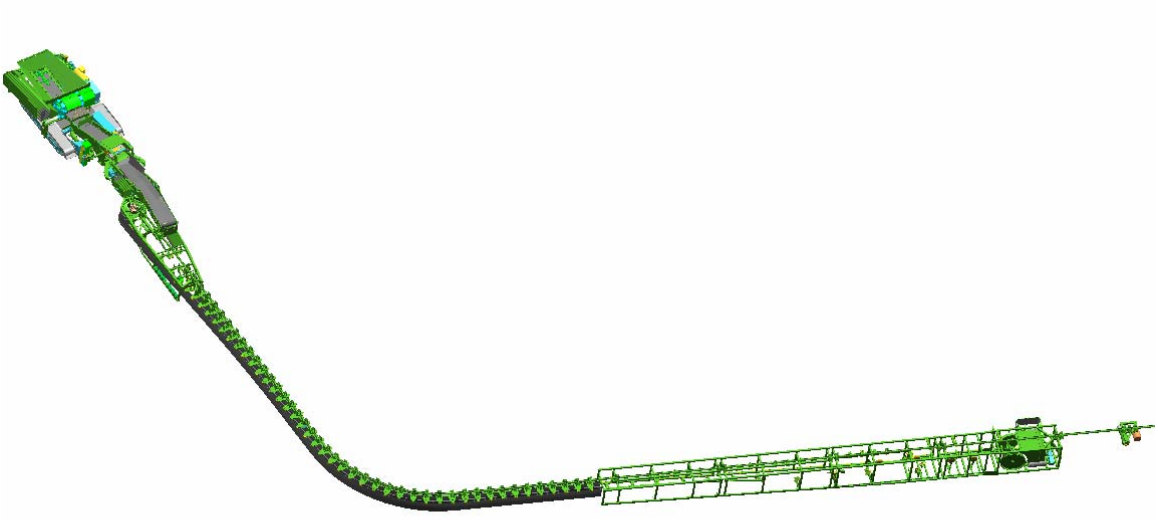
INNOVATIVE CONCEPTS IN UNDERGROUND

MATERIALS HANDLING

Continuous Haulage System

VACHS 500



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Continuous Haulage 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 present information on one of these methodologies – the continuous haulage system.

The system illustrates the deployment of conveyors capable of operating around corners while still operating as a continuous haulage system.

General Description

The Continuous Haulage System serves the requirement to mine underground mineral deposits in a way of increasing the efficiency of a continuous mining machine by maximizing the machine utilization which means eliminating the waiting for an intermittent material clearing system in the likes of a shuttle car.

The Continuous Haulage System will serve as a permanent connection between the continuous mining machine and the permanently installed underground material handling system of the mine.

The Continuous Haulage System follows the continuous mining machine throughout the entire cutting process. During this mining process the continuous miner is cutting the material out of the mining face and transporting it via on-board loading devices and conveyors to the back of the machine where it is discharged into a Hopper Car. This Hopper Car, as an integral part of the Continuous Haulage System, loads the Sicon conveyor system which transfers the material at its discharge end onto the permanently installed underground material handling system, which in the case of a coal mine will typically be the section conveyor. During the retreating operation of the continuous miner, the Continuous Haulage Systems also backs up out of the mined area always maintaining the connection of the material flow between the miner and the section belt conveyor system.

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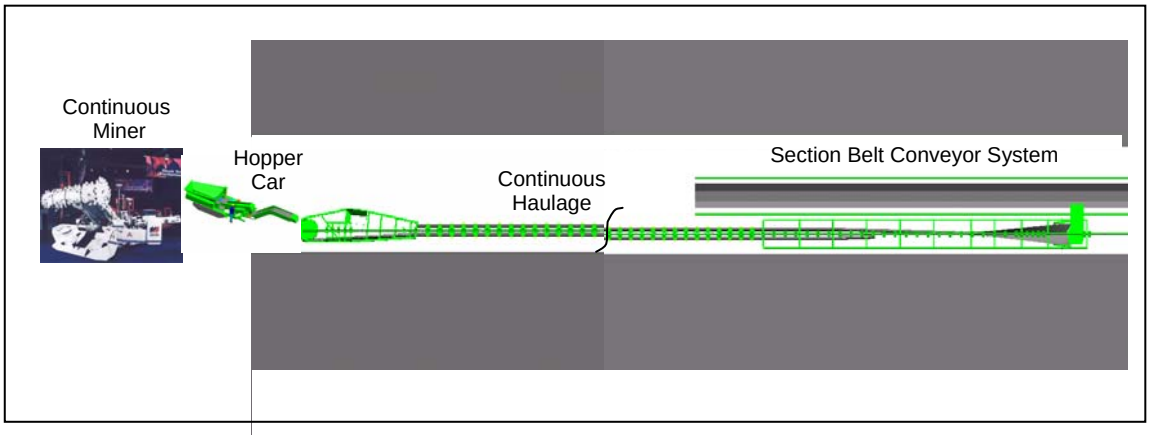
Detailed Description



Intermittent material clearing systems are very time and therefore money consuming.
Shuttle cars receive the mined material from the back of a continuous miner and 'truck' it to the section belt conveyor for conveying the material out of the mine. After discharging the load onto the belt conveyor the shuttle car returns to the back of the miner to receive the next load. During those extended waiting periods for the shuttle car to return, the continuous miner, in our case an ABM14, is not being utilized. Low utilization figures are being followed by low mining advance distances which again are directly affecting the production figures and therefore the income of the mine itself.
High emphasis is being given to reduce this waiting time by for example utilizing two shuttle cars so one can be loaded whilst the other one is in transit. This has increased the utilization of the continuous miner by some degree.
The ultimate target is to eliminate all the waiting time and this can be achieved when connecting the continuous miner permanently with the section belt conveyor and also giving the miner enough freedom to travel forwards and backwards during its cutting/mining process.
A real **continuous mining process** can then be performed.
This can be done, even though for a restricted distance, with a so called Continuous Haulage System. In our case the distance that the continuous miner is able to move forwards and backwards is within a **distance of 200m** between the rear end of the miner and the main section belt conveyor.

A maximum but **continuous material flow of 500m^3/operating hour** is thus guaranteed.

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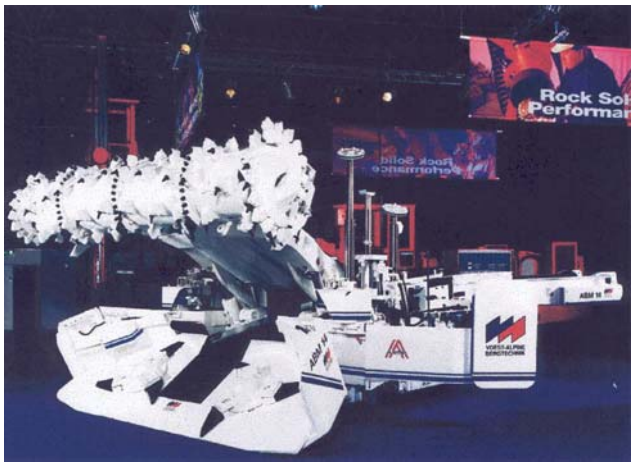
Continuous Mining Operation

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 discharged into to the Continuous Haulage System. The bolter miner also installs the necessary roof and rib anchors to keep the cut section permanently secure for the mining process and future access.



The **Material Handling Process** between the continuous bolter miner and the permanently installed main underground conveyor system is done via the Continuous Haulage System.

A **Hopper Car** is anchored to and acts as the mechanism for advancing and retreating the Haulage System. It is hydraulically driven via tracks and powered by its on-board hydraulic system.
The Hopper Car follows the continuous bolter miner and receives the cut material from it and transporting it for further handling through to the back of the Hopper Car via chain conveyors. Due to the fact that the mining process delivers material sizes in all different dimensions an on-board rock breaker will reduce the material size to around 70mm for improved handling and managing downstream.

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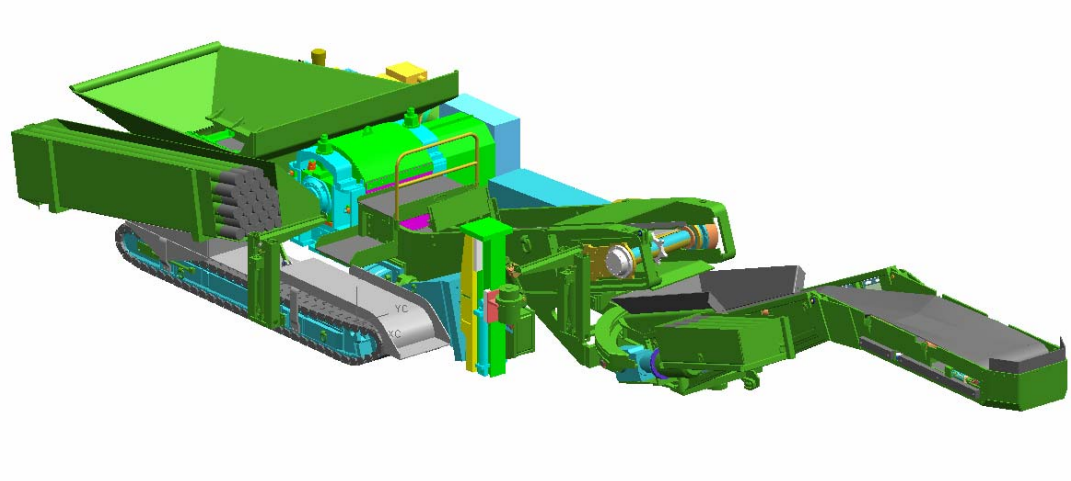
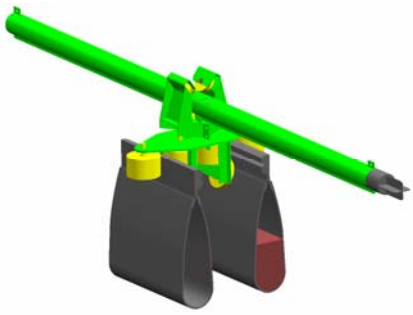
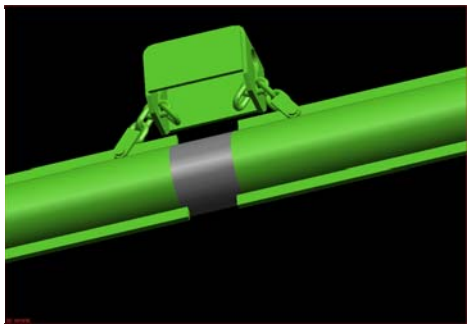


The Hopper Car, when advancing forward, pulls an approximately 200m fixed length SICON conveyor belt system behind which consists of a Loading Station, the actual SICON conveyor and a Discharge Station at the rear end of the conveyor.

The Sicon conveying system is suspended from wheel mounted brackets which run on a roof mounted tubular **Monorail System.** This system is installed by the Hopper Car. The Drill Rig, all the Monorail Tubes and all materials necessary to install the monorail system are located and stored on the Hopper Car.





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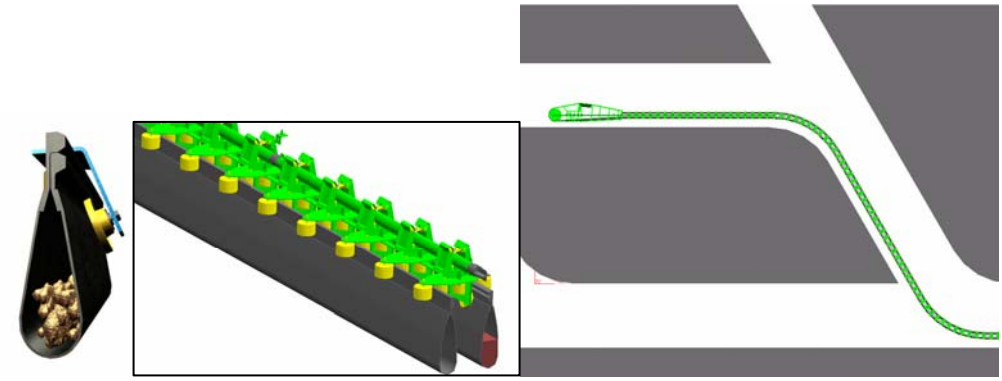
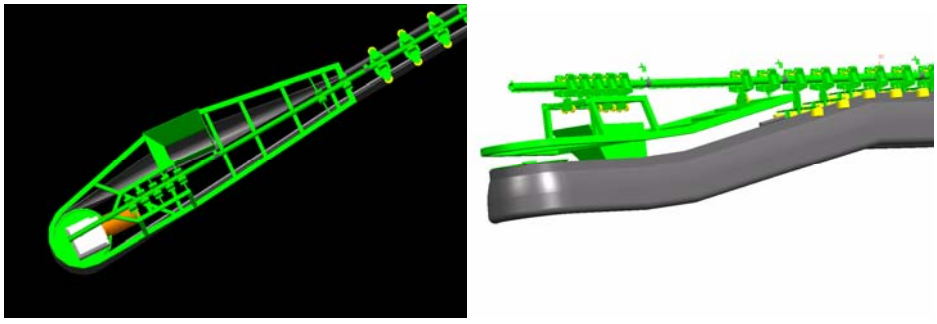
The **SICON Conveyor System** is a tear drop shaped conveyor which fully encloses the material and gives the conveyor, based on its design, the ability to run around very tight corners of around 6m radius. The ability and flexibility of this Continuous Haulage System going around such tight corners gives the system the leading edge in the underground market place.



The Hopper car discharges the mined material into the SICON conveyor via a **Loading Station**. Inside the Loading Station the enclosed SICON conveyor belt is opened up and filled via a loading funnel and closed again for the full conveying length. The Hopper Car has the ability to load into the Loading Station through all maneuvers even during going through the 6m turns.



The **Drive Station** (40kW) of the SICON Conveyor is an integral part of the Loading Station.

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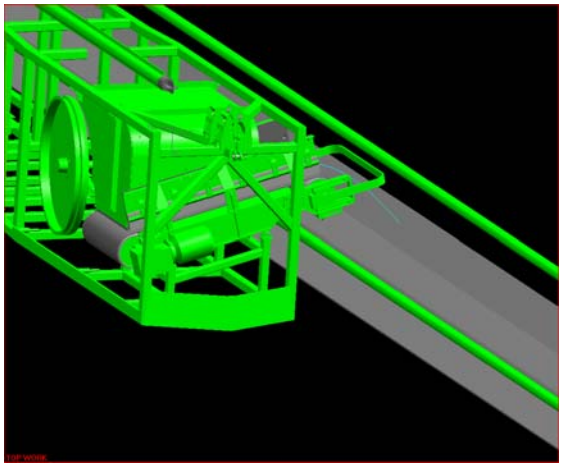
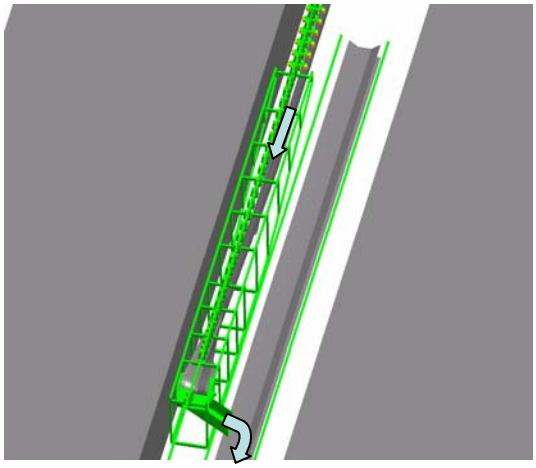
At the head end of the SICON Conveyor the **Discharge Station** transfers the mined material onto the main underground material handling system, which in the case of a coal mine will typically be the section conveyor.





The SICON belt is getting opened up again within the Discharge Station. There it is also turned over to empty the belt. After that the belt is being formed back into the tear drop shape and returned back to the Loading station in a parallel strand to the loaded conveyor belt side.

The tensioning of the SICON Conveyor system is being achieved by a frequency controlled **Winch** which is located at the head end of the Continuous Haulage System? During the forward motion the conveyor system is being pulled by the Hopper car against the force of the Winch and on the reverse motion the Winch is pulling the conveyor system back against the resistance of the Hopper car. During all the movements of the mining process the Continuous Haulage System stays operational and is able to transfer material from the mining face to the section conveyor.

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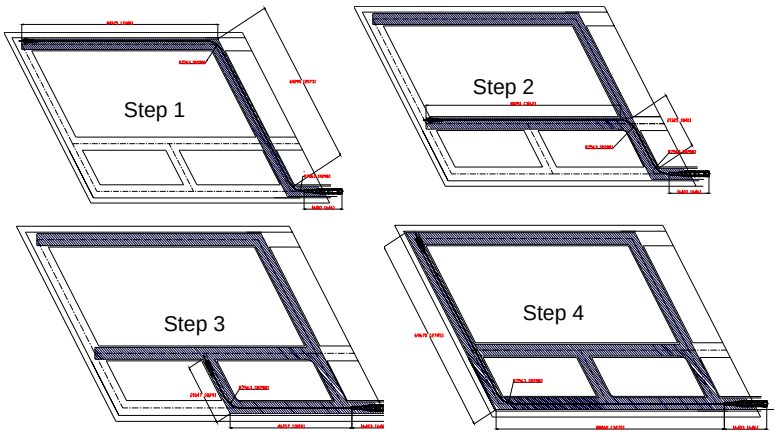
Relocation of the Continuous Haulage System

At the end of one mining/cutting sequence of about 200m distance from the main section conveyor, the whole system is being relocated with the Hopper Car to its new start up area. For this the Winch will be retracted and detached from its anchoring. The full relocation process is performed via the Monorail System.

The **Start-up Length** of the Continuous Haulage System (incl. the continuous miner) is approximately 220 meters. This will give the Continuous Haulage System a reach of about 200m from the main section conveyor for a fully flexible cutting/mining process.

The minimum operating height is limited to 2200mm and the width to 3000mm.



One 200m Mining/Cutting Sequence

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