Underground Mining of Metalliferous Deposits
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Lecture No. 19
Underground Development Works Horizontal Drivages - II

HORIZONTAL DRIVAGE - Drilling and Blasting

LOADING AND TRANSPORTATION

After blasting, the broken ore is loaded and transported by machines that may be powered by compressed air, diesel fuel, or electricity.

Highly mechanized mines employ units that load themselves, haul the rock to an ore pass, and dump it. Known as LHD units, these come in various sizes denoted by the volume or weight of the load that they can carry.

The smallest ones have a capacity of less than 1 cubic metre (1 ton), whereas the largest have a 25-ton capacity.

Figure 1. LHD – Load Haul Dumper

Figure 2. Low profile dump truck

In small, narrow vein deposits, tracked or rubber-tired overshot loaders are often employed.

After the bucket of this machine is filled by being forced into the pile, it is lifted and rotated backward so that it dumps into a built-in dump box or attached railcar. Overshot loaders are commonly powered by compressed air.

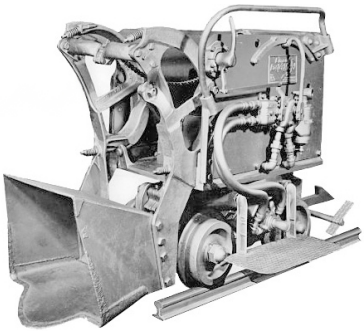

Figure 3. Rocker Shovel/line loader

Another type of loading machine features special gathering arms that sweep or scrape the broken material into a feeder, whence it is fed via an armoured conveyor belt into waiting trucks or railcars.

Although most loading machines have an onboard operator-driver, some are controlled remotely via television monitor.

SCALING AND SUPPORTING

After the broken rock has been removed (and sometimes even during the loading process), the roof, walls, and face are cleaned of loose rock.

This process is called scaling.

In small openings scaling is normally done by hand, with a special steel or aluminum tool resembling a long crowbar being used to “bar down” loose material.

In larger openings and mechanized mines, a special machine with an impact hammer or scaling claw mounted on a boom is used.

Scaling is an extremely important step in making the workplace safe.

Depending on the ground conditions and the permanence of the openings, various means of rock reinforcement may be employed before beginning a new round of drifting.

The ideal is for the rock to support itself; this is accomplished by keeping rock blocks in place, thereby allowing rock arches or beams to form, but often these blocks need to be reinforced by various implements, the most common being rock bolts inserted into holes drilled around the opening.

If the rock pieces are quite small, a steel net (much like a chain-link fence) or steel straps can be placed between the bolts.

Figure 4. Scaling and supporting equipment’s

Some mines simply cement reinforcing bar or steel cables in the boreholes.

Shotcrete, concrete sprayed in layers onto the rock surfaces, has also proved to be a very satisfactory means of rock reinforcement.

Often steel arch supports are also used

ADVANTAGES

- Drilling and blasting techniques are easy to adopt.
- Preparation time required are short.
- Level of mechanization depends on the investment available
- Discrete method allows more maneuvering
- Can be adopted for any rock type (universally adopted)
- More control over bends, dimension and shape of the drift
- Better supervision and control

DISADVANTAGES

- Progress is slow 30 – 40 m/month.
- Often time cycle of unit operations cannot match with shift schedule.
- Time loss for blasting work – especially, the fume dispersion time
- Involvement of more man power
- Performance of manpower affected by poor ventilation