1* supports the notion that transformation is guided by clear legislation, transformation targets, and objectives. The shared purpose of these acts is to create true democracy and a non-racial country (Esterhuyse and Nell, 1990). In support of the constitution, the legislation and acts furthermore strive to recognise human rights, improve the quality of life, and promote equality for historically-disadvantaged South Africans (HDSAs) (Booyens, 2006; Swart 2003).

The Employment Equity Act, for example, enacted affirmative action measures with the aim of obtaining equity in the workplace (Republic of South Africa, 1998; Thomas, 2002). The enactment of the Skills Development Act aims to ensure the development of critical, core management skills of HDSAs in the workplace. The Broad-Based Black Economic Empowerment (BBBEE) Act followed as an intervention to address the apartheid legislation that prevented

HDSAs from fully partaking in the economy (Burger and Jafta, 2006). This Act seeks to obtain a balanced strategy that addresses ownership, management, employment equity, skills development, preferential procurement, and enterprise development.

Specific to the mining industry, the Mineral and Petroleum Resources Development Act (MPRDA) documents and enables the transformation of national mineral and mining policies (Republic of South Africa, 2002; Van der Zwan and Nel, 2010). The MPRDA furthermore established that the mining sector has a duty to guarantee that exploitation of minerals shall benefit the economy, adhere to corporate social responsibility issues, safety, health, skills development, and provision of employment opportunities for HDSAs (Chamber of Mines, 2007).

In support of the Act, mining companies were advised to introduce social plans, which are aimed to benefit the wider economy. Social plans were to be accompanied by an exploration plan (work plan), financial plan, mining plan, labour plan, environmental plan, empowerment plan, as well as a marketing plan (Cawood, 2004, p.58).

Transformation in the mining industry is furthermore informed by the Broad-Based Socio-Economic Empowerment Charter for the South African mining and minerals industry (DMR, 2010; Fauconnier and Mathur-Helm, 2008). This charter addressed ownership and employee transformational targets and aims to promote equitable access to the nation's mineral resources for all the people of South Africa; substantially and meaningfully expand opportunities for HDSAs to enter the mining and mineral industry and benefit from the exploitation of the nation's mineral resources; utilise the existing skills base for the empowerment of HDSAs; expand the skills base of HDSAs in order to serve the community; promote employment; and advance the social and economic welfare of mining communities (DME, 2004).

Initial transformation targets were captured in a Mining Scorecard that was officially launched in 2003 (Cawood, 2004, Fauconnier and Mathur-Helm, 2008). The

2003 Mining Scorecard was informed by the elements of the 2002 Mining Charter and also developed to be in line with the

BBBEE Codes of Good Practice. While the Mining Charter expanded on 'how to do it', the Mining Scorecard illustrated 'how

companies will be evaluated' (Rungan, Cawood, and Minnitt, 2005, p.740). This scorecard was, however, criticised

Table 1: Chronological list of legislation affecting mining and BEE in South Africa.

Act number	Act name	Brief description	Date of commencement
Act 16 of 1967	Mining Titles Registration Act	Regulates the registration of mining titles and other rights connected with prospecting and mining.	1 October 1967
Act 20 of 1967	Mining Rights Act	Deals with the issue of unwrought precious metals.	1 October 1967
Act 61 of 1973	Companies Act	Governs the formation and regulation of companies in SA.	1 January 1974
Act 78 of 1973	Occupational Diseases in Mines and Works Act	Deals with the compensation for diseases contracted by persons employed in mines and works.	1 October 1973
Act 69 of 1984 (GG 9285, 1; 4 July 1984)	Close Corporations Act	Governs the formation and regulation of Close Corporations . in SA	1 January 1985
Act 56 of 1986 (GG 10291, 1; 25 January 1986)	Diamonds Act	Created the Diamond Board and instituted regulations for the trade in diamonds.	1 October 1986
Act 30 of 1989 (GG 11783, 1; 31 March 1989)	Mineral Technology Act	Provides for the continuation of MINTEK (Council of Mineral Technology) and its management by a board.	1 August 1989
Act 50 of 1991 (GG 13253, 1; 22 May 1991)	Minerals Act	Regulated the mining industry until May 2004.	1 January 1992
Act 66 of 1995 (GG 16861, 1; 13 December 1995)	Labour Relations Act	Amended SA's labour legislation to take account of the provisions of the final constitution, regulate trade unions and streamline procedures for resolution of employment disputes. It also created the Labour Court and the Labour Appeal Court.	11 November 1996
Act 29 of 1996 (GG 17242, 1; 14 June 1996)	Mine Health and Safety Act	Deals with the protection of the health and safety of employees in a mining operation.	14 June 1996
Act 108 of 1996 (GG 17678, 1; 18 December 1996)	Constitution Act	Contains a Bill of Rights that protects all South Africans.	4 February 1997
Act 55 of 1998 (GG 19370, 1; 19 October 1998)	Employment Equity Act	Achieves equity in the workplace by eliminating unfair discrimination. Also adopts affirmative action measures.	1 December 1998
Act 4 of 2000 (GG 20876, 1; 9 February 2000)	Promotion of Equality and Prevention of Unfair Discrimination Act	Gives effect to the Equality clause (S 9) of the Constitution.	16 June 2003
Act 28 of 2002 (GG 23922, 1; 10 October 2002)	Mineral and Petroleum Resources Development Act	Transferred mineral rights from private holders to government as guardian of peoples of SA and makes special provision to benefit historically disadvantaged persons.	1 May 2004
Act 53 of 2003 (GG 25899, 1; 9 January 2004)	Broad-Based Black Economic Empowerment Act	Established a legislative framework for the promotion of Black Economic Empowerment.	21 April 2004
Act 49 of 2008 (GG 36523, 1 31 May 2013)	Mineral and Petroleum Resources Development Amendment Act	Provides a framework for the regulation of associated minerals including guidelines for the partitioning of rights. This Bill furthermore enhances provision relating to the regulation of the mining industry through beneficiation of minerals, the promotion of national energy security in order to streamline administrative processes and to align it with previous Acts.	01 January 2013
Act 46 of 2013 (GG 37271, 2; 27 January 2014)	Broad-Based Black Economic Empowerment Amended Act	Inserts new definitions and amends others, provides for remuneration of council members, promotes compliance, incentive schemes to support black-owned enterprises, establishes BEE commission.	27 January 2014

Source: Department of Mineral Resources, (2014); Rungan *et al.* (2005)



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because it was merely a checklist with 'yes or no' options, and concerns were raised over the practicability of measurement scales (Rungan et al, 2005).

Additionally, a compliance assessment done during 2009 showed that the industry was not fully compliant and some targets were not met. As a result, the Mining Charter was amended in 2010 to provide more measurable items, scales, and targets. Indeed, it was the vision of the 2010 Mining Charter to facilitate sustainable transformation growth, and development of the mining industry (Shabangu, 2010). The amended 2010 Mining Scorecard served to supplement the amended Mining Charter and contained more measurable items (Miningmx, 2011). The revised charter sets a target of 26% black ownership of South Africa's mining assets by 2014, as before, and adds that HDSAs should constitute 40% of the total at all levels of management of mining companies.

At present, the DMR does not allow new-order mining rights or grant mining licences unless companies are BEE-compliant and have the necessary BEE credits and allotments in place (Miningmx, 2013). In 2013, a redrafted black economic empowerment bill was passed in the National Assembly. This bill will eventually stipulate entirely new BEE codes which are likely to be vastly different from the milestones in the Mining Charter.

### Transformation progress

In delivering her budget speech in May 2013, Minister Shabangu emphasised that mining houses will implement government's transformation agenda – 'come hell or high water'. Minister

Shabangu directly confronted mining houses about the slow progress made on the BEE front. 'Every other stakeholder suffered from a case of parochial amnesia in terms of their responsibility for the implementation of this transformation agenda', she said. 'We ended up with widely-varied accounts on the extent or otherwise of the progress that has been made in this regard' (Miningmx, 2013).

However, mining analysts, lawyers, and industry players have different views about the industry's level of compliance, particularly in respect of BEE codes (Miningmx, 2013). In general, there seems to be consensus that most South African mining houses have largely met the transformation objectives and that they will meet the stipulated 26% black ownership target. The way in which government will measure compliance with that target is, however, uncertain (Davenport, 2014). A frequently-cited problem is the current disjoint between difference definitions in relevant acts, frameworks and scorecards. At a fundamental level, the definition of historically disadvantaged individuals contained in the MPRDA Act/Mining Charter, for example,

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includes white women, but the BEE codes regard only black, coloured and Indian people as previously disadvantaged (DMR, 2009; Miningmx, 2013). These definitions directly impact the calculation of BEE targets and such ubiquitous create widespread dismay (Miningmx, 2013, Rungan et al, 2005; Tupy, 2002).

Despite the confidence that ownership targets will be reached, there is less certainty regarding the 40% employment equity target at all levels, especially management. Although mining houses claim that they will exceed targets at the lower management levels, they blame skills shortages in management, critical, and core skills as the main reason for not meeting targets at more senior levels (Deloitte & Touche, 2013; DMR, 2010; Healing, 2013; Rungan et al, 2005). According to the Landelahni mining report, the mining industry is competing for scarce skills with infrastructure, manufacturing, and other local industries as well as the global mining industry. Reasons cited for the skills shortage are declining numbers of graduates in mining-related qualifications, high HDSA staff turnover, and retirement (Healing, 2012; Landelahni, 2013).

In 2008, the Landehlani mining survey revealed that local mining graduates' pass rate was 13% compared to the expected 25% throughput rate for four-year programmes. South Africa is also experiencing a high shortage of well-qualified, competent, and experienced artisans and professionals in the mining sector (Landelahni, 2008). This explains the

provision of attractive bonuses, spiralling salaries, and retention packages by mining companies to retain HDSAs possessing these attributes (Engdahl and Hauki, 2001).

Industry players furthermore argue that it is challenging to address the skills shortage given the deficiencies of the Mining Charter and unrealistic targets set (Davenport, 2014; Miningmx, 2013; Mokoena, 2006; Schoeman, 2010; Tupy, 2002). The skills shortage will thus remain an issue as long as there is ineffective leadership for driving transformation, inability by mining companies to identify and manage a talent pool, and the broad transformation legislation (Esterhuyse, 2003).

Notwithstanding these challenges, industry players are aware that their context has changed and claim to embrace the concept of transformation. They moreover publicly declare that they are investigating the required resources to not only comply with legislation, but rather to achieve true change (Davis, 2014). This article will consider current initiatives undertaken to drive transformation and challenges experienced in the quest to identify the barriers to transformation. The research questions of the study were the following:

- What is the progress made in transforming the mining industry, and what initiatives have been put in place by mining companies?
- What are the challenges and barriers to transformation in the South African mining industry?

The methodology used to explore the status of transformation is reviewed below.

### Research methodology

A qualitative research methodology was used and data collected through ten in-depth interviews. Participants representing mining houses listed on the JSE were selected by means of probability purposive sampling. This technique allowed the researchers to select and interview executives or senior managers who oversee transformation, sustainability, human resources, people management and/or employment equity for the entire company. The size of the companies ranged from small to large multinational groups.

The duration of interviews ranged from 45-90 minutes, and interviews were conducted at a place convenient for the participant. Nine out of ten interviews occurred at the offices of the participants. The overarching topic of the interview was the participant's experience with transformation in the mining industry. This topic was supported by open-ended questions dealing with different issues related to transformation and employment equity scorecard (see *Appendix 1* for a research questionnaire). Each participant voluntarily signed informed consent documents, and was informed about the purpose of the study and assured that their information would be treated as confidential.

All interviews were recorded and later transcribed into primary documents.

Qualitative content analysis was used

*Results for this comprehensive study, suggest buy-in and commitment by the industry as a whole to transformation.*





It was the vision of the 2010 Mining Charters to facilitate sustainable transformation growth.

to analyse transcribed verbatim data. A summative approach to qualitative content analysis was used, which entailed counting and comparing quotations, keywords, or paragraphs, followed by the interpretation of the underlying context. The coding and theme identification process was prepared in Atlas.ti, which is a qualitative data analysis software package that offers support for the interpretation of text (Muhr, 1991, p.349). Categories and code names emerged from the data and quotes, keywords, or paragraphs were counted and compared followed by interpretation of the underlying context (Rosengren, 1981).

### Discussion of findings

Themes were aligned with research questions and categorised to identify initiatives employed to promote and execute transformation, as well as challenges experienced in the process of transformation, in a manner that addresses the research objectives. It is important to firstly discuss the interpretations of the meaning of transformation by participants before a discussion on initiatives to promote transformation and challenges experienced in transforming the mining industry. This forms part of the next discussion.

### Common understanding

It was found that the participants had varying interpretations of transformation, although common terminology regarding transformation understanding was that transformation is a cultural change but not a racial issue involving replacing white individuals by black individuals in specified positions.

Transformation was regarded by participants as a mind-set change, the act of embracing diversity, equalising rights and creating opportunities, and doing what is right for organisations. The majority of participants acknowledged that transformation is a process that will take a long time to realise.

Part II of this paper in MQ's April-May issue, concludes with the participant interviews and the fact that open dialogue and trust are key requirements for addressing current transformation challenges.



An advertisement for Beowolf Mining. The background is a close-up of a rocky surface with a white circular area in the center. Inside the circle, various drilling tools are displayed, including black drill rods, red button bits, and yellow DTH drilling tools. The text 'YOU KNOW THE DRILL' is prominently displayed at the top left, with the website 'www.beowolfmining.co.za' below it. The Beowolf Mining logo, featuring a stylized orange and yellow flame-like shape, is in the center. Below the logo, the text 'MAXDRILL Industry Technology' is visible. Other labels include 'ALL TYPES OF DRILL STEEL', 'DTH DRILLING TOOLS', 'BUTTON BITS', and 'SHANK ADAPTORS'. At the bottom, there is a large blue and white box with the text 'BEOWOLF MINING' and 'FOR ALL YOUR DRILLING NEEDS'. Contact information for Herbert (Minetec Botswana), Jannie (Desert Mining Namibia), and Riaan is provided in the bottom corners.

# Proactive Aspasa – a tough campaigner

*The Aggregate & Sand Producers Association of Southern Africa (Aspasa) has sent out an invitation to its members to attend the prestigious GAIN meeting, which is being held at The Lord Charles Hotel, Somerset West, from April 11-13. MQ chats to Aspasa director Nico Pienaar about GAIN and the Association's activities over the last quarter.*

**G**AIN (the Global Aggregates Information Network) was founded by UEPG (European Aggregates Association) in 2010, driven by the conviction that international sharing of experience and best practice promotes a more efficient and sustainable aggregates industry globally. It is impressive to note that GAIN members currently represent 60% of the global aggregates production estimated at 37,5-billion t, and therefore has a major lobbying strength on behalf of the industry.

GAIN meetings were held in Brussels in October 2014 attended by representatives from aggregate associations across Europe, North America, South America, Australia, China and South Africa.

Many valuable insights and experiences were shared on common health and safety, environmental, economic, as well as technical and public relations challenges. The discussions revealed that the industry faces similar challenges across the globe with the various regions devising different approaches and solutions. There is ongoing contact between these associations providing value support on specific industry challenges as they arise.

It has been decided to hold these meetings at two-year intervals, with the next one being hosted by Aspasa, in Cape Town.

At this stage, it looks as if there will be attendees from the USA, Australia, China and South America, together with the secretary-general of UEPG Dirk Fincke, and

Jim O'Brien, who is the honorary president of UEPG and the GAIN coordinator.

The agenda promises to be excellent with discussions on developments in the various regions, followed by roundtable reviews. Presentations include safety, occupational health, environmental aspects and illegal quarrying. Other papers will look at global machinery innovations, the pros and cons of aggregate production taxation, best practice experiences for optimal cost efficiency, the challenges of representing SMEs, and dealing with a future vision for the industry.

The executives coming to South Africa are captains of the global aggregate industry, and the networking opportunities will certainly prove to be invaluable.

The GAIN meeting is being held prior to the Institute of Quarrying Southern Africa's (IQSA) annual conference and exhibition, which is held in conjunction with Aspasa, at The Lord Charles from April 14-15.

Discussing aggregates as a strategic resource, Pienaar says our law makers need to take a leaf from the book of a recently passed Bill by the USA House of Representatives defining aggregates as strategic and critical. The House acknowledges that aggregates play an essential role in the national security and economic viability of the country, and are vital for infrastructure and transportation infrastructure. In South Africa, the aggregates industry is under increasing pressure from a number of fronts. Among others, the industry faces severe threats from illegal

quarry operations undercutting prices, as well as legal borrow pits set up by municipalities and contractors as a temporary source of sand and stone, often in non-compliance with basic rules and legislation.

"Additionally, our quarries are governed by the same legislation as mines and have to comply with stringent and





expensive regulations in terms of mineral rights, health, safety and the environment, including royalties on materials mined. The end result is that our quarries are under pressure to survive and must either hike prices to cover overheads and unfair competition from illegal operators, or they must cut corners and risk losing their businesses.

"We want the authorities to take a closer look at our industry and realise that it needs to be governed in a way that acknowledges the importance of sand and stone in the development of infrastructure."

Aspasa has been vocal about the need to curb illegal mining and is continuing to work closely with the Department of Mineral Resources to ensure quarries are not subjected to the same requirements as large-scale mines and underground operations. "Rampant illegal quarrying effectively exempts unscrupulous operations from obtaining mining permits and excludes them from paying both tax and royalties and complying with legislation," Pienaar says. "It also offers no protection to workers in these operations, and

environmentally these quarries are free to do as they please outside the realms of legislation.

"Our quarries are better managed than ever before, thanks to the implementation of world-class standards and the close cooperation of quarry operators within the regional and national structures of Aspasa," he says, adding that audited standards are mandatory for members.

Two separate management systems for health and safety and a system for environmental management are used. "Member companies are required to comply with the Association's strict About Face environmental standards which are in line with global standards and designed to ensure that the local industry is sustainably managed with minimal impact on the environment and its people. Compliance is also measured annually in an audit to test quality, health and safety and road traffic compliance."

While these are considered 'softer' issues, Aspasa is a tough campaigner for the rights of its members. Included among these is its recent work with the

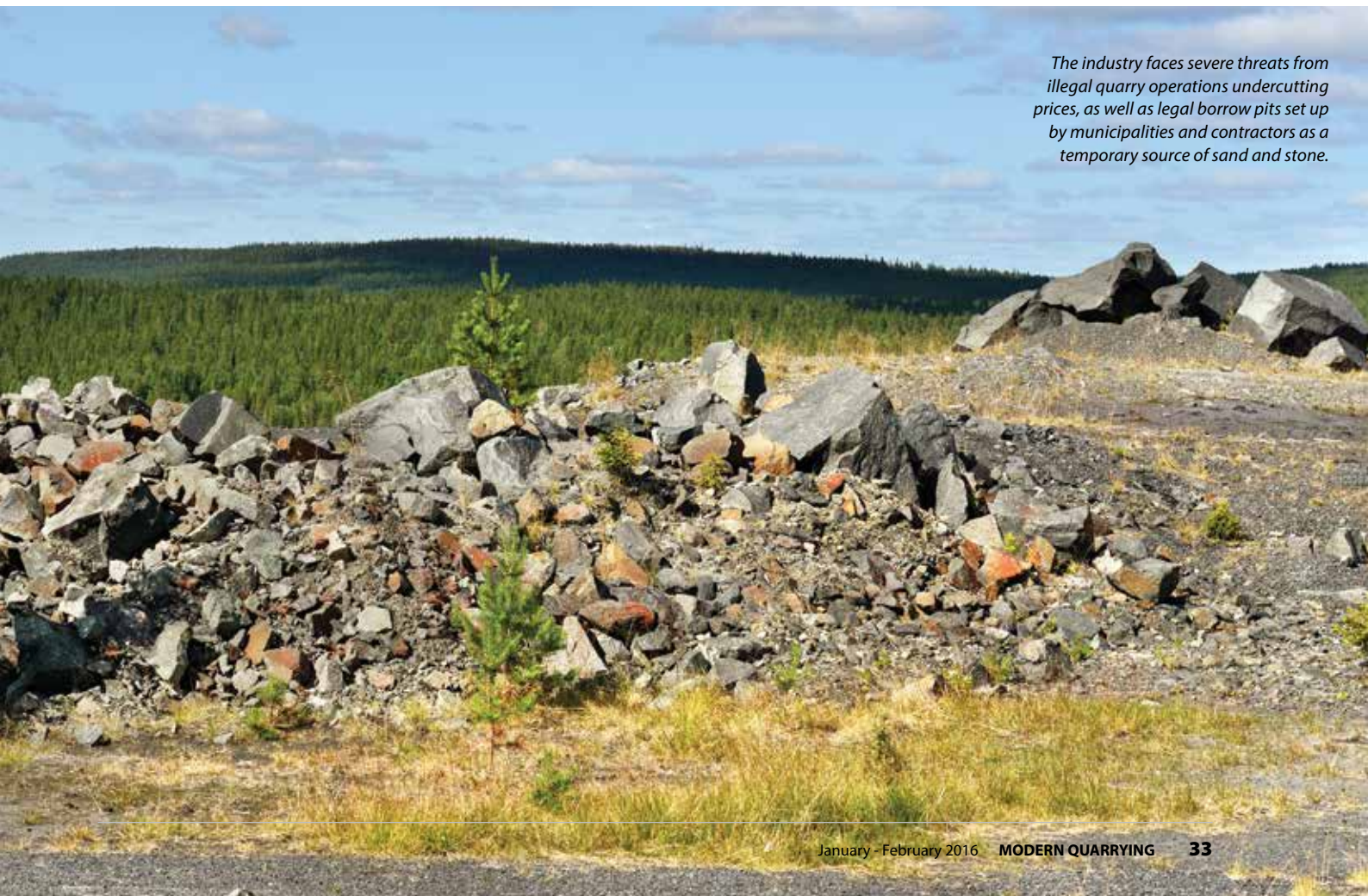
South African Revenue Services (SARS) to overturn a decision evoking the rights of quarry operations in claiming rebates. It is also working with SARS and Treasury on the effects of royalties levied on sand and aggregates, which is the only country worldwide requiring royalties on construction materials.

Aspasa is active on various government liaison committees in terms of challenges affecting industry stakeholders, employees and surrounding communities. "However, while it is our role to unite the industry, it is also our responsibility to guard against collusion and discourage competitive behaviour," he adds.

To this end, it holds regular workshops to educate its members in issues ranging from legal compliance, health and safety, to crushing, road transport and a host of other topics, which include various manuals in terms of best practices and compliance issues. "Our aim is to train our members to be honest and upstanding operators," Pienaar confirms.

[www.aspasa.co.za](http://www.aspasa.co.za)

Report by Dale Kelly



*The industry faces severe threats from illegal quarry operations undercutting prices, as well as legal borrow pits set up by municipalities and contractors as a temporary source of sand and stone.*

# Powerscreen drives Middle East development

*Al-Mohsen Engineering Company in Qatar is one of the country's leading specialists for the supply of aggregates to major construction companies currently involved in Qatar's many infrastructure projects. Since its establishment in 2012, Al-Mohsen has become a huge player in the construction segment thanks to its ability to supply large volumes of high quality aggregates to the market.*

**T**he company has invested in a range of Powerscreen rock crushing and screening equipment to meet the aggressive aggregates demands of huge local industry players involved in some of the most ambitious road development programmes undertaken in recent decades.

The first two machines purchased from local Powerscreen distributor, Arabian Agencies Company (Araco), were the Powerscreen® Chieftain™ 2100X mobile screen and Powerscreen® Trakpactor™ 500 impact crusher. As customer demand for quality aggregates has increased, Al-Mohsen has taken delivery of two further Trakpactor 500 and a Trakpactor 320 impactor, two Chieftain 2100X screens and a Warrior 2100 heavy-duty scalping screen.

According to operations manager for Al-Mohsen, Mohamad Naji, the machines are excellent. "We have had a great experience with Powerscreen; the equipment can sustain intense and heavy work for long hours and is very productive. We find the Trakpactor 500 impactor easy to operate and to service

when required. The efficiency, productivity and uptime of the Powerscreen equipment, has a huge impact on our daily activity and allows us to meet the needs of our clients on time, which is the ultimate goal."

Global equipment manufacturer Powerscreen also places a strong emphasis on meeting clients' needs. During a recent visit to the site where the equipment is working, international sales director, Stephen McCartney says: "Powerscreen has had a strong track record in Qatar and in the wider Middle East region for many years where our machines are widely known and well respected. The considerable investment by Al-Mohsen and the positive feedback it has provided since taking delivery of the machines, serves to underline this. A strong relationship with our customers and distributors is important to us. We want to make sure that customers get high-quality machines that are delivered on time. We are proud that our equipment is working in the construction of some of the most ambitious infrastructure projects in the region, the legacy of which will last for many decades."

## **Orbital highway project**

Al-Mohsen has provided essential materials to the J&P Group construction company for use in its ongoing Orbital Highway & Truck Road project, expected to reach completion in 2017. The Orbital Road project will create a vital north-south connection bypassing Doha City and reducing traffic and congestion within the Qatari capital. The J&P Group is responsible for the design and construction of 45 km and eight lanes of road network including four major interchanges and all related overpass and underpass structures.

The feed material for the machines is excavated limestone boulders which are transported from Lusail (north-east of Doha)



to the road construction site, where Al-Mohsen's Powerscreen plant is working for 20 hours/day. The Powerscreen machines are configured to deliver aggregates of 0-70 mm and 0-50 mm, and the plant reaches 7 000 t of crushed and screened material per day.

In addition to the J&P Group, Al-Mohsen also provides services to other major players such as Midmac, Al Darwish Company, Al Badr Group, Doha Logistics, ATM Group, Bin Tawar and Yuksel Midmac.

The company supplies aggregates to the China Harbour Engineering Company for a contract in the development of the major East West Corridor project. When the East West Corridor is completed, it will provide important strategic links with southern Doha and connect the Orbital Highway & Truck Road and the new Hamad International Airport.

"The support we receive from Araco, especially from the sales and customer support team is highly commendable. With the excellent performance of our machines, Al-Mohsen is now considered mature in our business field in the Qatari market," says Naji.

Araco has been Powerscreen distributor since 2009 and is a leading provider of commercial equipment in Qatar, backed by strategic investments and a strong product portfolio. Araco's philosophy to strive for continuous development and delivering the ultimate customer support is backed by its 46 000 m<sup>2</sup> facility with a team of highly-trained technician and service personnel who are available on a 24-hour basis to provide impeccable after-sales support.

Speaking of the projects in which Al-Mohsen is involved, Araco GM Antoine Azar says the company has a very strong working relationship with all its customers. "Our technical and customer support is one of our business's core strengths and we enjoy seeing our customers succeed. We are very proud to be involved in the construction of such important infrastructure for Qatar."

[www.powerscreen.com](http://www.powerscreen.com)  
[www.terex.com](http://www.terex.com)



Al-Mohsen Engineering Company representatives take delivery of the new Powerscreen Trakpactor 320.



Expected to reach completion in 2017, the Orbital Highway & Truck Road project will create a vital north-south connection which bypasses Doha City.

Qatar is experiencing some of the most ambitious road development projects undertaken in decades.

## Weir moves into global aggregates sector

Weir Minerals is gaining acceptance in the global sand and aggregates sector following the expansion of its comminution offering with the inclusion of the Trio product range. An example of this is that Weir Minerals recently supplied all of the equipment for a large scale, dewatering sand plant to the Middle East's leading quarry operator Stevin Rock LLC.

In the last 35 years Stevin Rock LLC has developed a reputation, which has become synonymous with reliability and consistency, delivering the highest quality material to several of the leading developers and construction companies both inside and outside the Middle East region.

The establishment of a successful working relationship with this globally renowned company has further enhanced Weir Minerals' credibility in the industry and guarantees its capability to supply

world class equipment to all major quarrying regions across the globe.

Stevin Rock LLC's three Emirate of Ras Al Khaimah-based quarries (Khor Khuwair, Al Ghail and Kadra) have the capacity to produce and sell more than 45-million t/year of high-grade limestone, gabbro rock, concrete and asphalt aggregates for the construction and manufacturing markets of the United Arab Emirates, Gulf region and Asia.

The new minerals plant will assist Stevin Rock to increase the recovery of water, one of the country's most valuable resources. It will further enable the water recovered to be reused, thus saving costs. In addition to this, the plant will upgrade the fine aggregate product to internationally accepted standards, which will increase the value of the product and their revenue stream.



Trio products include crushers, screens, feeders, chutes and material handling solutions.

Supplying equipment to one of the Middle East's largest and most prestigious quarry operating companies is a significant accolade for Weir Minerals and a milestone which will secure the company's global position in the sand/aggregate sector moving forward.

Stevin Rock joined forces with Ras Al Khaimah Rock Company (RAK Rock) late in 2007. Together the two companies form one of the largest quarrying entities in the world, effectively employing more than 2 500 people.

[www.weirminerals.com](http://www.weirminerals.com)

## Oil change intervals made easy

There are two groups of hydraulic fluid currently approved for use on Caterpillar's hydraulic mining shovels (HMS). The first comprise Cat HYDO™ Advanced mineral oil based hydraulic fluids, available in viscosity grades SAE 10W, SAE 20, and SAE 30. The second is Cat Long Term Hydraulic Fluid HSS, previously named Bucyrus Long Term Hydraulic Fluid HSS, which is now being phased out. Caterpillar acquired American original equipment manufacturer, Bucyrus, in 2011, with Cat dealer support provided for all legacy machines.

Both oils have a proven history, providing for 10 000 hour service intervals when combined with Cat S-O-SSM Services fluid sampling and oil analysis programmes. "Oil change intervals must be performed at 5 000 hours where S-O-S sampling is not adhered to," explains Barloworld Equipment group product specialist Reuben Pasha, "although this approach is definitely not recommended." Proper sampling means hydraulic oil S-O-S samples must be taken and evaluated every 500 hours. The recommended viscosity grade is SAE 20W for Cat and Bucyrus HMS units.

Compatibility studies were performed to confirm acceptable performance with an 80% mixture of Cat HYDO Advanced and Cat Long Term Hydraulic Fluid HSS. Therefore, for Bucyrus fleet owners, typically in the RH40 to RH400 model range, the transition to Cat HYDO Advanced is an easy and safe process. However, as Pasha points out, the correct system drainage procedures still need to be observed.

When changing a HMS from Cat Long Term Hydraulic HSS to Cat HYDO Advanced, at least 80% of the used fluid should be drained from the system. For most machines, this will require draining the hydraulic oil tank, suction header and suction lines, as well as the hydraulic cooler and hoses.



Adherence to Cat S-O-SSM Services fluid sampling and oil analysis programmes forms an essential component of predictive and preventative maintenance planning.

Correct drainage becomes even more important to note when machines transition to HYDO Advanced from a compatible, but non-Cat product. Then stricter measures need to be observed, with 90% of the used oil drained from the machine.

"Never mix incompatible oils as this can create sludge and precipitates that will prevent the system from operating correctly," Pasha stresses.

If the commercial oil is deemed to be incompatible with Cat HYDO Advanced, a more thorough draining and flushing process will be necessary, working with Barloworld Equipment specialists for the changeover process. However, the end result will be worth it, as improved efficiencies and optimum mechanical health translate into measureable bottom line savings.

[www.barloworld-equipment.com](http://www.barloworld-equipment.com)



## It's all systems GO! for Flanders Quarry

KZN aggregate producer Flanders Quarry has expanded its operations and fleet of Pilot Crushtec International equipment with the opening of an additional site at Verulam on the north coast.

The new operation, known as Flanders Canelands, is already underway with the current establishment of a new quarry and the successful supply of a significant amount of aggregate for use in the construction of the new Cornubia Industrial Development, the Umhlanga Interchange and other local developments.

Central to the growing operation is a brand-new Rubble Master RM80 GO! mobile impact crusher supplied at short notice by Jet-Park-based crushing and screening specialist Pilot Crushtec International. The new arrival will augment the company's existing RM80 GO! which has worked at its Mount Edgecombe quarry since late 2013, as well as other crushing and screening equipment.

Pilot Crushtec International CEO Sandro Scherf explains that the delivery and commissioning process was successfully completed within a three-day period in order to meet construction deadlines. The machine is already performing at close to design capacity. "The RM80 GO! is working as the primary crusher on site and is processing decomposed dolerite from a feed size of 500 mm. It is producing quality Colto G5 and G6 material at a rate of up to 160 tph without issues and has already produced more than 4 000 t of product for use as back fill and sub-base for these projects, including potentially new products for the interchange."

Flanders Quarry managing director Karl Stott explains that a second Rubble Master was the logical choice as a mainstay for the new venture. "It makes sense to stick with tried and tested equipment. We understand the machine, we know how it operates and experience has shown that we can rely on Pilot Crushtec International's service and technical back up. Our operators are familiar with the machine, like it, and so there is no need to spend valuable time in retraining."

Stott affirms that one of the major attractions of the RM80 GO! is the compactness of its design, which supersedes the traditional jaw crusher-cone crusher-screen production train. Functions are accommodated within one single unit, a significant space saving advantage for operators working within the close confines of a start up quarrying operation.

"The relatively small size of the Rubble Master aided by its remote control system, make it an exceptional product when used in the confined spaces of a new quarry. By the same token it can also be easily transported to alternative sites."

Flanders Quarry was also influenced by the product's ability to fulfil a varied number of applications and Stott is keen to investigate opportunities concerning the commercial recycling of construction materials.

"The recycling culture is something new to the local market. However, we believe that this is definitely an area of opportunity for both of our operations. We are looking at recycling opportunities that could either involve transporting recyclable material to the quarries or alternatively process the waste at source. This is a definite option given the ease with which the Rubble Master can be transported by road," Stott adds.

[www.pilotcrushtec.com](http://www.pilotcrushtec.com)



*The RM80 GO! Rubble Master can easily manoeuvre in confined spaces on quarries.*

## Ultra-efficient crushers and screens

Mobile crushing and screening equipment manufacturer Powerscreen, recently celebrated 20 years in the southern African industry in partnership with long-time local distributor ELB Equipment.

During a gala launch event at ELB Equipment's East Rand head office, the company showcased its new range of ultra-efficient crushers and screens designed to maximise output in right confines. The Trakpactor 260 impact crusher in combination with Warrior 600 screen is able to punch well above its weight despite the system's small footprint.

Powerscreen's marketing executive Gemma McCallan, says the successful relationship between the two companies has been mutually beneficial throughout the 20-year partnership. "With an ever-increasing range to service a number of new markets, we believe that we have a stronger proposition for the southern African market than ever before.

"Equipment like the new Trakpactor 260 and Warrior 600 have the potential to open up the market for smaller operations such as small-scale quarries, recyclers, demolitions, composters, etc, who will have the benefit of higher output mobile equipment without the need for much space," she says, adding that the Warrior 600 is the most compact mobile screen on the market and can easily be shipped in a single 20-ft container. "In combination with the Trakpactor 260, the duo has an aggressive action and fast throughput of over 200 tph, enabling it to compete with much bigger and bulkier machines."

[www.elbequipment.com](http://www.elbequipment.com)



*The Warrior 600 in a granite crushing operation.*



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## Smart financing solution

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"KomRent represents our response to tough market conditions and a shift in the purchasing strategies of customers in the mining and construction industries. Today's customers need more flexible funding options and we believe that this new partnership offers them the intelligent and cost-effective solutions they need," says Komatsu GM, Sales and Marketing, Mike Helm.

RentWorks, a FirstRand Group Company, finances more than R3-billion in assets for more than 400 organisations, across a range of industries and asset types.

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[www.komatsu.co.za](http://www.komatsu.co.za)  
[www.rentworks.co.za](http://www.rentworks.co.za)

From left: Michael Bolland, CFO Komatsu South Africa; Trevor Cronje, CEO RentWorks; and Deon van Wyk GM Sales, Wesbank.



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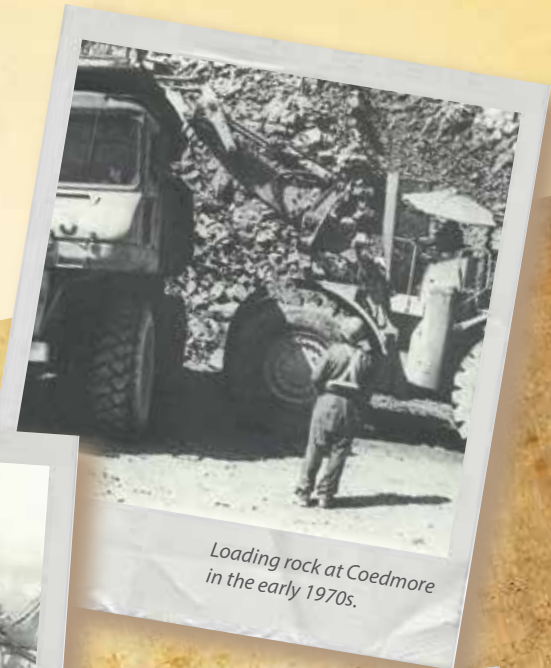
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## Blast from the past

As **MQ's** focus this issue has been a bit of a blast from the past, I've come across a collection of old photographs and newspaper cuttings given to me many years ago, which would be fun to share. **MQ** is always interested in 'old' photographs and memories. If you have any to share, we can make this a regular feature in the

magazine. Any photographs sent to me will be looked after and returned, otherwise scan them and email them to me directly. The ones displayed here are mostly black and white or very faded colour images. Let me know if you recognise any of these.



Loading rock at Coedmore in the early 1970s.



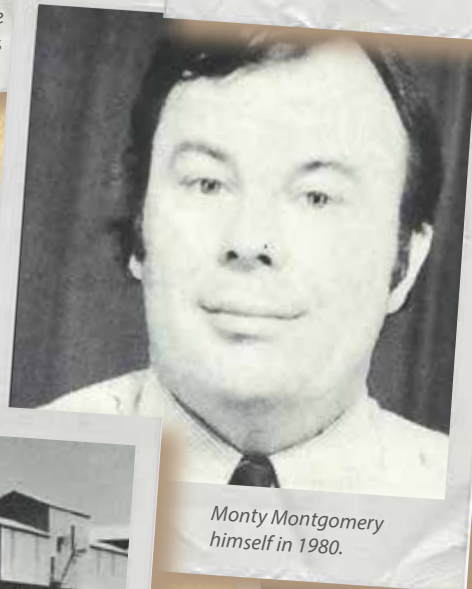
Recognise anyone? This was the very first N2 quarry supervisor's course intake in 1982.



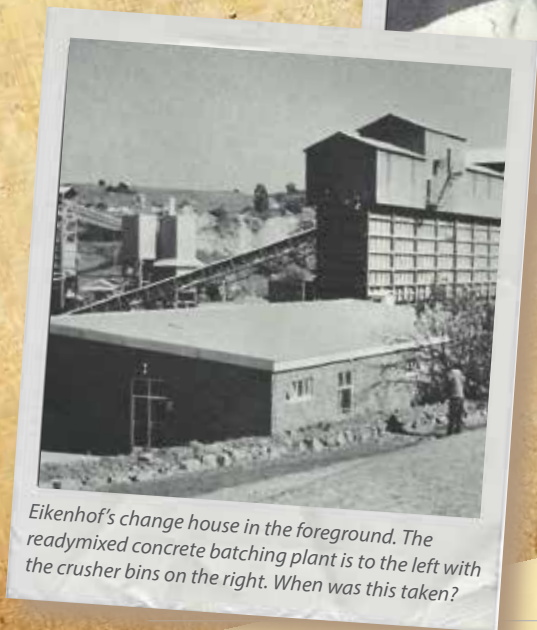
1984: Iscor's Donkerhoek quarry.



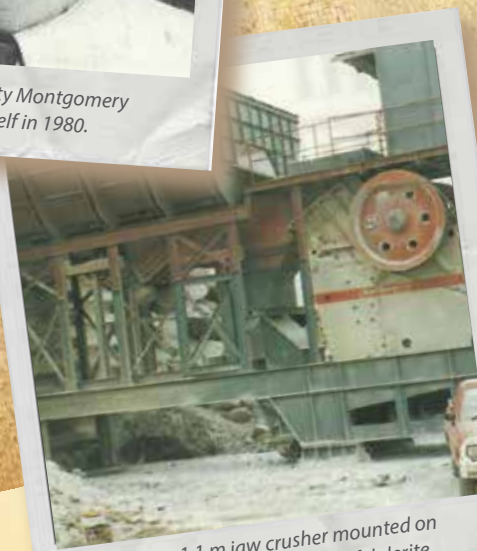
This is a mobile plant on the Stocks & Stocks section of tollroad, producing high-quality washed concrete aggregates. The quantity produced was 600 000 t.



Monty Montgomery himself in 1980.



Eikenhof's change house in the foreground. The readymixed concrete batching plant is to the left with the crusher bins on the right. When was this taken?



A 1,3 m x 1,1 m jaw crusher mounted on a chassis producing 500 tph of dolerite basecourse at Somerset East.

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