Illustration: Bea Crespo

MINING

Generation next

More than just "hole-diggers", miners are a specialised workforce driving a critical, technologically advanced industry – so, where are the graduates? **Jane Nicholls** finds out what mining companies are doing to attract new-gen employees.

Like any other recent university graduate embarking on a career, Michaela Padayachee is excited by the industry she's chosen, hungry for the opportunities that await and ready to make her mark. And yet, Michaela's fellow course graduates – mining engineers – are thin on the ground.

It seems that despite a profusion of wildly varying jobs that keep the modern mining industry productively humming across CBD offices and deep down remote mine shafts, the resources industry is facing a workforce crisis; specifically, an alarming drop in university enrolments for specialist mining engineering degrees. Yes, the career paths are numerous, the pay is excellent and the ability to choose a roster that suits personal preference is readily available. Still, there just aren't enough students coming through.

For Michaela, 22, the lure was simple. "The opportunity to work outside and all that big machinery had me excited," says the freshly minted University of New South Wales (UNSW) grad. Having just started her job as a mining engineer with Evolution, a goldminer, she represents hope for an industry facing a dearth of trained specialists.

"There's an image problem with mining, particularly in the eastern states, because there's a disconnect between people living in cities and [their understanding of] how mining contributes to Australia," says Paul Hagan, executive director of Mining Education Australia (MEA) and professor and mining discipline leader at UNSW's School of Minerals and Energy Resources Engineering.

Industry progressives concede they have been part of the problem and now need to become part of the solution. Addressing The Melbourne Mining Club in November last year, Woodside CEO and managing director Peter Coleman spoke of needing to prove to potential recruits that "we're not just simply a cash register but [that] we're doing something

that's meaningful, something that's enduring, something that we'll all be proud of. For Woodside, it means contemporising our company to become more a technology company; embracing data analytics, artificial intelligence [AI], robotics, additive manufacturing. It means looking at new energies and new fuels and new ways of doing things [and] being part of the carbon debate."

Debra Stirling, chair of Monash University's Mining & Resources Advisory Board, says the sector must "practically demonstrate environmental credentials" that go above and beyond mere compliance and also "think long term and build trust with our employees, especially over job security". She emphasises that the industry is critical not only for the economy but also for daily life. "Without resources we'd have no technology and no industry – no phones, computers, vehicles, buildings, roads, machinery. There's a huge purpose that benefits humanity, and resources is a highly advanced, exciting industry at the forefront of AI, robotics, analytics – not just dirty hole-diggers!"

It's easy to find eloquent ambassadors among young people already employed in the sector. They're proud of their work and believe in the environmental stewardship of their companies but concede they cop flak. "I can tell my friends judge me a bit – and I was once like that myself," says Saraya D'Ath, 23, who thought she would study marine science and still volunteers for a turtle rehabilitation centre in Queensland, the state where she now works underground as an electrician at BMA's Broadmeadow coalmine.

"A lot of our coal goes to Japan to make steel for cars and buildings and I don't think people are aware of that. I'd love to bring them down here and show them exactly what we do," says Saraya.

Young graduates like mining engineer and "greenie" Michaela Padayachee are the new face of the industry

The fact that industry leaders are acknowledging the urgency of climate action should help swing public opinion. "Climate change and the policy decisions associated with it affect all members of the community," Woodside's Coleman told The Melbourne Mining Club. "It is imperative that we act."

In the wake of the speech, at Woodside's base in Western Australia, "you could definitely feel the buzz vibrating around the company", says Khan John, a 20-year-old chemical engineering student and Bunuba man who has a cadetship there. "Being an environmental fanatic, that was great."

More university-educated workers are urgently needed. "Highly specialist mining engineers perform a very specific function in mine design, planning, optimisation and ventilation," explains Gavin Lind, director of Workforce Skills, Health and Safety at the Minerals Council of Australia and executive director of the Minerals Tertiary Education Council.

Four years ago, says Lind, about 250 mining engineers were enrolling in degrees across Australia; that number has plummeted to fewer than 50 today. "We need a minimum of 200 graduates a year just to fill resignations and retirements, let alone the expansion happening," he says.

Sentient Computing's Mark Smith (above) creates 3D models of mining equipment, like this animated dredger (top), which are then visualised virtually

Gaming technology is not just a recruitment tool; it's central to an innovative resources-jobs arena.

Suzan McDaniel, vice-president of Resourcing and Onboarding at the BHP Group, says mining has an "older brand" image, whereas "the reality is that our sector is at the forefront of much of the progress in innovation in technology – drilling, rail and truck automation – so we have an opportunity to reshape and portray the current reality".

She says there's a lot of competition for talent in new areas, such as data engineering and analytics, as well as "our core business areas – chemical, mechanical, petroleum and mining engineering – and that talent pool is getting smaller".

The MEA is working to grow it. Initiatives include a virtual reality (VR) "minerals awareness experience" and MineSolarCar, a new educational module for the popular video game *Minecraft*, where players have to explore and excavate the minerals needed to manufacture a solar-powered electric vehicle. The VR experience, used by the four MEA member universities (The University of Queensland, Curtin University, UNSW and The University of Adelaide) at open days and taken on tour to high schools, is built around a smartphone and the more than 50 different minerals used to make it – "most of which are mined in Australia", says Hagan. It's a journey around mine sites where some of the minerals are extracted. "We're helping the general public to understand what happens in mining, what decisions need to be made and the processes involved."

Gaming technology is not just a recruitment tool; it is central to an innovative resources-jobs arena, with designers, animators and programmers creating software that features rich 3D visualisations of mining equipment and entire sites. Doug Bester launched his company, Sentient Computing, in Perth almost a decade ago and now counts BHP, Rio Tinto, Woodside, Shell and Orica among his customers.

Sentient Computing creates numerous 3D and VR products for resources companies: 3D "fly-throughs" of sites (such as an offshore drilling rig), VR safety training and real-time data visualisations of complex mine-site environments. They look and feel like sophisticated video games, and Bester has six programmers, four animators/designers, a mechatronics engineer, a process-control engineer and an electrical engineer on his 20-plus team.

Paul Hagan and students explore a virtual mine site using world-first AVIE technology

Mark Smith, who has a degree in game design, swapped piecemeal gaming-industry gigs to join Sentient full-time, where the work is a close cousin of game design. "I create 3D models, texture them and animate them, and set them up in a virtual environment to move around and interact with other assets – but instead of a spaceship, I'm modelling a haul truck," explains Mark, 25. Early on, he modelled an enormous dredger "almost a kilometre long and articulated in all sorts of areas, with a big bucket-wheel. I built every handrail, stairway and walkway, everything inside and out on this huge monster, and it was really cool to walk around in virtual reality and explore this machine that I'd built."

Of course, it's not all VR; "at the coalface" describes Saraya D'Ath's real workday. Saraya did her electrical apprenticeship at BMA's Broadmeadow Mine, where she is now employed. When she started in 2015, she was one of only two female apprentices working in the underground coalmine. The arrival of the young women was a "surprise" to the men, she says, though they were welcomed – and underground toilets have since been installed. "They're trying to employ and sustain females in their workforce and it's been a huge success; there were a lot more female apprentices in the years after us."

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Technology is enabling women to join in manual labour. "They've put a lot of mechanical aids on machinery for the vehicles underground so females can drive these machines and load stuff onto them on their own," says Saraya. And, she adds, while working underground took some getting used to, "now I really like that environment". Yes, the pay is good "but money can't keep you there. Now I can't see myself doing anything else. I've found my groove."

Bec Sudholz, 27, a graduate mechanical engineer at BHP's Yandi iron-ore mine in WA's Pilbara, was tentative ahead of her first site work-experience during uni, because she had an image of "mining as a men's industry". She was pleasantly surprised. Bec is now a fly-in fly-out worker on a "lifestyle roster", which means she's home in Perth every weekend. "Lots of flying but I never miss a weekend."

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September 3 – 6 **Miles, Chinchilla. Dalby**
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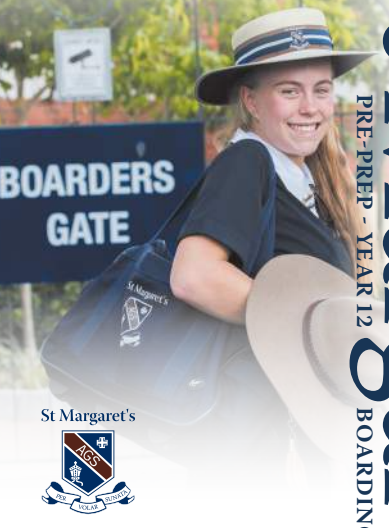

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Always on: graduate mechanical engineer Bec Sudholz believes her generation is well suited to the demands of mine work

She thinks her generation is perfectly equipped for mine work. "Younger people are always multi-tasking and in mining that's what you have to do: the mine never stops," she says. "I feel like this generation will be really good at keeping on top of it all and juggling." And women, she adds, "are just normal up here... we're using better tools, which means you don't need that brute strength to do the work. Anyone can fix things."

Woodside cadet Khan John, who's dreamt of being an engineer since high school, is about to have his first practical experience on an offshore rig and can't wait. "I'm an ocean kid – I love being out there in the environment. My father's an oil-rig operator. He used to come home and tell me stories about life on the rig, like, 'Oh Khan, you should have seen this huge tuna off the side of the rig today!'"

As for Michaela Padayachee, she's excited that everything is "moving towards having a social licence to operate and creating a sustainable mining industry". During her four-year degree, Michaela says students learnt how to design mines "based on social and environmental aspects, as well as economic and productivity factors. So it gets on my nerves when friends say, 'Oh, mining is such a dirty industry.'"

She and a fellow graduate friend "are both greenies, both vegetarian and big fans of sustainability. A lot of our friends still say, 'You're a mining engineer, you're just going to dig holes.' It's difficult when people tell you that you're harming the environment. I say to them, 'Wouldn't you rather we – people who are environmentally and socially conscious – work in the industry?'" ●