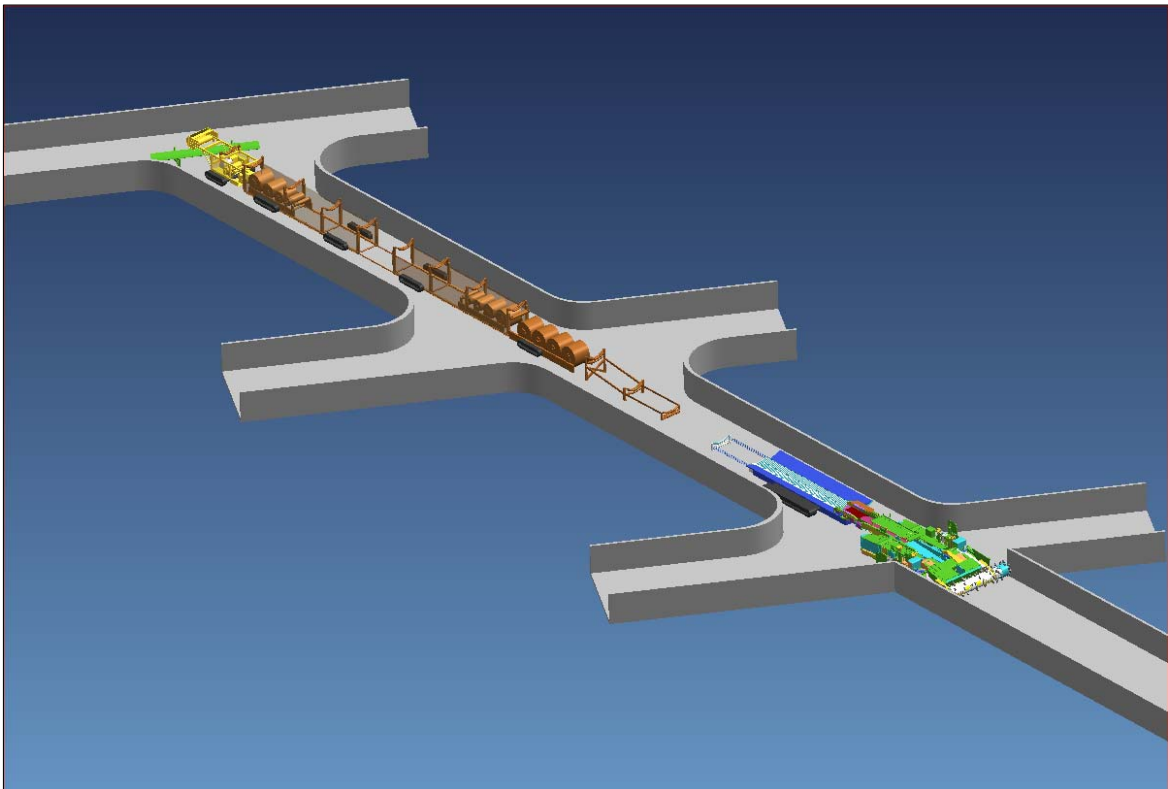


INNOVATIVE CONCEPTS IN UNDERGROUND MATERIALS HANDLING

Punch Mining System



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PUNCH MINING SYSTEM

Abstract

There is still a drive world wide to improve on existing methods of mining. The demand is for mining volumes to be increased while the productions costs must be reduced.

Against the background of these requirements, SANDVIK has researching and developing innovative concepts for meeting these particular demands. The purpose of this presentation is to share information on of these methodologies – the punch mining system.

This system demonstrates the principle of extremely fast straight line development coupled with the flexibility of sustained rapid re-deployment of the system.

General Description

The Punch Mining System serves the requirement to mine underground mineral deposits in a way of cutting short straight distances (punches) into the deposits, taking only a short period of time and to have the complete mining system retrieved out of those finished punches, before permanent strata control measurements (roof/rib bolts) become necessary.

Those short straight distances or so called punches are currently limited to a length of 200 metres and can be cut / mined within a period of (2) two 8-hour shifts, where as the retrieving of the whole system, including a new set-up for a new punch in an adjacent section, will take (1) one 8-hour shift.

The Punch Mining System combines a Continuous Mining Machine, for example the Alpine Bolter Miner ABM10 and a Continuous Straight Line Conveyor System together, to cut a coal or ore deposit and to transport the mined material from the cutting face to the permanently installed main underground material handling system, which is clearing the material out of the underground section.

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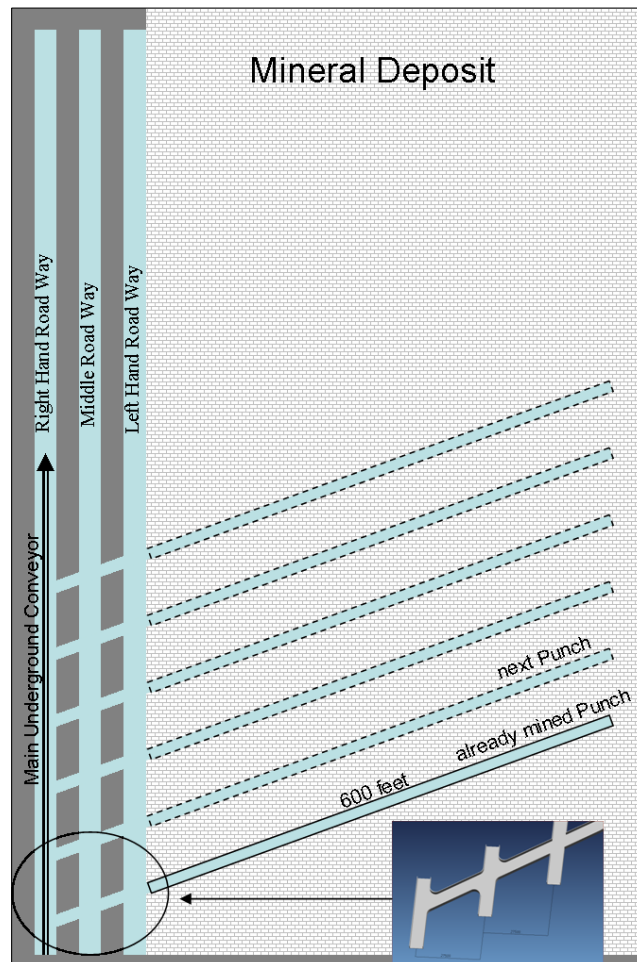
Detailed Description

Strata Control and Ventilation Measurements of underground mining sections are very time and money consuming.

Whereas the ventilation of the newly cut sections is of utmost importance during the mining process (extraction of gases of any kind), the strata control in the likes of permanent roof and rib anchors can be skipped, in case the mining process is finished and all equipment and personnel have left the newly cut section (one mining sequence) within a, by law, set period of time (i.e within 24 hours). Only short-term or temporary strata control systems will be installed which secures the operation for the time it takes to mine and retrieve the whole system.

This rapidly mined and temporary secured newly cut section must not be entered by anybody after all equipment and personnel had been removed.

In case this section has to be entered in the future, permanent strata control measurements have to be installed prior to entering as well as the ventilation requirements have to be fulfilled.



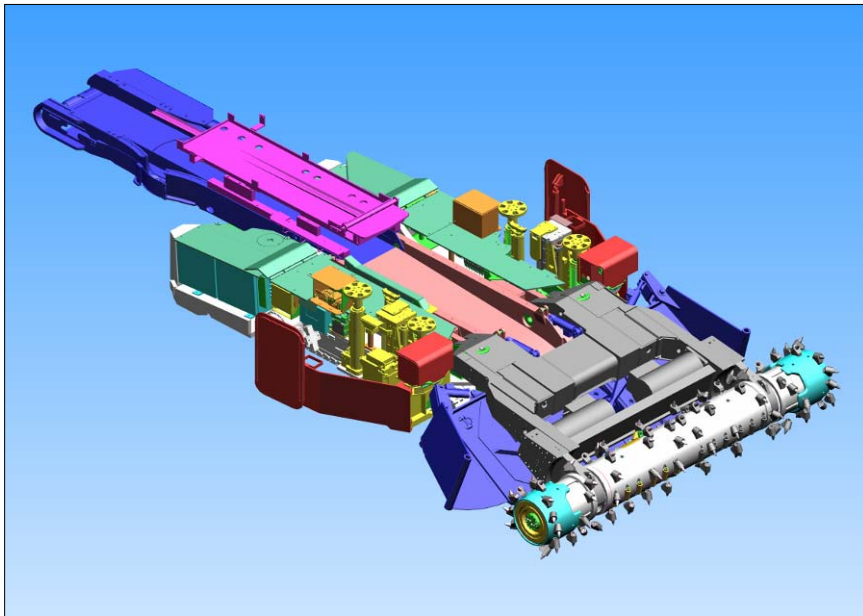
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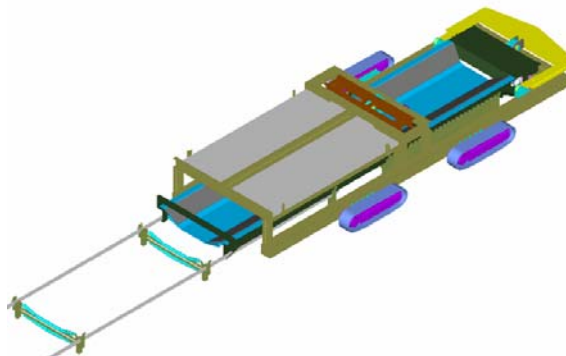
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Punch Mining Operation

The **Cutting/Mining Process** is performed by a continuous bolter miner, which is cutting the material deposit and transfers the cut material via on-board conveyor systems to the back of the machine. There it is handed over to the straight line continuous haulage system. The bolter miner is also installing the necessary roof and rib anchors just to keep the cut section temporarily secure for the time it takes to mine and retrieve.



The **Material Handling Process** between the continuous bolter miner and the permanently installed main underground conveyor system is done via a straight line continuous haulage system.



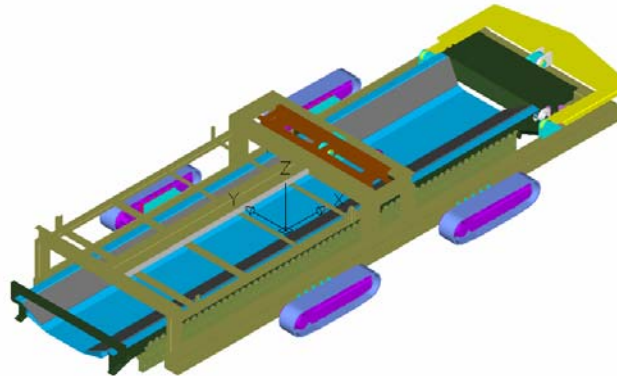
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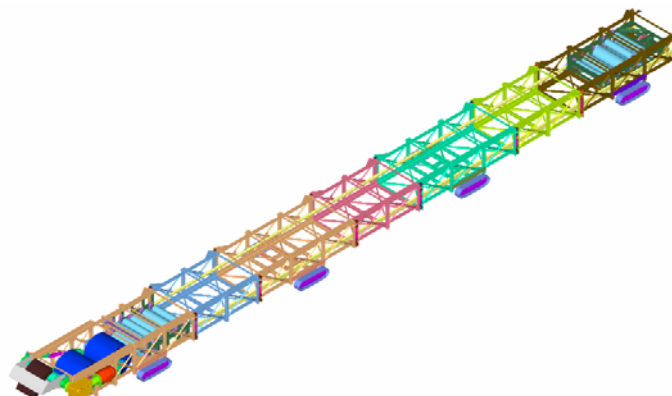
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A **Hopper Car** is acting as the advancing system for the haulage system. It is hydraulically driven via tracks and powered by the continuous miner's hydraulic system via two hydraulic hose connections (Pressure and Tank Line).

The Hopper Car follows the continuous bolter miner and receiving the cut material from it. The necessary additional conveyor belt structures, including the carry and return rollers for the full length of one Punch, are stored inside the Hopper Car and are released in distances of approximately 2.6 metres when the Hopper Car advances.



The Hopper Car, when advancing forward, is pulling the additional conveyor belt out of a **Loop-Take-Up System**, sitting at the other end of the haulage system. The Loop-Take-Up system can store approximately 160 metres of conveyor belt, which gives an advancing distance of about 80 metres. The additional necessary conveyor belt length to reach the 200 metre mark is stored in the form of 2 belt rolls at the front of the Loop-Take-Up system and will be pulled into the Loop-Take-Up via on-board hydraulic motors, a belt clamping device and the conveyor belt tensioning winch. For relocation purposes, the Loop-Take-Up system is track mounted and divided into sections, which are individually hinged to manoeuvre around corners.

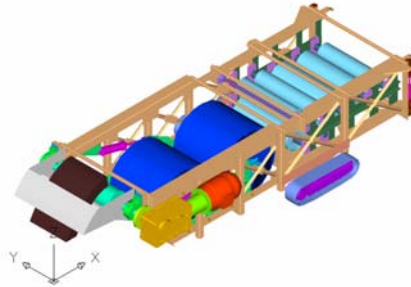


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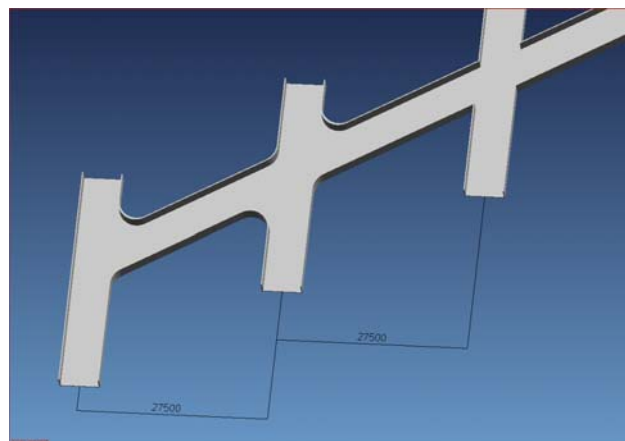
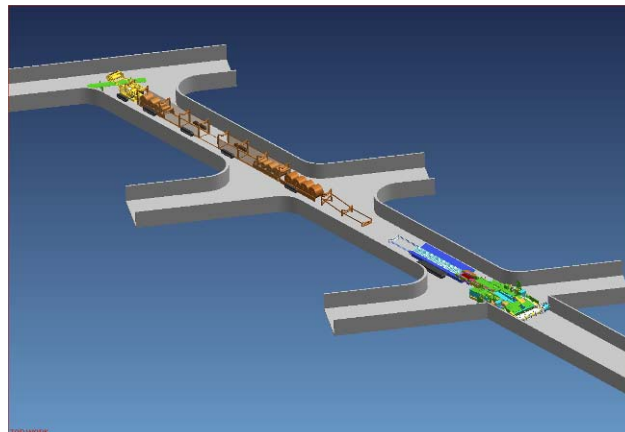
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The **Drive/Transfer Station** (45 kW) combined with the transfer chute connects the haulage system to the main underground conveyor system. It is sitting at the end of the straight line continuous haulage system. Also this system component is track driven.



The **Start-up Length** of the Punch Mining System (incl. the continuous miner) is approximately 55 metres.



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One example of a start-up section set-up is to have a three roadway arrangement along the whole length of the, to be extracted, mineral deposit.

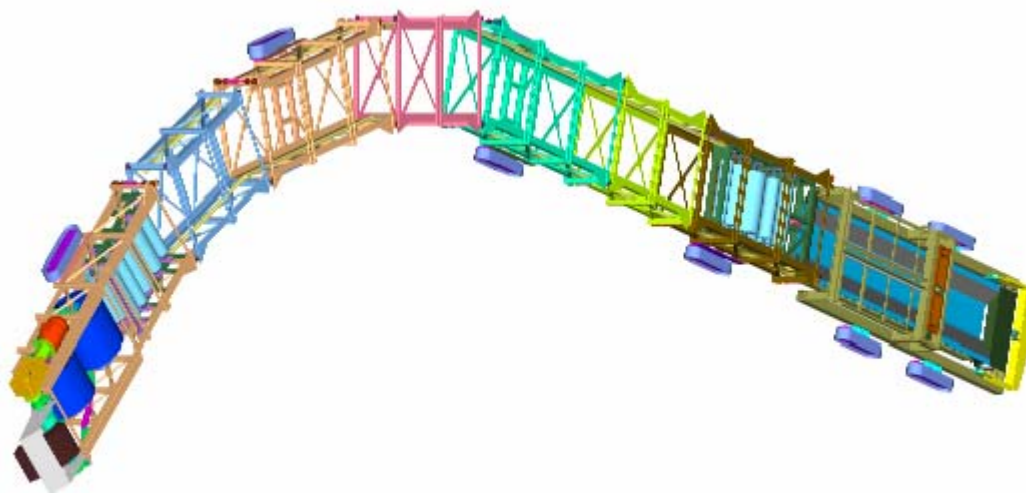
- Left Hand Roadway containing the main underground conveyor and for ventilation
- Middle Roadway for intermediate storage (material, transformers, etc.) and for ventilation purposes
- Right Hand Roadway for relocation (continuous miner and haulage system) and for ventilation purposes

Retrieving/Relocation Operation

After finalising the 200 metre punch, the mining system has to be retrieved out of the section, relocated and set up for a new 200 metre cutting/mining sequence.

For this the continuous bolter miner and the Hopper Car will return to their starting position, collecting all conveyor structure (back into the storage area of the Hopper Car) on their way back and also reeling the conveyor belt surplus back onto the rolls via on-board hydraulic driven reelers.

Back in their start-up position and therefore out of the latest cut punch, the whole Punch Mining System will be split by separating the continuous bolter miner from the Hopper Car (Hopper Car will be connected to the Hydraulic System of the conveyor system). The two split parts will manoeuvre individually up the Right Hand Roadway by releasing all hinge points of the conveyor system to give the flexibility to get around the corners.



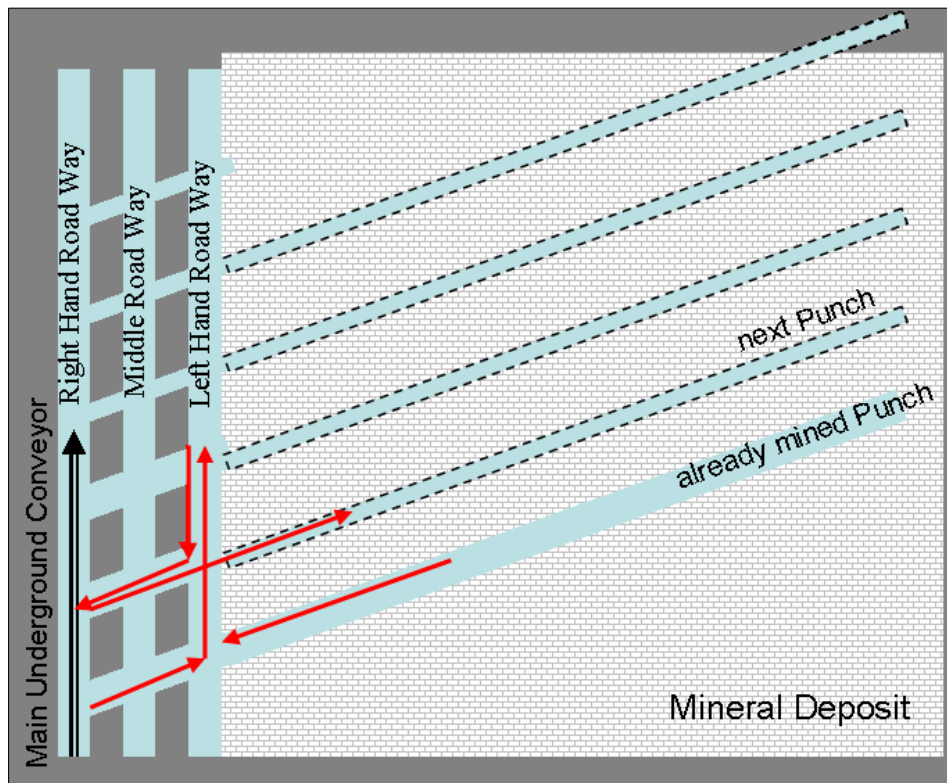
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The system will move upwards the Right Hand Roadway till the Drive/Transfer Station is on equal height of the next “start-up” road-way, will then reverse backwards towards the main underground conveyor till the transfer chute and the main underground conveyor line up. In this position the continuous bolter miner as well as the Hopper Car will be fully in line with the new “start-up” road-way.

The continuous bolter miner and the Hopper Car will now move forwards till standing at the new cutting face and the new cutting/mining sequence, punch, can start in the above described way.


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