SIEMAG TECBERG

TECHNICAL INFORMATION

TRUCKLIFT SYSTEM

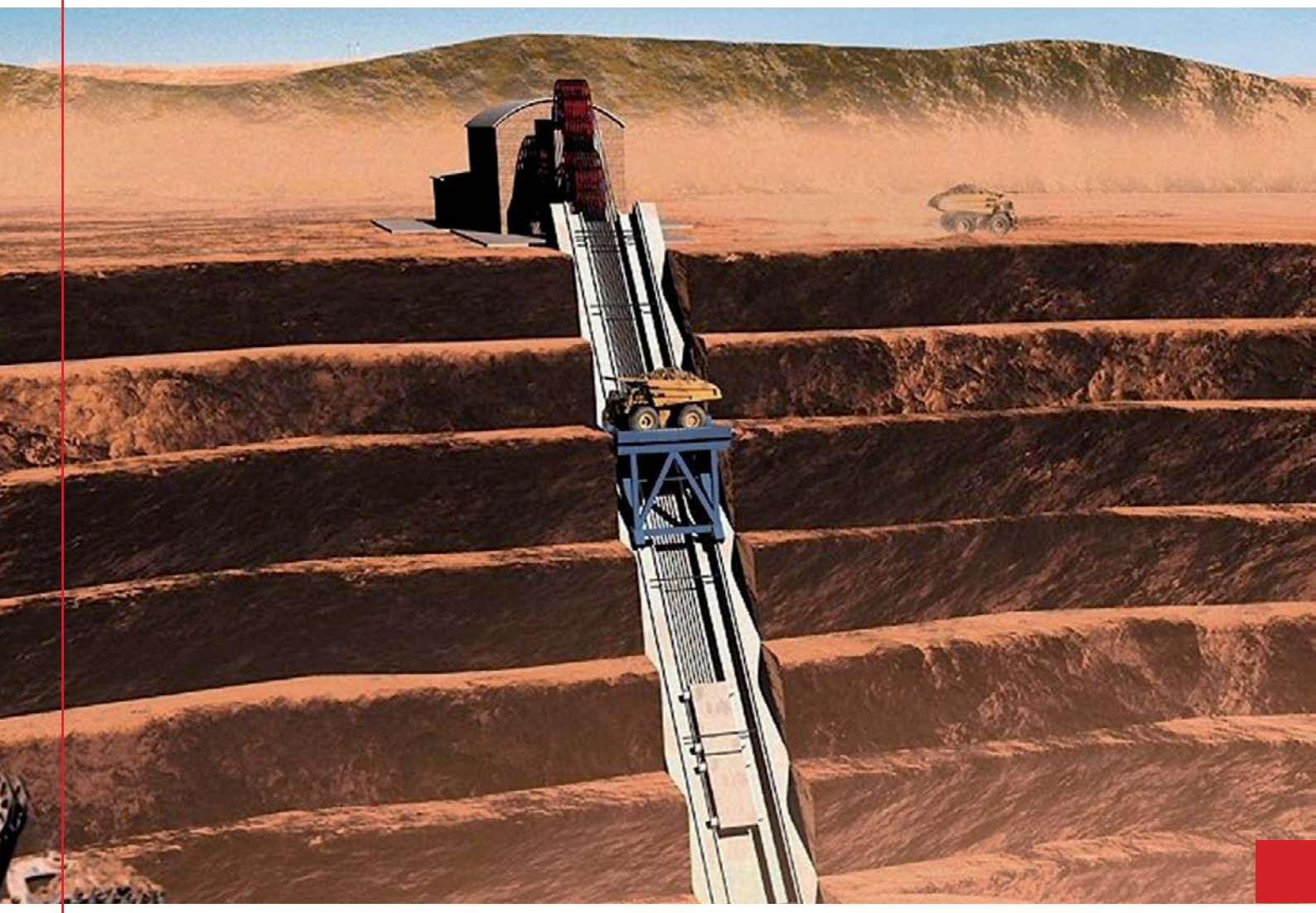
(INNOVATIVE TRANSPORT TECHNOLOGY FOR OPEN PIT MINES)

TECHNICAL INFORMATION

SIEMAG TECBERG TRUCKLIFT

Ore deposits close to the surface are generally developed by open pit mining. Due to the hardness of the rock, mining is usually carried out by means of drilling and blasting. Large excavators load the material directly onto big trucks which convey the uncrushed rock from the mine. Most of the rock is overburden which is transported to one or several dumps close to the mine. On the other hand, the ore is driven to a crusher close to the processing plant. Apart from the simple way the uncrushed material is handled, this form of conveyance has the advantage of the trucks being able to be flexibly driven to the varying loading points and also to be tipped at diverse points depending on actual requirements.

When mining penetrates increasingly deeper, this mostly means that the mine takes some kind of funnel shape. The deeper the funnel, the greater the expense for transport. While the roads hardly change deep down in the mine as well as at the top, expenditure on the haulage incline increases drastically. On the one hand, the driving time is prolonged by the increasingly longer incline road and the relatively low driving speed of the trucks on this section. On the other hand, fuel consumption increases considerably, just as, in particular, does vehicle wear. This means that the part of transport on the incline is becoming an increasingly decisive cost factor.



SIEMAG TECBERG TRUCKLIFT SLOPE HOISTING SYSTEM

To optimise transport while maintaining flexibility offered by truck transport, SIEMAG TECBERG has developed the TruckLift slope hoisting system which considerably accelerates and cheapens transport from the mine.

The advantage lies in the transport time being curtailed by the difference in height being rapidly overcome. While the trucks move upwards at less than 3 m/s on a slope of 10 % at the maximum, a slope hoisting plant can overcome the mine's natural angle of repose of over even 50° at 8 m/s. This means that a truck is hoisted to surface in only 2 minutes while driving on the haul road incline takes some 20 minutes (from 300 m depth, time for driving on and off the TruckLift platform included). Whereas one vehicle is on the slope with the TruckLift plant at one time, conventional haulage requires a large number of trucks only on the inclined part of the road for achieving the same transport volume. Thus the truck fleet can correspondingly be reduced.

SIEMAG TECBERG has drawn up several studies to individually highlight this information for different projects. The studies concern the comparison between truck transport with a payload of 100 - 290 t in the conventional way over the incline haul road, and transport with these vehicles using the TruckLift slope hoisting plant.

THE TRUCKLIFT SYSTEM: TRANSPORT CAPACITY AND ECONOMIC VIABILITY

The TruckLift System transport capacity depends mostly on the truck size and hoisting depth. Capacity can be starting with 4,000 t/h and being at 2,000 t/h at the final depth. With a conservatively calculated annual operational time of 7,500 hours, this means a transport capacity of 15 million tons at the final depth. Depending on the depth, the saving in number of trucks in operation increases up to 12 – or even more.

Naturally what has to be ascertained is that initial investment for a slope hoisting plant is relatively high, whereas investments for new and replacement trucks only rise continuously. However, operational expenditure for trucks, comprising maintenance, spare parts and personnel costs for drivers as well as for fuel, is very high, making up considerably more costs compared to a slope hoisting plant, so that total costs quickly develop in favour of slope hoisting.

Comparing the costs by the present value method using an interest rate of 10 % on future costs and considering an annual price increase of 3 %, investing in a slope hoisting plant usually pays off within less than five years. During a plant's running time of 20 years, a volume of up to 60 % can be saved with regard to gradient transport.

SIEMAG TECBERG TRUCKLIFT SLOPE HOISTING TECHNOLOGY

The TruckLift System is designed for transport on the natural angle of repose of the open pit mine and can be lengthened for increasing depth. It is set up as a single conveyance plant with counterweight, providing maximum flexibility of the hoisting operation.

It is designed for two or more loading points, one or more down in the mine and a second one above at a height appropriate for the purpose. Trucks are transported on a platform. Down in the mine, the fully laden trucks drive to the loading station, at which one vehicle drives onto the transport platform in each instance. The slope hoisting plant conveys the truck out of the mine to the upper loading station where it leaves the plant. The driver stays in his vehicle during hoisting so that no change of driver is necessary. At the upper loading station, an empty truck drives onto the platform for the downward trip immediately after the platform is free. In this way, the plant runs constantly loaded, each time a vehicle changes at the loading stations.

The transport platform comprises the platform proper, on which the truck stops, with pavement, box profiles as lateral limits, as well as the pertinent sub-construction. This construction consists of a carrier which overcomes the offset angle between the horizontal vehicle and the roadway and where the ropes are hitched. Moreover, the running gears are attached here which undertake the carrying and guiding function on the travel path.

The travel path is a concrete or steel construction, on which the rails for the transport platform and counterweight are attached. It has appropriate foundations in the rock. It is designed trough-shaped, as the counterweight runs under the transport platform. Rope rollers take over the carrier function for the ropes on the slope section.

Truck loading station

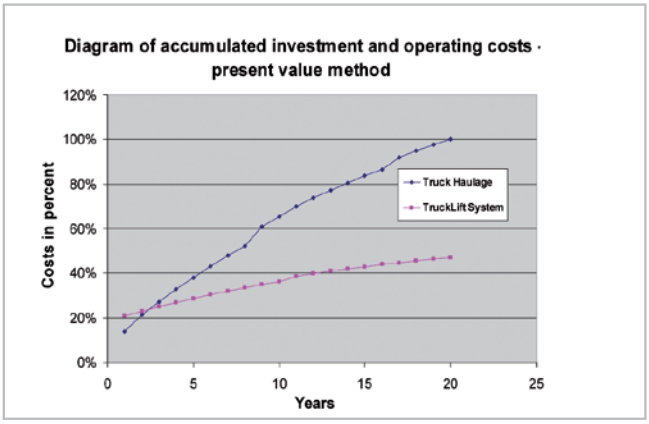
The counterweight is designed as a flat platform with a running gear to take up the plate weights. What is more, rope magazines are accommodated here, where on each some 25 m of rope length can be stored, enabling the transport distance to be lengthened without rope having to be changed.

The transport platform and the counterweight are attached to 6 to 8 ropes and are powered by means of a multi-rope friction winder. The winder is appointed in a machine house above the top loading point, rope sheaves guiding the ropes appropriately. The motor is appointed in the driving pulley, since the winder is big enough with regard to diameter and width. The plant is designed for operation without tail ropes as weight compensation for the hoisting ropes. In this manner, there is no equipment necessary at the bottom end of the hoisting plant, as such equipment would be expensive to reinstall for a greater depth.

The loading stations comprise the ramps and pertinent concrete construction in the area between the ramp and hoisting plant. Platform arrestors are provided at the loading points, which are run out when the transport platform arrives, ensuring that the transport platform is held in position when the load changes by the trucks arriving and departing. At the same time, this reduces the dynamic load on the ropes. When the bottom loading station is transferred, as a result of deeper mining progression, first of all the new ramps and the civil construction for the loading station are completed. All that has to be done now to move the loading station properly is to transfer the mechanical equipment, basically the arrestors, and to let out the ropes out of the magazines. This work can be done in a few shifts.

ECONOMICAL STUDY FOR SPECIFIC MINE CONDITIONS

We offer our engineering service to prepare an economical evaluation comparing the TruckLift System with your road haulage on basis of your particular data. For this purpose we have prepared a questionnaire that is available on your request. You will receive an economical study that also comprises a general technical layout and budget proposal with technical description of the TruckLift adapted to your specific requirements.



FURTHER ADVANTAGES OF THE TRUCKLIFT SYSTEM

THE TRUCKLIFT OFFERS FURTHER ADVANTAGES THAT WILL ADDITIONALLY REDUCE THE TRANSPORT COSTS:

- Higher availability of the complete truck fleet
- Potential reduction of the final mine size by avoiding construction of a haul road to the deepest levels – improved strip ratio
- Avoidance of investment needs into larger trucks and shovels, wider roads, new maintenance shops, etc.
- Reduced maintenance for the haul road
- Potential decrease of the energy costs for the TruckLift against truck fuel costs that tend to increase
- Better safety records by reduced truck accidents
- Faster transport of other equipment up and down the mine
- Less air pollution in particular at low in-pit air exchange

These advantages need to be considered for any particular mine as they of course partly depend much on the specific conditions.

TECHNICAL DATA

METRIC DIMENSIONS

DATA OF TRUCKS

Truck payload	about 300 t
Gross weight of trucks with payload	about 500 t

OPEN PIT MINE DATA

Starting with mine depth	> 300 m
Start of operation of TruckLift System as of a depth of	100 m
Service life of the TruckLift System	up to 30 years

COMPARISON OF TRANSPORT DATA	HAUL ROAD	TRUCKLIFT
Gradient of haul road	8 –10 %	
Transport angle on pit wall		25 – 55°
Driving speed upwards	2.5 – 4 m/s	8.0 m/s
Driving speed downwards	10 m/s	8.0 m/s
Service life of the trucks	7 – 8 years	> 10 years




LOCATIONS:

GERMANY | HAIGER (HEADQUARTERS)
SIEMAG TECBERG GmbH
Kalteiche-Ring 28-32
35708 Haiger, Germany
Phone +49 2773 91610
E-Mail info@siemag-tecberg.com

POLAND | KATOWICE
SIEMAG TECBERG POLSKA Sp. z o.o.
ul. Mickiewicza 29
40-085 Katowice, Poland
Phone +48 32 2072086
E-Mail info@siemag-tecberg.pl

SWITZERLAND | SEDRUN
SIEMAG TECBERG GmbH
Plant Operation
7188 Sedrun, Switzerland
Phone +41 81 9365280
E-Mail info@siemag-tecberg.ch

CHINA | BEIJING
Beijing SIEMAG TECBERG
Mining Equipment Co., Ltd.
Room 21-03, Block A, CITIC Building
19 Jianguomenwai Dajie,
Beijing 100004, P.R. China
Phone + 86 10 8526 1713
E-Mail info@siemag-tecberg.cn

CHINA | TIANJIN
Tianjin SIEMAG TECBERG Machinery Co., Ltd.,
Guangyuan Road South,
Tianjin High-Tech Industrial Park,
Third Phase Wuqing Development Area,
Tianjin 301700, P. R. China

AUSTRALIA | SYDNEY
SIEMAG TECBERG Australia Pty Ltd.
Unit 7, 2 Eden Park Drive (PO Box 1442)
North Ryde NSW 2113, Australia
Phone +61 2 9888 3900
E-Mail info@siemag-tecberg.com.au

SOUTH AFRICA | JET PARK
SIEMAG TECBERG (Pty) Ltd.
Unit 15, Lakeview Business Park,
Yaldwin RD, Jet Park, Johannesburg
P.O. Box 2964, Edenvale 1610,
South Africa
Phone +27 11 383 9300
E-Mail info@siemag-tecberg.co.za

SOUTH AFRICA | GERMISTON
Winder Controls (Pty) Ltd.
56 Stanley Street, Germiston, Ext. 3, Gauteng,
P.O. Box 383, Germiston 1400,
South Africa
Phone +27 11 873 4650
E-Mail winder@winder.co.za

USA | MILWAUKEE
SIEMAG TECBERG Inc.
2969 South Chase Avenue
Milwaukee, WI 53207, USA
Phone +1 414 727 5725
E-Mail info@siemag-tecberg.us

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