Underground Mining of Metalliferous Deposits
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Lecture No. 25
Raising and Winzing - IV

RAISE/WINZE BORING METHODS

Raise-Boring

In this system, the pilot hole is drilled down to a lower level in the mine or civil project. Once the pilot hole connects to the lower access level in the rock, the drill bit is removed and a reamer or raise head is attached and the reamer is rotated and pulled upwards. The broken rock falls to the lower level by gravity. This system operates with the drill string in tension and this provides the most stable platform.

World's largest raise borer, the HG 380 with an operating torque of max. 710kNm. Aker Wirth raise boring machines hold the world record for the largest diameter raise (7.1m) and the longest raise (1,260m).

Down-Reaming/Winzing

In this system, the pilot hole is drilled downwards until it connects to a lower access level. The drill string (all drill rods, stabilizers and cutting bits) is retrieved and then a reamer is pushed downwards. The cuttings flow down the previously drilled pilot hole. This method uses drill string in compression and usually stabilizers must be installed to eliminate the potential of the drill string buckling.

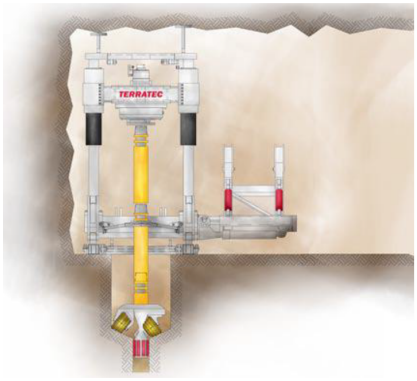

Figure 1. Down Reaming method of raise boring

Box-Holing

The most difficult raise method, known as Box-Hole excavation.

It is to drill a pilot hole to any level up from the raise borer.

Once the desired length is achieved the drill string is retrieved, and a reamer attached and pushed upwards.

The broken rock falls down the enlarged hole onto a special collection chute attached to the top of the raise borer.

This technique has been largely used to replace ladder rises, which completes the box-hole using conventional methods. Ladder rise excavation is very dangerous.

Advantages - RAISE/WINZE BORING

Raise boring offers several advantages over the conventional drill and blast method. The most important are safety, speed, physical characteristics of the completed hole, labour reduction and cost reduction. The safety factor in raise drilling cannot be over emphasized. No men are exposed to the danger of rock fall from freshly blasted ground or to the continual use of explosives, with their fumes and inherent danger of misfires. Raises can be safely drilled in ground that would be extremely hazardous, if not impossible, to drive by conventional methods.

A hole drilled by Raise Boring Machine can generally be completed in a fraction of the time required for conventional methods. The bored raise, with its firm undisturbed walls, is more adaptable to use as ventilation and rock passes. As conventional methods require a relatively large opening, it has become customary to drive raises larger than actually required for ore and rock passes, a fact that long experience has borne out. The advantage of smooth walls in ventilation raises is well known.

Raise boring will not only reduce labour requirements by achieving a higher advance per day but, along with another technological advances, will have the tendency to attract a higher level of skilled labour to the mining industry.

Last, and probably most important from the long-range viewpoint, is cost reduction. Although, it is true that the direct cost of conventional raises, especially short ones, may currently be less in many cases, labour and material costs are continually escalating and therefore their costs increasing.

Skilled conventional miners, always in short supply, are not required to operate a Raise Boring machine. Improved raise drills, drilling techniques, pilot bit and cutters are lowering the cost of machine excavated (RBM) raises. Less total manpower, less rock to handle, less construction time and increased safety all add up to less costs and earlier projects.