



Job Report Surface Mining

# 2100 SM, 2200 SM, 2500 SM: Bauxite mining in Guinea



## Wirtgen Surface Mining:

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Bernhard Schimm, January 2005

#### Surface Mining technology is introduced in bauxite mines

How is it possible to increase the exploitation of bauxite deposits? This was the central question bauxite mine operators in Guinea raised in the late 90s. In the Tsentralnaya ore body section of the Debele Mine some ore pillars were left over in the vicinity of a generator substation and along a public road and a railway line. In this area blasting was of course prohibited. The reserve of these pillars was estimated to be around 89,000 t. Further locations with similar conditions had been identified. The mine owner, Kompanyia Boksity Kindii Co. Ltd., decided in 2000 to purchase a Wirtgen Surface Miner 2100 SM for the blast-free removal of these sections. During October 2000 the 2100 SM started the operation in the Tsentralnaya ore body. In nine and a half months time, i.e. after approximately 3,000 working hours, this machine mined 300,000 t of bauxite and 25,000 t of overburden.

During the year 2001 the CGG company bought a second machine, a 2200 SM Wirtgen Surface Miner. In November 2001 this machine started the operation in the Tsentralnaya ore body. After three months time, i.e. after approximately 900 working hours, the 2200 SM mined 95,000 t of bauxite and 20,000 t of overburden.

In both cases the Wirtgen Surface Miners operated on narrow faces with lengths of less than 100 m to 160 m and widths ranging from 35 to 55 m. Common road trucks with an average loading capacity of 16 t were loaded with the mined material. Some rock samples tested showed a compressive strength of 30 to 125 MPa. The compressive strength to tensile strength ratio ranged from 5 to 7. This indicated that the material is of a tenacious nature. Depending on the hardness of the rock, cutting performances ranged from 140 to 550 t/h. The average cutting performance was in the range of 250 t/h. However rock with different types of



The direct loading of the cut material facilitates the operational processes in open-cast mining.



Surface Miners convince through their ability to selectively mine the respective material.

hardnesses could be cut without interrupting the mining process. Up to March 2003 nearly 1 million t of bauxite ore from the reserve's abandoned zones, where drilling and blasting processes were not allowed, had been extracted by means of Wirtgen Surface Miners.

#### Surface Miners at work in the Frija ore deposit

The economical blast-free and clean removal of bauxite and the production of small particle sizes, along with the elimination of the crushing process, convinced the bauxite mine operators of the strengths of the Wirtgen Surface Mining technology. Apart from mining out blocked bauxite from areas in which blasting is prohibited, the Surface Mining technology was also considered for the use in the general mining process at the Frija ore deposit.

Up to 2003 bauxite from this mine had been mined by conventional methods using drilling and blasting. However the very complex deposit structure made it very difficult to reach the required raw material quality. The Frija ore deposit consists of five ore zones, each of them has 3 to 7 seams. The respective seams thickness ranges from 2 to 12 m. The ore seams contain substantial inclusions of low grade bauxite with less than 37%. Therefore the ore is mined from several pits to reach the required average ore quality.

The 2200 SM was shifted to this deposit in April 2003 and is now used for the selective mining of bauxite in the difficult geological sections described. The machine dumps the cut



Surface Miners are able to mine materials with varying hardness without interrupting the mining process.

material on the ground and builds up a mine stockpile. The material is later picked up on demand by front-end loaders and loaded onto trucks with a loading capacity of 100 t. In 2003 414,000 t have been mined selectively out of the total production of 2,308,000 t. The average production rate per motor hour of the machine was 180 t/h.

Planning a production expansion the mine decided to purchase a 2500 SM Surface Miner. Beside their ability of selective mining, the mine was able to eliminate the expansion of their crushing plant since the particle size produced by the Wirtgen Surface Miners eliminates primary crushing.

The 2500 SM was commissioned in July 2004. During the commissioning phase this machine reached a cutting performance of 500 t/h on average. Considering truck change and manoeuvring times the real production rate is 360 t/h on average.

During 4 years of operation the various models of Wirtgen Surface Miners have become a proven technology for bauxite mining in Guinea.

This technology is an economical solution for:

- ▶ Blast-free mining of bauxite.
- ▶ Mining of materials with varying hardness without interrupting the mining process.
- ▶ Selective mining of different bauxite qualities.
- ▶ Elimination of primary crushing.



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