

## **CRUSHING SOLUTIONS FOR ROM SIZING**

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### **ABSTRACT**

The details mentioned below the technology for crushing solutions and sizing of ROM material. Advantages of the equipment with respect to the existing crushing technology are described briefly.

**Keyword:** *Crushing Technology.*

### **INDRODUCTION**

Crushing technologies have been used in underground mining since the 1960s. Even then, the cramped conditions led to the use of horizontal crushers, the long-established conventional jaw crusher was unsuitable because of restricted headroom, meaning it was no longer able to meet performance requirements. This resulted in roll crusher technology being introduced. Having undergone continuous development, this technology is now in service in both underground and surface mining.

HAZEMAG has a long history as an equipment supplier for coal production in many areas, including crushing. As a supplier of coal mining equipment in general, the company particularly focuses on the manufacture of primary-stage crushers associated directly with extraction.

#### **Horizontal Material Flow**

The change from jaw to roll crusher was not the only engineering innovation. HAZEMAG has implemented horizontal material flow as a key feature of all its primary crushers, which have the role of breaking large lump feed material down to a size suitable for belt conveying and further processing. In contrast to conventional crushers with vertical, now horizontal crushers offer the benefits of compact and light design combined with high throughput and reversible linear material flow. This means that the machines can be easily relocated and do not require a concrete foundation. Horizontal flow also reduces energy requirements and allows larger feed size. Horizontal crushers can also be fed at grade, so no costly conventional ramp is required for applications that do not have a feeder hopper.

HAZEMAG crushers are controlled by an integrated programmable logic controller (PLC), which allows unattended operation through monitoring and control of feeder and crusher operation. Jams can be easily remedied by reversing the conveyor. No costly time-consuming and labour-intensive manual removal is required.

### **Primary sizer**

Underground coal mining primarily uses either the room and pillar or the long wall method. In room and pillar mining, a relatively large number of faces are mined in varying sequence. This requires the use of mobile technology for both the extraction equipment and the coal conveyors. Transfer to these conveyor requires primary crushing of coal to the desired product size of 0 – 250/300 mm.

This is why the primary sizer is used, either as a separate machine or integrated into a highly mobile extraction system the primary sizer comprises a chain conveyor with crusher roll that is equipped with round-shank bits. The roll is encapsulated in the crusher housing. The horizontal chain conveyor is fed with ROM coal, either from an upstream chain conveyor or shuttle cars, which then conveys the ROM coal through the roll crusher, transporting the crushed coal to the downstream conveyor.

HAZEMAG primary sizers achieve a throughput of 2000 tph and more.

Flexible roll design and roll height adjustments allow variations of the final product size. With the Crawler-mounted design, the primary sizer is highly mobile. The whole design meets the needs of underground mining: compact dimensions, powerful drives and explosion-proof electrical systems.



*A HAZEMAG primary sizer*

### **Roll Crushers and Impact Roll Crushers**

Hazemag roll crushers are ideally suited to the selective crushing of soft to medium hard materials with a low percentage of fines in the product. They have also prove their effectiveness in the crushing of cohesive materials with a high moisture content.

Hazemag roll crushers have been installed in plants as primary and secondary crushers for raw materials as limestone, clay coal, coke phosphate, etc. Roll crushers with differing tooth configurations can handle feed material of upto 1500 mm to generate a product of 250 mm ar rates up to 2500 t/h.

To ensure that product size is acceptable roll crushers are used on the chain conveyor. The roll type and crusher dimensions are adapted to individual requirements. When extracting from thick seams without associated strata, either impact roll crushers or roll crushers can be used.

For applications where adjacent or in-seam rock is extracted, intentionally or unintentionally, heavy-duty impact roll crushers are preferable. Both roll crushers and impact roll breakers use the primary sizer principle and are often called primary sizers in these applications.



*WB 1414 Roll Crusher*

In contrast to those used in room and pillar operations, the chain conveyors of over 400-m-long used in longwall mining are integrated into the extraction systems. A roll crusher or impact roll crusher is mounted onto the chain conveyor that operates adjacent to the longwall and that ultimately discharges the coal onto the conveyor. The roll width and diameter are adapted to the required throughput and the dimensions of the chain conveyor. Designs such as V-belt or gear drive, single or dual drive are customer-specific. Hydraulic roll height adjustment, central lubrication or specific requirements with regard to water spraying system round out the range of possibilities. *Surface mining, coal handling and stockpiling* surface-mined coal also has to be processed, the first step of which is primary crushing. In contrast to underground mining and depending on the mining and transport methods the first crushing stage may require crushing of ROM coal to a size of less than 50 mm (typically for low and medium throughput rates) to 250 mm (for higher throughput systems). A larger product size can be used in primary crushing to avoid over dimensioning of crushers with high throughput rates. Further reduction can be undertaken in a second crushing stage. Designed for throughput of up to 3000 tph, the HAZEMAG primary sizer can be fed in a number of ways. Often transported by dump trucks with a payload of up to 300 t, coal can be fed directly with or without the use of a hopper, onto the primary sizer. The coal can often be additionally pushed by wheel loader or bulldozer.

The absence of steel hoppers in the design allows easy relocation of the system. Extension of the downstream conveyor allows the crusher remain close to the advancing face, minimizing the chain conveyor length. This maintains the conveying capacity without the need for new or larger trucks. If designed correctly, the transport distance for the truck can generally be kept short, cost-intensive uphill loads by trucks minimized or avoided entirely.



*180 t truck dumping onto a primary sizer running at 2500–3000 tph*

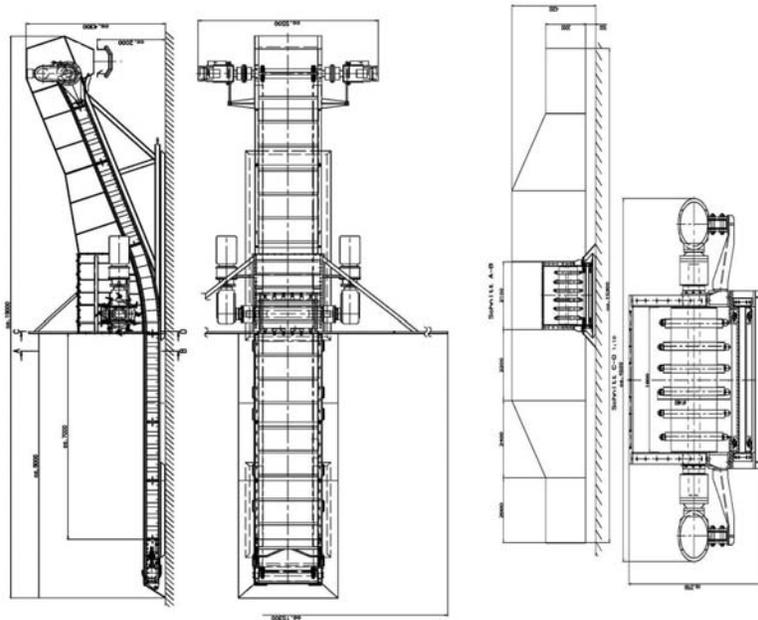
## CRUSHING SOLUTIONS FOR ROM SIZING



*Impact Roll crusher in a coal open-pit, fed by either truck, front end loader or dozer via a hopper built up from coal.*

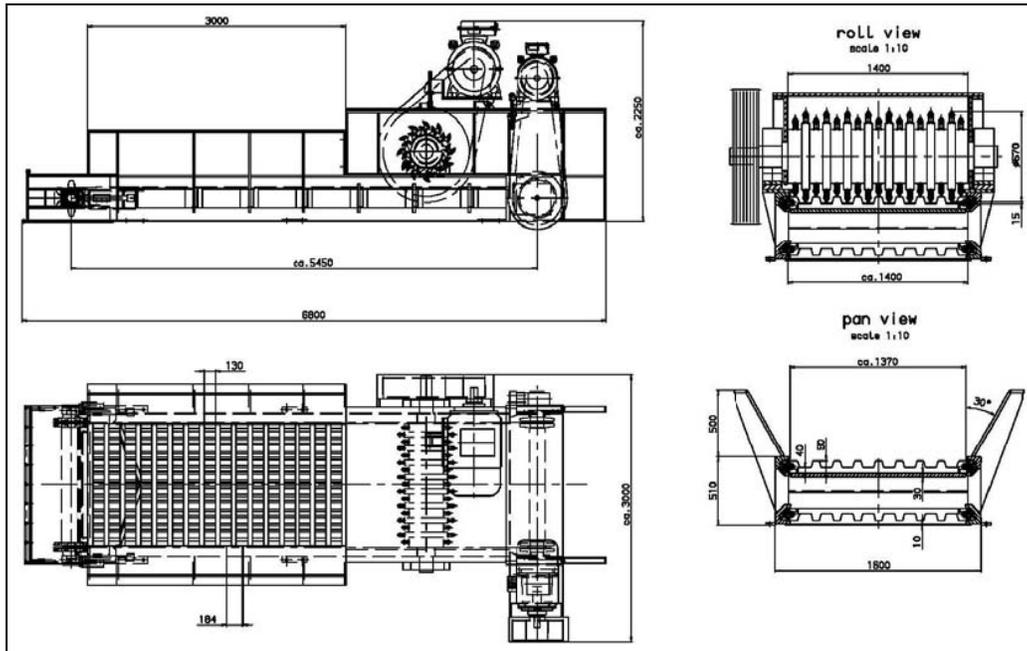
For lower throughput rates, primary sizers are suitable for achieving a product size of 0–60/80 mm in a single stage.

Here, roll crushers with round-shank bits are used. The type, arrangement and number of bits on the crusher roll largely determine the product size and are designed to specification.



*Reclaim Primary sizer used to crush coal while transferring it from stockpiles onto belt conveyors (can be used without the crusher roll as a simple reclaim feeder—  
A system as used at Kalimantan mine, Indonesia*

With a throughput rate of 500 tph, the roll crusher crushes the ROM coal to a size of 0 – 50 mm. The stationary system with a feeder hopper can be supplied either directly by SLKW alone, or with additional pushing by wheel loader or bulldozer. The 1400-mm-wide, 670-mm-diameter crusher roll has 204 bits to ensure the required product size. With a 1370 mm inside width of the integrated chain conveyor, special shape and arrangement of the flight bars and the conveyor speed regulated by frequency control, the required parameters of throughput and product size are achieved. The crusher roller is driven via V-belt by a 110 kW motor, while the conveyor is driven by a 55 kW motor. The primary sizers are also suitable for crushing or conveying in coal handling and storage areas.



*Roll Crusher handling ROM coal at a rate of 500 tph with final product size of 0–50 mm*

The frequently encountered reclaim feeders are nothing more than a primary sizer without a crusher roll. The remaining chain conveyor receives coal from the stockpile via discharge holes or by bulldozing. A special feature of the reclaim feeder is that they often transition from horizontal to upgrade in order to reach the required height for transition to the downstream belt conveyor. Reclaim feeders can normally be retrofitted with a breaker roll if required, thus converting them into the familiar primary sizer.

### Chain conveyors

Typically, chain conveyors are rugged heavy-duty conveyors used in the working area to transport course ROM material. Chain conveyors transport all sorts of minerals and materials of various consistencies. Materials can be discharged at a continuous rate into crushers, screens or belt conveyors, or batch removed from stockpiles and bunkers.