

SURFACE MINING: A selective approach

Surface mining technology is finding favour in greenfield projects where conventional excavation methods are constrained or uneconomical, Jamie Wade writes for *Australian Mining*.

With quality deposits diminishing, mine operators are facing increasing cost pressures, particularly where existing or proposed mining activity near built-up communities occurs.

This is especially so in areas such as the New South Wales Hunter Valley and Western Australia's Margaret River, where mining occurs in a highly visible and contentious region.

Thankfully, technology is keeping pace to aid in overcoming these challenges.

For a few decades now, surface miners have filled the niche for mining applications that required a selective approach to ore extraction.

However, surface miners are no longer just auxiliary equipment – they've become the key production machines in many mining operations locally and globally.

Filling the niche

The operating method of surface miners resembles that of cold milling machines.

A special cutting drum cuts and crushes the material before it is loaded on dumpers via a robust conveyor system.

The material can alternatively be deposited as a wind-row between the miner's crawler tracks – an option that enables surface miners to not only save time but costs and energy as well.

In addition surface mining technology allows raw mineral materials to be mined by cutting, not by drilling and blasting, which prevents damaging vibrations in the immediate vicinity of the mining site.

Heavy vibration restrictions and strict blasting are in place around the Hunter Valley due to the close prox-

imity of the mines to nearby communities.

Even so, complaints of increased vibrations, despite falling well within guidelines, still occur and negatively effect the public's perception of the mining operation.

It also prevents the possibility of dust plume events due to blasting, which anger

the local communities and raise the concern of 'toxic fumes' spreading around the site, despite the fact these events are often caused by damp, coloured dirt rather than 'dangerous' chemicals.

Surface mining supplier Wirtgen has been on the front foot in developing the technology that aids in avoiding these situations.

Speaking to *Australian Mining* on the eve of their surface mining workshop in Perth, Wirtgen staff including group manager mining division Bernhard Schimm, mining manager Colin Ford and national development manager Andrew Gotley were keen to highlight how new technology was making dollars and sense.

"There is a growing demand in mineral mining for mining methods that are more economically efficient and more environmentally compatible at the same time," Schimm explained.



A Wirtgen SM2500 Surface Miner in operation at FMG producing in excess of 1000 tonnes per hour.

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"With increasingly difficult geological conditions resulting in lower contents of useful minerals both in existing and newly developed mineral deposits, surface mining increases the exploitation rate of mineral deposits, because it enables the minerals to be mined in a selective operation."

"Selective mining produces a high yield of useful minerals of high purity, while saving natural resources at the same time," Ford added.

"Mineral deposits can be exploited right up to the peripheral areas of the mine."

On the surface of it

The low levels of noise and dust developing during the mining operation are yet another mark in favour when compared to conventional drilling and blasting methods.

Surface mining permits allow useful minerals to be mined effectively and without difficulty right up to residential areas or roads.

The surface miners cut and crush the minerals to be mined, producing small-sized material that is ideal for profitable processing, because it requires only minor additional treatment.

Mining coal, bauxite, phosphate, kimberlite or salt becomes increasingly profitable, and surface miners are capable of mining even hard lime or



A Wirtgen SM4200 Surface Miner in operation at FMG producing in excess of 2500 tonnes per hour.

granite rock of up to 260 megapascals without the need for drilling and blasting.

Coal mine operators in Australia can benefit greatly from surface mining technology, according to Colin Ford, who sees strong application of the technology on Greenfield coal mine sites on the eastern seaboard.

"New South Wales and Queensland have coal strata that are absolutely ideal for surface mining," he said.

The ability to mine close to residential areas is of key importance for operators in the two states' coalfields, where large open cut coal mines often back on to residential areas and acreage, which has caused tension in the regions as communities claim the mining industry is impacting the region and encroaching on their land

due to its visible and extremely noisy operations.

The machines have also seen use at Fortescue Metals Group's iron ore mines in Western Australia's Pilbara region, where the surface miners were able to produce in excess of 2500 tonnes/hour.

Crushing and screening

Not to be outdone by advances in surface miner technology, crushing and screening technology has delivered greater efficiencies – particularly in the process flow of material through the crusher.

"We started about five to 10 years ago by placing independent vibrating double-deck screens on mobile equipment before the crusher to remove more of the fine or on-size material to bypass crushing," Gotley said.

Greater belt widths are also said to be improving the flow of material through the machines to reduce blockages.

For the latest Mobirex MR 110 ZS Tracked Impact Crusher, "we start with a metre wide belt on the feed hopper followed by a 1.1m wide belt on the crusher, a 1.2m wide belt on the chute underneath the crusher to accept the materials, then a 1.3m wide belt coming out," Gotley added.

Another key advance in the machinery, says Wirtgen's Andrew Gotley, has been the change from hydraulic to electric drives for better fuel economy: "Less diesel means less cost to process the raw material."

Moving forward

Other key developments in the crushing machinery, accord-

ing to Andrew Gotley, have been the development of new blow bar designs and crushing wear plate designs that improve the flow and crushability of material.

With mobile crushers, adds Gotley, many Kleemann machines are now fitted with back to base monitoring or a Global System for Mobile communications (GSM) card.

"As long as there's a network, you can access the machines and troubleshoot if required," he said.

Another key trend seen is stationary processing plants increasingly being replaced by mobile machines.

Under the Kleemann brand, Wirtgen has developed special secondary crusher units which work, electrically interlocked, together with other machines such as primary crushers and screens.

Its secondary impact crushers and cone crushers are, depending on the process requirements, operated with or without fitted screens.

Depending on the application, the secondary crushers can be used as secondary or tertiary machines.

Even complicated processing sequences can be solved nowadays with several machines connected in series.

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Mobility is Mine - Economy

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The use of conveyors for material transportation significantly improves the economics of mining operations. A newly developed Tenova TAKRAF "state of the art" fully mobile crushing series provides a flexible link between mining shovel and face conveyor, reducing or eliminating the use of haul trucks. The versatile TMCS mobile crushing system can serve three mine benches with heights of more than 15 meters each by either directly feeding the face conveyor, or by utilizing a belt wagon or mobile bridge.

The mobile crusher is extremely manoeuvrable catering for continuous and synchronous movement with the face shovel. A crawler support located directly below the shovel dump hopper results in a very robust and stable design. The TMCS layout allows for the installation of either a twin shaft sizer or double roll crusher. The fixed and oversized discharge conveyor below the crushing unit equalizes material flow and minimizes spillage. The TMCS series has been designed to work in conjunction with the standard shovel range of 20 to 65 m³, yielding a design throughput from 3,000 up to 12,000 t/h.



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