


Cutting, crushing and loading rock in a single operation.

The World of Wirtgen Surface Miners







Breaking new ground in the mining of primary resources.

THE ECONOMICAL EXPLOITATION OF PRIMARY RESOURCES IN OPENCAST MINING IS BECOMING INCREASINGLY DIFFICULT AS THE MINERAL CONTENT OF MANY DEPOSITS IS DWINDLING DUE TO DIFFICULT GEOLOGICAL CONDITIONS. IN ROCK CONSTRUCTION, MACHINES ARE REQUIRED FOR PRECISE LEVELLING OPERATIONS UNDER RESTRICTED SPACE CONDITIONS. OUR PATENT REMEDY IN BOTH CASES IS MECHANICAL EXPLOITATION BY MEANS OF SURFACE MINING. BEING THE INNOVATIVE LEADER IN THIS TECHNOLOGY, WIRTGEN IS PASSIONATELY DRIVING THE DEVELOPMENT OF THIS ECONOMICAL AND ENVIRONMENTALLY GENTLE PROCESS, USING ITS EXPERTISE TO SUCCESSFULLY MASTER THE EVEN MORE DEMANDING CHALLENGES LYING AHEAD.

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Efficient and environmentally compatible mining of rock

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WIRTGEN is global market leader in the manufacture of machines for cutting rock in open-cast mining operations. WIRTGEN surface miners cut primary resources such as coal, gypsum, iron ore, salt, phosphate, bauxite, limestone or granite, achieving high degrees of purity in the process. They are increasingly used as primary extraction equipment also in

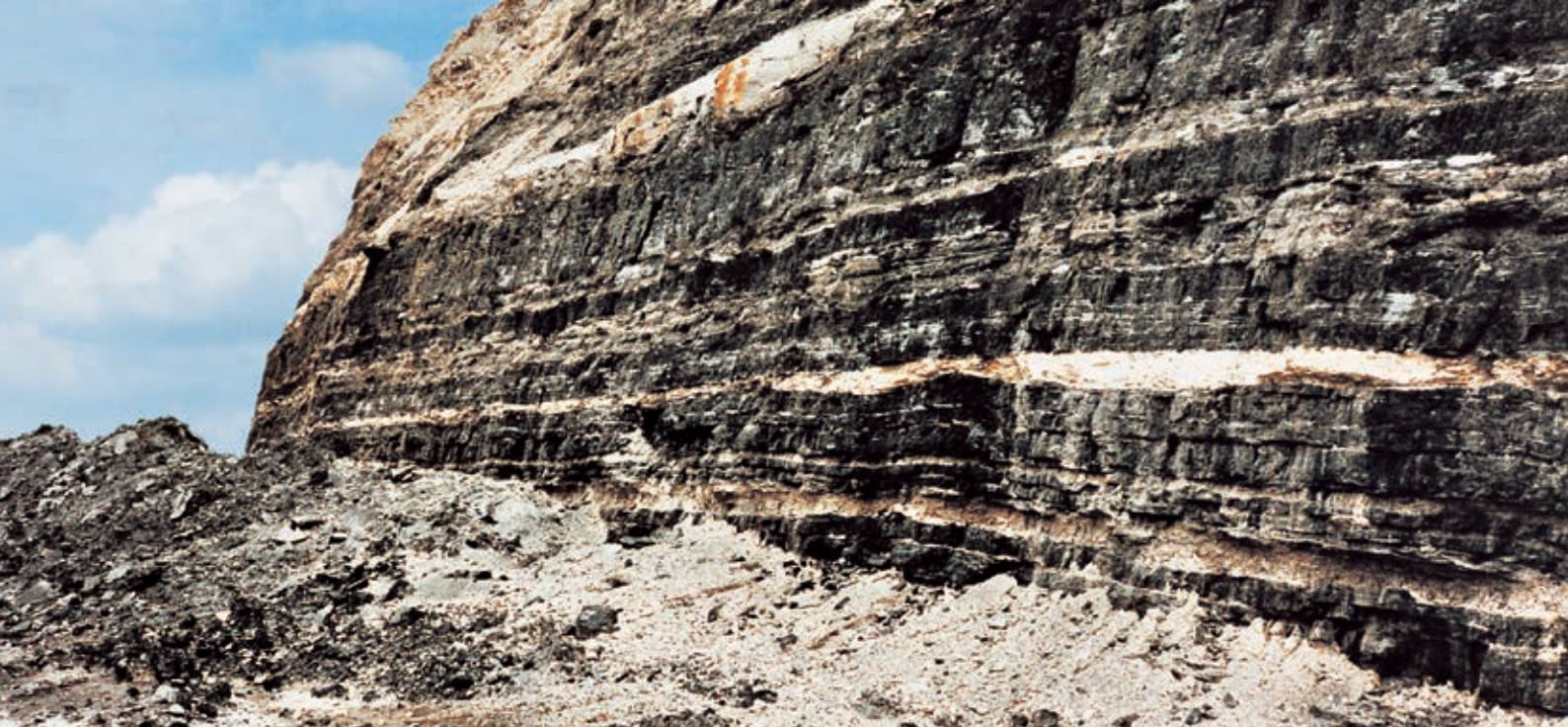
newly opened-up opencast mines or extensions of existing opencast mine operations.

Surface miners are just one step in a whole process chain but have a vital influence on the entire process – and in particular on the final result. The following features are the hallmarks of this innovative method:

SELECTIVE MINING

Surface miners extract primary resources in a selective operation, achieving high degrees of purity and maximizing exploitation of the deposits. Selective mining considerably reduces equipment, labour and time requirements as well as overburden volumes.





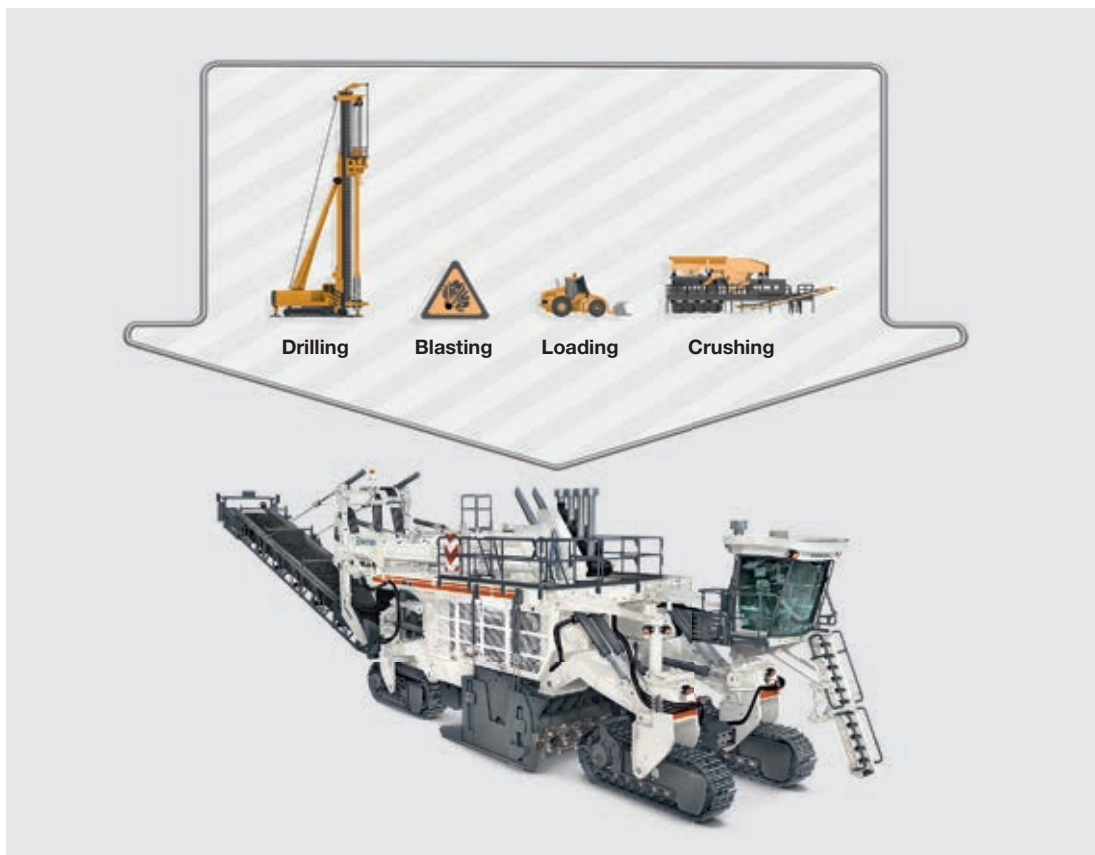
CUTTING, CRUSHING AND LOADING IN A SINGLE OPERATION

The mining material is cut, crushed and, if required, loaded straight into trucks or dumpers in a single operation, thus dispensing with conventional primary crushing in an additional work step. The surface mining process is much more economical than standard drilling and blasting methods with subsequent material loading.

BLASTING IS AVOIDED, STABLE SURFACES ARE CREATED

Strict environmental standards in terms of noise and dust emissions make the vibration-free surface mining process attractive in comparison to drilling and blasting. The stable, precise and level surfaces produced in mining, earthworks and rock operations are suitable for immediate use as pavements, slopes or tunnel floors.

The process is eminently suitable for the selective mining of various types of minerals, such as thin coal seams of high quality.



WIRTGEN surface mining – a single operation instead of four.

From future vision to recognized technology

1980

The 3000 SM prototype is successfully used in coal mining.



1983

The 1900 SM is mining gypsum in South Africa.



1989

WIRTGEN presents prototypes of the 2600 SM for use in coal and limestone mining.



1989

An optimized model of the largest surface miner built to date, the 4200 SM, is produced even today.



1999

WIRTGEN sets up production of the 2500 SM for special operations in hard rock.



2000

The 2500 SM is of modular design and suitable for versatile use in soft to medium-hard rock.



2009

The optimized 4200 SM is launched in two designs for soft rock and hard rock mining.



2012

WIRTGEN Pick Inspection (WPI) allows measuring of the degree of tool wear and scheduling of maintenance intervals.



1985

The 3500 SM is in operation in the USA, cutting foundations in hard limestone material.



1996

Cutting trenches, the 3700 SM simultaneously produces gravel material intended for further use.



2001

A modified method of depositing the mining material makes the 2100 SM extremely efficient in coal mining.



2013

For the mining of soft rock, the 2200 SM 3.8 is equipped with a 3.8 m wide cutting drum unit.



WIRTGEN DRIVES THE DEVELOPMENT OF SURFACE MINING

Why don't we apply our expertise gained in asphalt milling to the mining of hard rock? In the mid 70s, this idea triggered the development of a new, economically efficient opencast mining method known as surface mining.

What followed was an unparalleled success story, and it was headed by WIRTGEN as the driving force behind it right from the start. 1980 marked the birth of the state-of-the-art surface mining process - WIRTGEN developed a prototype based on road milling machines, the 3000 SM surface miner. Market entry was accomplished in 1983 when the first machine, a 1900 SM surface miner, was sold.

In keeping with market requirements, we then continued to develop ever larger machines for ever higher performance rates.

Surface miners in detail

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DISCHARGE CONVEYOR

Discharge conveyor including raising and slewing function for direct loading onto a transport vehicle.

1 |

COUNTERWEIGHT

Movable counterweight for high machine stability and undisturbed operation along the edge of embankments.

2 |

POWER UNIT WITH DIESEL ENGINE

Fuel-efficient, powerful diesel engine paired with a heavy-duty mechanical belt drive for high cutting performance.

10 |

DRUM TOOLING

Extra-robust mining tools arranged in a helical pattern for high cutting performance, minimized tool wear and extended durability.

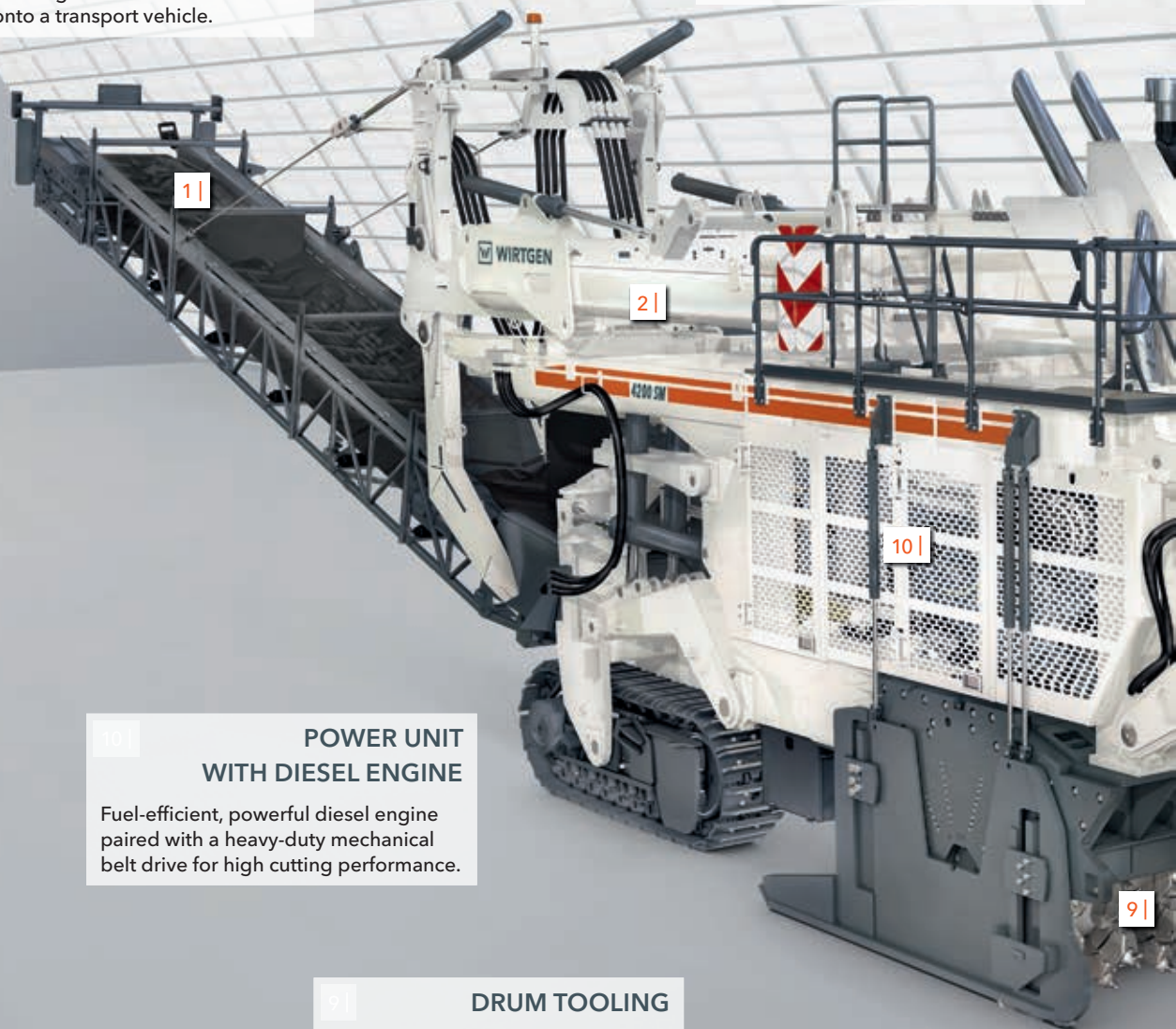
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CUTTING DRUM

Mechanically driven, wear-resistant cutting drum working in up-cutting mode for efficient operation.

8 |

9 |



MINING MINERALS IN A SINGLE OPERATION

As the surface miner moves forward, a special cutting drum rotates against the direction of travel, cutting layers of material from the rock formations and crushing it in the process. The primary conveyor picks up the material in the drum housing and transports it towards the rear of the machine, where it is then accepted by the slewable and height-adjustable discharge conveyor. The discharge conveyor loads the material into trucks or dumpers or discharges it to the side of the miner. The discharge height can be adjusted to the height of the transport vehicles. The surface miner is driven via four steerable and height-adjustable track units. An automatic levelling system ensures precise adherence to the cutting depth, thus enabling even thin seams or layers to be mined selectively and with maximum accuracy.

SAFETY EQUIPMENT

Comprehensive safety package ensuring compliance with international mining regulations.

CABIN

Fully glazed and sound-insulated comfort cabin including swivelling function for productive working.

WIRTGEN PICK INSPECTION

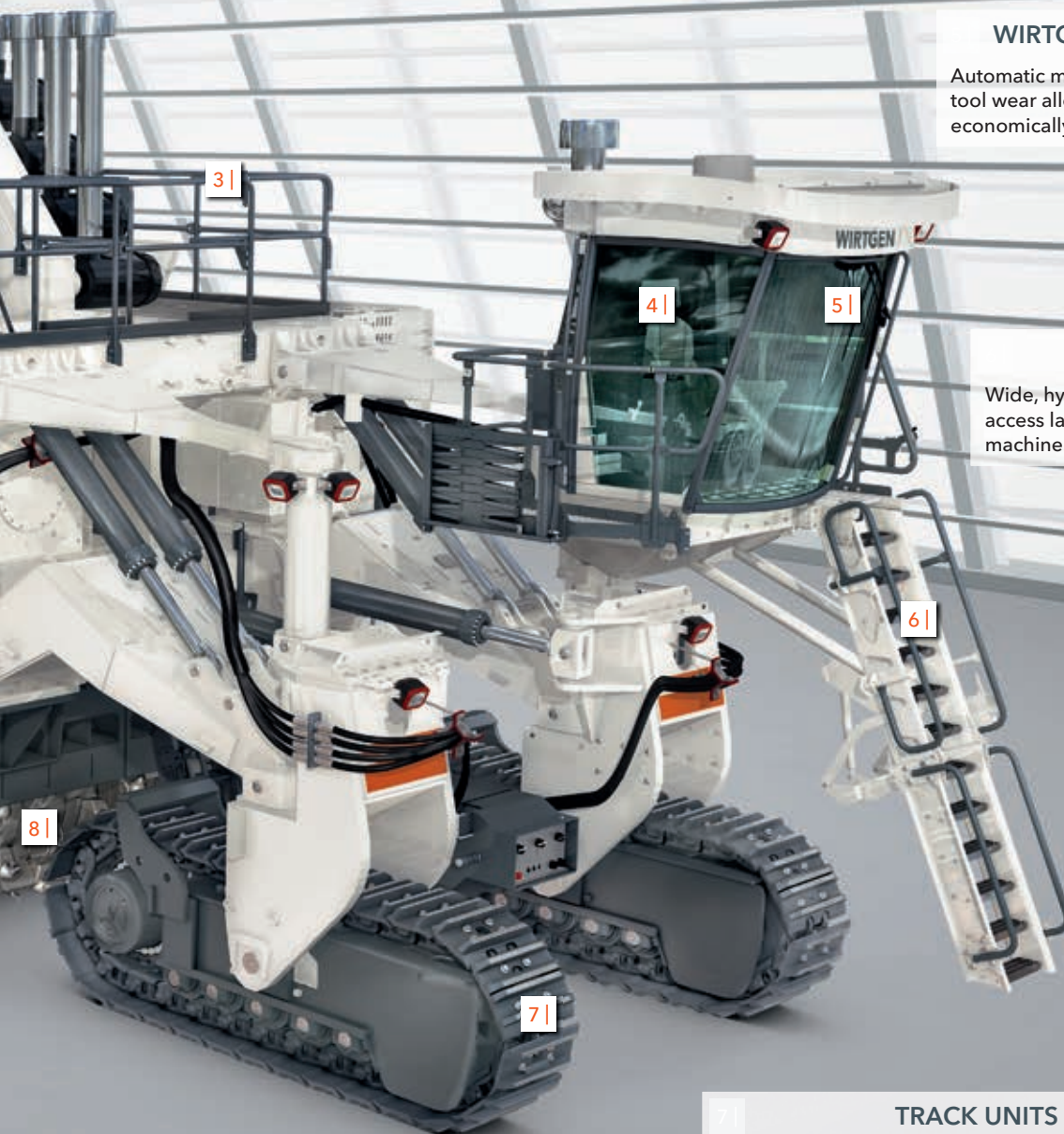
Automatic monitoring of the degree of tool wear allows the tools to be replaced economically at precisely the right time.

ACCESS

Wide, hydraulically adjustable access ladder for easy access to the machine.

TRACK UNITS

Separately steerable and height-adjustable track units for full manoeuvrability and precise cutting depth adjustment in off-road operation.



Operating principle and components

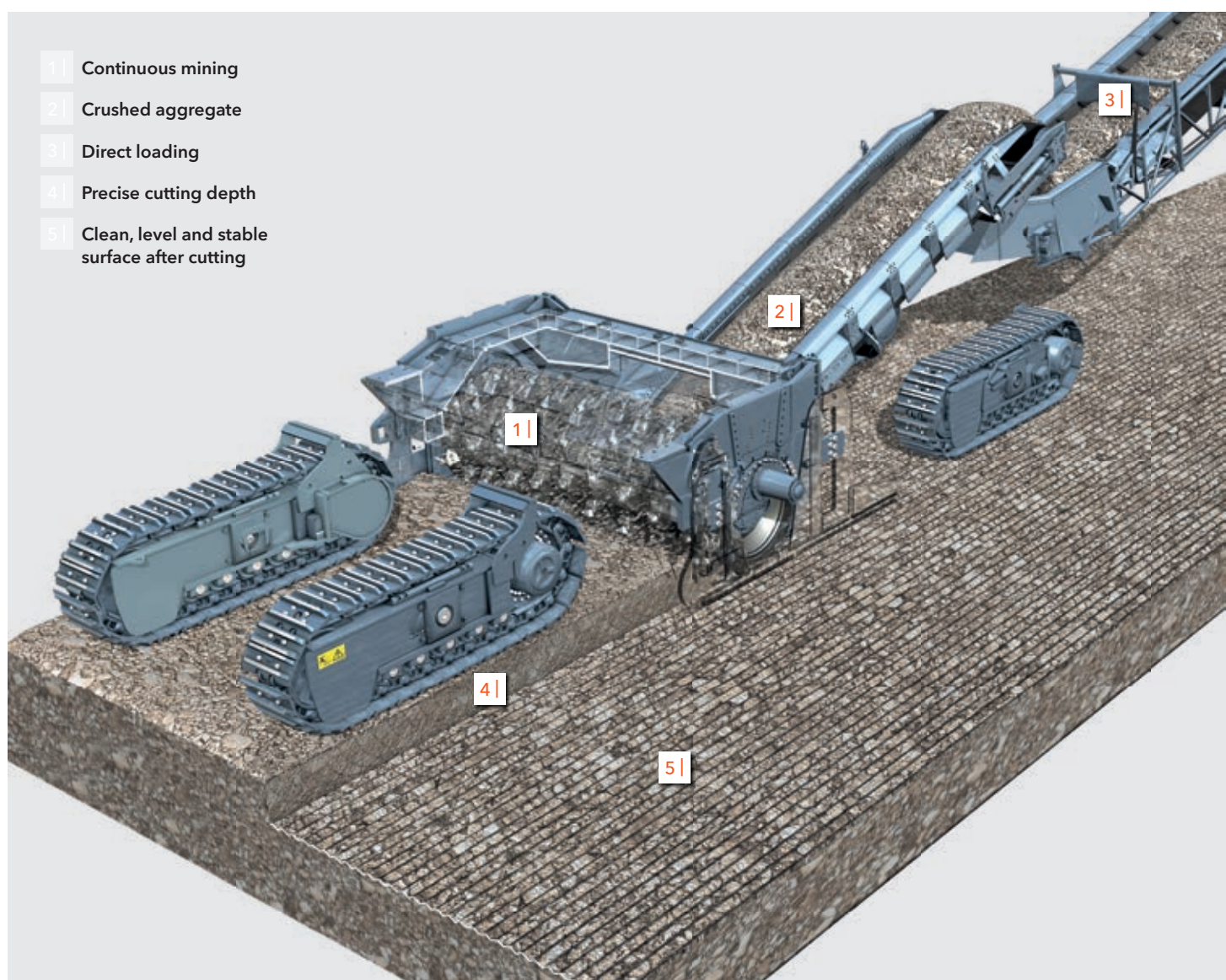
INTELLIGENT CENTRAL-DRUM DESIGN

The technical centrepiece of the central-drum design implemented in our surface miners is the cylindrical cutting drum. Fitted with replaceable carbide tools and mounted close to the machine's centre of gravity, the drum guarantees maximum cutting performance and precise cutting depths in the mining of hard rock.

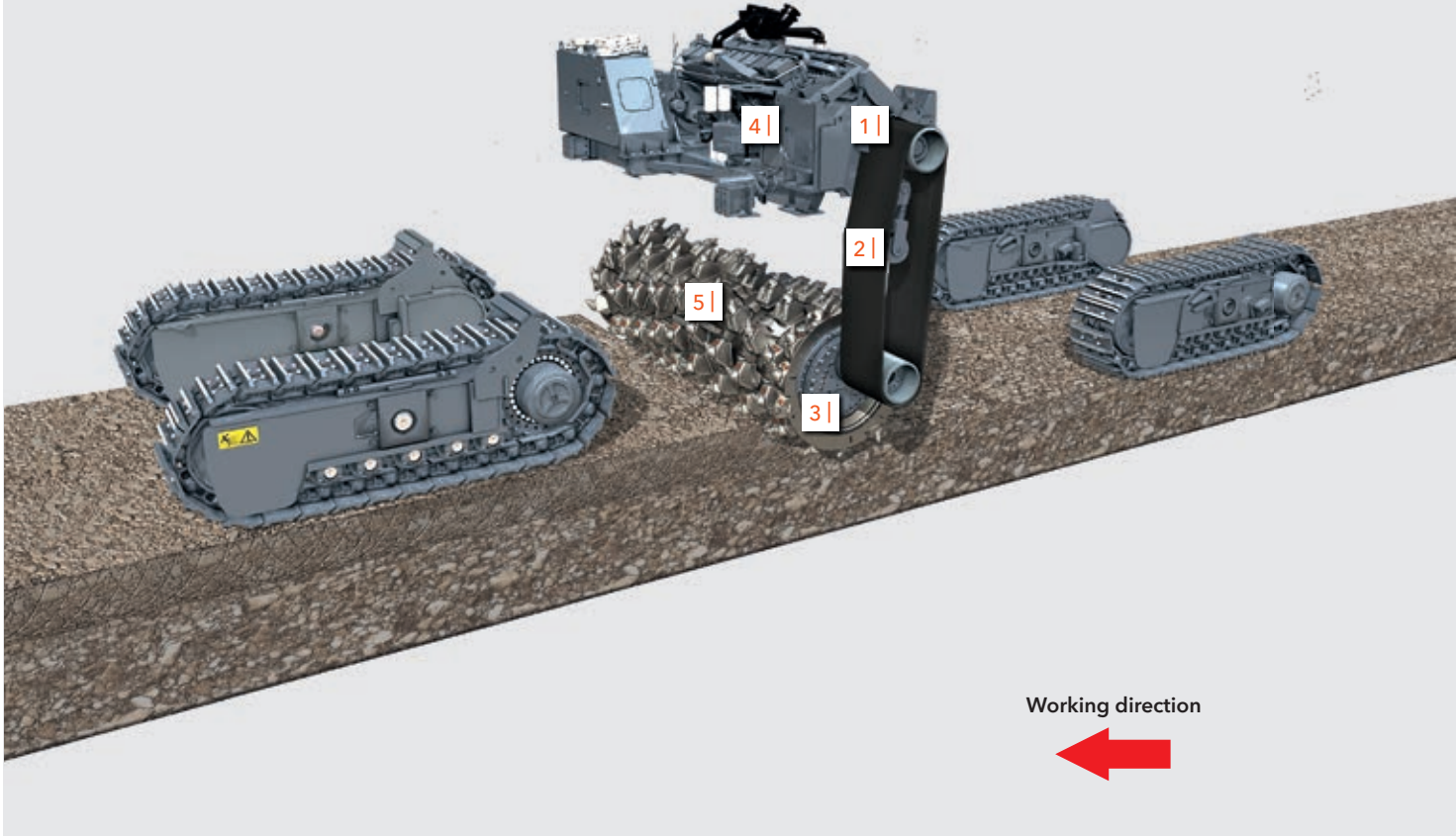
A powerful diesel engine combined with a heavy-duty belt drive contributes to the machine's rapid progress in hard rock.

Optimum transmission of power is ensured by the highly efficient mechanical cutting drum drive. Our miners are capable of selective mining, and this valuable feature also enables them to mine even thin coal seams or interburden with precision and economic efficiency.

The continuous, highly effective cutting operation guarantees an uninterrupted flow of material. The production of both small-sized material and a level, stable surface permits the use of lightweight trucks in the mine operation.



- 1 | Clutch
- 2 | Power belts
- 3 | Planetary transmission
- 4 | Diesel engine
- 5 | Cutting drum



Working direction



Drum drive design with centrally arranged cutting drum.

The cutting drum rotates against the direction of travel to allow cutting from the bottom upwards - no vibrations incurred.



WIRTGEN cutting tools guarantee maximum cutting performance while minimizing the cost of wear.

Unrivalled cutting technology

OUR FIELD OF CORE EXPERTISE

WIRTGEN cutting drums, toolholders and cutting tools are tried-and-tested, proprietary high-tech elements subject to a continuous improvement process. For each application, we are making every effort to optimize the cutting performance while at the same time maximizing the service life and minimizing operating costs.

To achieve this goal, the cutting drum and toolholder system are given a heavy-duty design tailored to performance requirements in accordance with the type of rock to be mined, rock hardness and material gradation. The un-

rivalled HT15 quick-change toolholder system is the decisive element here. If required, the cutting drums are additionally provided with special wear protection equipment.

Yet another highlight is our optional "WIRTGEN Pick Inspection" (WPI) feature: this system identifies worn tools automatically by means of an optical measuring process.



1 | The cut material can also be deposited in a windrow behind the cutting drum.

2 | WPI uses camera laser sensors to measure the degree of cutting tool wear, displaying the results on a separate screen.

3 | Hydraulically operated cutting tool extractors improve productivity.



High-performance loading

FLEXIBILITY GUARANTEED - WHATEVER THE JOB

WIRTGEN surface miners master material loading with superior ease. Huge amounts of mining material are loaded into transport vehicles via a conveyor system. Needless to say, however, that windrowing or discharging the material to the side for stockpiling are also part of the machine's loading repertoire. This high degree of flexibility is owed to the height-adjustable and slewing discharge conveyor which can be adjusted precisely to any

given mining parameters. Surface miners are designed as front or rear loaders, depending on the model, but powerful and steady loading is a common feature of all miner models.

The miners' powerful conveyor drive, continuously adjustable conveyor belt speed and wide, steep-incline belts with extra high ribs make sure that even large dump trucks are loaded to full capacity regardless of the job to be completed – and even when mining minerals of high density, such as iron ore.



1 | The 2200 SM is a front loader, its discharge conveyor being mounted at the front of the machine.

2 | The counter-weight of the 2500 SM rear loader provides stability when discharging the material to the side of the miner.

3 | The discharge conveyor has a slewing range of 90 degrees to the left and right, thus enabling direct loading into trucks or dumpers.



Effective operating and safety concept



The cabins offer perfect visibility and ergonomic design.

FULL FOCUS ON PRODUCTIVITY

WIRTGEN surface miners can be operated efficiently by one machine operator only. The cutting operation, cutting depth control and loading process are all carried out in a mostly automated process. The operator can fully focus on steering the track units, regulating the miner's advance speed and discharging the mining material. To do so, he can choose

his position on the ergonomically designed operator's platform so as to always have a good view of the front track units and of the conveyor's discharge zone.

Numerous safety features ensure the safety of machine operators and maintenance staff, as well as compliance with stringent mining regulations: vital ingredients of this concept include a comprehensive lighting package, non-slip walkways and accesses, standardized railings, readily accessible emergency stop switches, wide-range cameras, FOPS or ROPS/FOPS equipment, emergency exits and fireproof cladding.

The operator is in full control of the mining operation.





Strict safety regulations and machine standards can be complied with by making the relevant machine modifications.



The operator always keeps an eye on the loading operation.



2200 SM



2200 SM 3.8



2500 SM



4200 SM (hard rock)



4200 SM (soft rock)



The world's largest and most comprehensive model range.

CHOICE BETWEEN TWO MINING METHODS

The surface miners from WIRTGEN cover the full performance range in mining, earthworks and rock construction to up to 15 million tonnes of mining material per machine per year- this is truly unique! Whether a small quarry mining project in restricted space conditions or continuous operation in large-scale opencast mining: our range of machinery is the largest worldwide, offering the ideal miner for every type of resource and overburden in most diverse operating conditions. In addition, our surface miners can be tailored to accurately comply with specific application requirements and, as a standard feature, unconfined compressive strengths of up to 80 MPa.

WIRTGEN is also the only manufacturer worldwide offering customers two different mining methods. In line with requirements or to ensure maximum efficiency, the mining material can be deposited in a windrow or loaded onto waiting transport vehicles via a loading conveyor system.



Highest quality for continuous operation

WE MANUFACTURE PRODUCTS OFFERING GENUINE VALUE

The way a machine is manufactured is the key to a long and successful service life. That is why, in view of the tough operating conditions that surface miners generally face, robustness and quality must take pride of place. In our production plant at the company headquarters in Windhagen, our machines are designed to be extremely robust. Combined with production facilities developed in-house

and state-of-the-art processing technologies, machines are built here for uncompromising use in mining operations.

Our highly qualified and highly motivated staff is yet another essential asset when it comes to ensuring the top quality of our machines. Computer-aided manufacturing control and the high degree of vertical integration ensure first-class, consistent quality.



1 | Each cutting drum is designed in line with the specific operating conditions it is intended for, using state-of-the-art 3D CAD technology.

2 | Expert staff only performs welding work, for example, on the drum housing shown here.

3 | The cutting drum is produced with the greatest care.





We ensure 24/7 operation

CUSTOMIZED SERVICE CONCEPTS

Surface miners are used as primary extraction equipment and are typically operated on a 24-hour basis. To ensure maximum machine availability, WIRTGEN offers a unique customer-specific service for large-scale projects: in close cooperation between the German main plant and the WIRTGEN GROUP's local subsidiary, WIRTGEN sets up additional service facilities in the immediate vicinity of the customer's site. Service centres ensure the professional repair or overhaul of surface miners while enabling a comprehensive parts inventory to be stocked at the same time. Needless to say that, as part of the efficient service concept,

highly qualified WIRTGEN GROUP specialist staff is present at the service centre and in the mine all the time to ensure optimum machine support.

To ensure maximum machine utilization, WIRTGEN offers a broad, ongoing training programme at the mine, the service centre or the German main plant.



1 | Cutting drums and conveyor systems are overhauled in our own workshop set up in the customer's immediate vicinity.

2 | In cooperation with our customer, we make sure that all of the required spare parts are in stock at the service centre.

3 | Numerous WIRTGEN GROUP service experts offer "just-in-time" support on site.

Successful mining operations in all parts of the world

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CANADA

- > Limestone 1 SM
- > Kimberlite 2 SM
- > Oil sands 1 SM
- > Salt 1 SF

USA

- > Limestone 16 SM
- > Coal 4 SM
- > Gypsum 30 SM
- > Dolomite 1 SM
- > Sandstone 1 SM

EUROPE

- > Limestone 31 SM
- > Oil shale 3 SM
- > Salt 19 SF
- > Pegmatite 1 SM
- > Gypsum 3 SM
- > Coal 5 SM
- > Tuff 1 SM
- > Copper 1 SM

MEXICO

- > Limestone 2 SM
- > Gypsum 1 SM
- > Salt 2 SM



MOROCCO

- > Phosphate 1 SM

ALGERIA

- > Limestone 8 SM
- > Phosphate 1 SM

SENEGAL

- > Limestone 2 SM

GUINEA

- > Bauxite 13 SM

DOM. REPUBLIC

- > Limestone 3 SM

COSTA RICA

- > Limestone 3 SM

FRENCH GUYANA

- > Limestone 1 SM

PERU

- > Phosphate 1 SM

BRAZIL

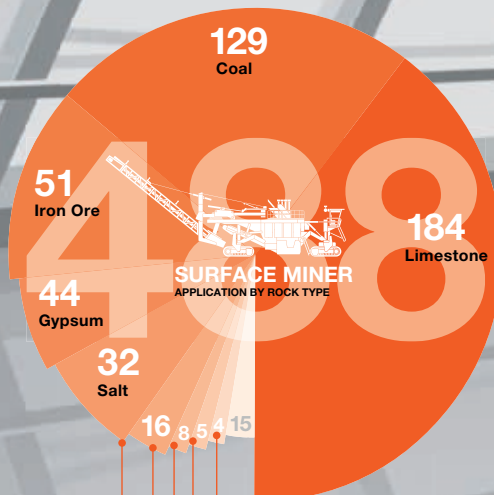
- > Limestone 2 SM
- > Bauxite 3 SM

BOLIVIA

- > Salt 2 SM

CHILE

- > Caliche 1 SM
- > Salt 2 SM



Bauxite
Phosphate
Others
Kimberlite
Granite



RUSSIA

- > Limestone 19 SM
- > Kimberlite 1 SM
- > Coal 3 SM
- > Salt 1 SM



MONGOLIA

- > Coal 1 SM

UKRAINE

- > Limestone 4 SM
- > Gypsum 1 SM

KAZAKHSTAN

- > Limestone 2 SM
- > Coal 2 SM

LEBANON

- > Limestone 1 SM

UZBEKISTAN

- > Phosphate 3 SM
- > Gypsum 2 SM
- > Limestone 1 SM

CHINA

- > Limestone 1 SM
- > Caliche 1 SM
- > Coal 6 SM

JAPAN

- > Limestone 2 SM
- > Granite 5 SM



EGYPT

- > Gypsum 1 SM

ISRAEL

- > Phosphate 1 SM

IRAN

- > Gypsum 3 SM

SAUDI ARABIA

- > Limestone 2 SM
- > Phosphate 1 SM

QATAR

- > Limestone 8 SM

THAILAND

- > Shale 2 SM

YEMEN

- > Limestone 1 SM

NIGERIA

- > Limestone 14 SM
- > Coal 2 SM

INDIA

- > Limestone 41 SM
- > Coal 92 SM



PHILIPPINES

- > Limestone 1 SM

INDONESIA

- > Limestone 4 SM
- > Coal 6 SM

BOTSWANA

- > Clay stone 1 SM
- > Salt 1 SM

MOZAMBIQUE

- > Coal 1 SM



SOUTH AFRICA

- > Kimberlite 1 SM
- > Limestone 1 SM
- > Coal 1 SM
- > Gypsum 3 SM



AUSTRALIA

- > Limestone 2 SM
- > Tuff 1 SM
- > Salt 4 SM
- > Iron ore 51 SM
- > Coal 6 SM



MINIMIZED ENVIRONMENTAL IMPACT

We not only develop innovative machines of the highest quality. With our machine technology, we also constantly endeavour to keep environmental pollution as low as possible. A WIRTGEN surface miner is a perfect example of this philosophy: it impresses with its environmentally friendly technology as it cuts, crushes and loads rock in a single operation. A tremendous advantage of selective mining is that the vibrationless mining operation without drilling and blasting is accompanied by low levels of dust and noise. The low environmental impact also permits maximum exploitation of the deposit right up to the edge of residential areas. The selective mining of high-quality materials requires considerably less space than conventional mining methods. Our fuel-efficient, intelligently controlled engines comply with the strictest exhaust emission standards.

- > **WIRTGEN SURFACE MINING** reduces four operating steps to one.
- > **STATE-OF-THE-ART ENGINE TECHNOLOGY** reduces exhaust and noise emissions.
- > **ANTI-VIBRATION ENGINE SUPPORT** reduces vibration and noise emissions.
- > **STATE-OF-THE-ART MACHINE CONTROL** reduces exhaust and noise emissions.
- > **SOUNDPROOFING** reduces noise emissions.

Resource-efficient surface mining.









WIRTGEN GmbH

Reinhard-Wirtgen-Str. 2 · 53578 Windhagen · Germany

Phone: +49 (0)26 45/131-0 · Fax: +49 (0)26 45/131-392

Internet: www.wirtgen.com · E-Mail: info@wirtgen.com

