



Job Report Surface Mining

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Bernhard Schimm, January 2005

Coal mining in India

When Wirtgen introduced its Surface Miners to the Indian mining industry in the early 80ies, coal mining was in fact one of the major targets. The access to the Indian market was however well prepared: Regional mining specialists in India had then already conducted comprehensive research studies on the Surface Mining technology and considered it as a suitable and profitable alternative to conventional mining methods in the coal area. Particularly for difficult deposits and mining conditions the advantages and benefits of the Surface Mining technology were very convincing for the

coal experts:

- ▶ Surface Miners allow selective mining of coal and parting seams.
- ▶ The machines simplify the mining process and processing methods.
- ▶ Last but not least the Surface Miners eliminate drilling and blasting.

Particularly selective mining is a crucial issue in the exploitation of coal deposits in India. The reason for this is obvious: In general the Indian coal derived from non-coking coal



The first 2200 SM with the 3.80 m cutting drum works in an Indian coal field since December 2004. The new drum increases the cutting performance of the machine and makes optimum use of the existing performance potential of the 2200 SM.



The coal can be cut and crushed in one machine pass with low manpower requirements. The material is deposited in a windrow behind the machine, ready to be loaded.

fields is characterised by a high ash content. This is due to the inherent ash content of the coal as well as to the occurrence of coal with embedded parting seams. When these coal deposits are mined by conventional methods as blasting and ripping, dirt bands are for example mixed with the coal. But it is of utmost importance for the Indian coal industry to produce high-quality coal at an economical rate for the increasing demands of electrical energy. It is however a given fact that the coal quality is getting worse up to a certain point where coal exploitation becomes unfortunately totally uneconomical. This situation forced the respective mine managers in charge of the coal deposits to look for suitable alternatives.

The introduction of Surface Miners to the Indian market

In 1998 Wirtgen was faced with the situation of locked coal in the Mahanadi coal field in the south-eastern part of India.

More than 7 Mio. t of coal were situated close to a village and could not be mined because of stringent blasting restrictions. Mahanadi Coal Ltd. set up a project together with Wirtgen and developed a solution of how to mine out the locked coal using Surface Miners.

A tender was launched. Contractors were invited to quote for this job with a clear commitment to use Surface Miners. Global Mine Tech won this tender and carried it out using 3 Wirtgen Surface Miners of the machine type 2100 SM.

These machines were commissioned between June and December 1999. During the first job which was terminated in March 2001, the Surface Miners mined out 7.010.000 t in a total of 24,744 operating hours. As a result the Surface Miners gained a strong acceptance as a core mining technology. Previously they had been considered only as a niche technology.



The Surface Miners ensure the selective extraction of the coal deposits. Indian coal has a high inherent ash content. Selective mining guarantees high quality coal for the energy industry.

During this project Wirtgen Surface Miners proved its strengths:

- ▶ Mining coal with a high production and performance rate without using blasting.
- ▶ The machines had a high availability, reduced down-times and showed a high capacity utilization rate (5,000 to 6,000 operating hours per year and machine).
- ▶ The Surface Miners proved to be very cost effective and produced higher quality coal by using selective mining methods than the conventionally mined deposits (only the Surface Miners, a front-end loader and a few trucks were required during the entire operation).
- ▶ The use of Surface Miners contributed to a very simple mining and operation planning.
- ▶ The even and solid surface which was initially produced by the Surface Miners allowed effective loading operations for the front-end loaders and the fast and safe operation of the additional trucks.

- ▶ Even common trucks could be used effectively. The loading of small particle size material did not harm the truck body as such and thus the wear and tear of the trucks in regard to e.g. tyres and chassis was reduced considerably.

The method of leaving the cut material on the surface in a windrow behind the Surface Miner and to load it on the trucks later has become a standard application in many Surface Mining operations to date.

This uncoupling of the cutting process from the loading operation offers the following advantages:

- ▶ It guarantees a higher productivity rate for the Surface Miners since there are no waiting times for the trucks involved.
- ▶ The cut material which has been laid down in advance can be used as a mine stockpile (emergency buffer). Loading can be done on demand.

This first success story in the Indian coal industry led to further interesting projects with increasing amounts of coal to be mined. Apart from the various mines of the Mahanadi coal field the Surface Mining technology is nowadays used in the South-Eastern Coal Fields and Central Coal Fields of Coal India Ltd. Today, more than 25 Surface Miners, including over 20 units from Wirtgen, produce approximately 50 Mio. t of coal annually in India: Surface Miners of the type 2100 SM and machines of the machine type 2200 SM are in operation at different Indian mining contractors. Recently another 2200 SM with a special drum unit of 3.80 m working width has been introduced.

Further technical developments

The technology of the machines has been permanently improved and further developed according to the increasing demands of the Indian coal mining industry. Starting with the 2100 SM, a machine which produces 6,000 t/day, Wirtgen

developed the 2200 SM, a machine with an average production rate of 9,000 t/day. The main objective was to reduce the production costs and to satisfy the demand for higher production rates.

The pace of the individual development steps is still kept at a high level. The projects showed that additional improvements regarding productivity, reduction of operating costs and a better control of gradation sizes were still necessary. Thus new development requirements came up for the Surface Miners. Therefore, Wirtgen made another effort to increase the overall performance of the successful 2200 SM model: The Wirtgen Surface Miner SM 2200 is a special machine for applications in both, open-cast mining as well as earth-moving and rock construction. In addition to the standard 2.20 m wide cutting drums with a cutting depth of 300 mm, a new drum unit of 3.80 m width for special applications in soft rock has been developed for this versatile Surface Miner.



The 2100 SM was one of the first Surface Miners working in the Indian coal industry. Today, more than 20 units of the models 2100 SM and 2200 SM produce approximately 50 Mio. t of coal annually in India.

The new unit has a maximum cutting depth of up to 250 mm, optimises the mining performance and reduces the operating costs at the same time. In doing so, Wirtgen focused on materials with a uniaxial compressive strength of up to 30 MPa, envisaging primarily the mining of coal/lignite, soft limestone and marl, phosphate and gypsum in order to increase the cutting performance of these applications. The new drum increases the cutting performance by at least 40 %.

The wider cutting drum makes optimum use of the existing performance potential of the Surface Miner. With its increased engine power of 840 HP, the SM 2200 can fully utilise the performance capacity of the 3.80 m wide drum unit. In addition to the higher cutting performance, the contractor also benefits from the improved cost effectiveness of the machine that is due to this new development. This fact is also reflected in the capital and operating costs: Less cutting tool wear and reduced fuel consumption prove that the new concept works out 100 % in the tested applications in soft rock.

For the respective coal applications in India it was the main target to cut 12,000 t/day and, in addition, to reduce the

maximum particle size of the cut material. The first 2200 SM with the 3.80 cutting drum unit was commissioned in December 2004. The first cutting results exceeded all expectations. An average production rate of more than 1,200 t/h with a peak of more than 2,250 t/h was measured. That means that a daily production rate of more than 20,000 t is feasible.

The Surface Mining technology has reached a high level of acceptance in the Indian mining industry. Wirtgen is – as the pioneer in mechanical mining – still the number one in India when high productivity, low operating costs, gradation control and high machine availability are requested.

Due to the middle drum concept the Surface Miners are able to reach the required targets:

- ▶ They produce small gradation, also in hard materials with good production rates.
- ▶ The machines mine selectively and produce a clean and even surface.

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Wirtgen GmbH
Hohner Str. 2 · 53578 Windhagen · Germany
Phone: +49 (0) 26 45 / 131-0 · Fax: +49 (0) 26 45 / 131-242
Internet: www.wirtgen.com · E-Mail: info@wirtgen.com