Underground Mining of Metalliferous Deposits
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Lecture 44
Artificially Supported Mining Methods

BACK FILL MATERIALS

Different materials that have been used to backfill mine openings include the following:

- Dry sand and rock fill
- Uncemented hydraulic backfill
- Cemented hydraulic backfill
- Cemented rock fill
- Paste fill
- Pneumatic fill
- Flowable fill

Chalcopyrite ($CuFeS_2 3H_2O$) (example 1.2% Cu)

Mine backfill is soil, overburden, **mine** tailings or imported sand, aggregate material used to replace excavated zones created by **mining** operations.
Rock fill can be cemented or non-cemented **mine** waste rock or aggregate material placed underground by means of:

- Trucks, conveyors, raises
- Boreholes
- Combination of borehole and pipelines

Previously hydraulic back filling of stopes was carried out by means of **river sand** using timber barricades lined with bamboo mats. Establishment of **milling facilities** at the pit head and availability of **mill tailings** completely revolutionized the filling system using back fill.

Minerals in the ore: chalcopyrite, pyrite, pyrrhotite, pentlandite, millerite, magnetite, ilmenite, molybdenite, tetradymite, wehrlite, cubanite, sphalerite, galena, mackinawite, heazlewoodite, native silver, arsenopyrite, bravoite, valleriite, skutterudite, bismuthinite, and uraninite.

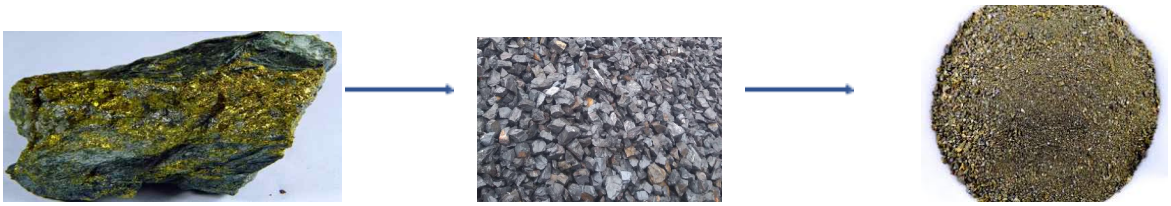

Figure 1. From ore to metal

Grinding up to (-)200 mesh size or 75 micron for *liberation of value minerals* from gangue minerals

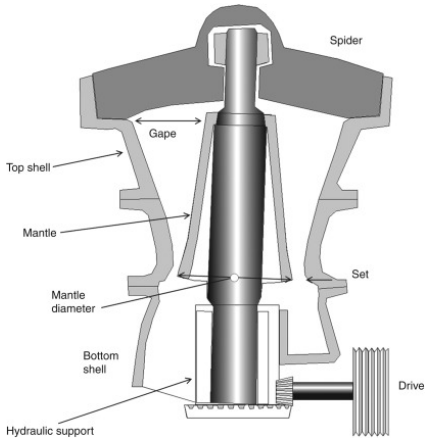

Figure 2. Gyratory crusher

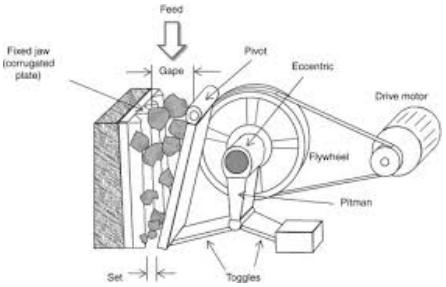

Figure 3. Jaw crusher

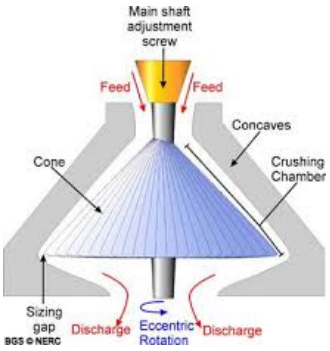

Figure 4. Cone crusher

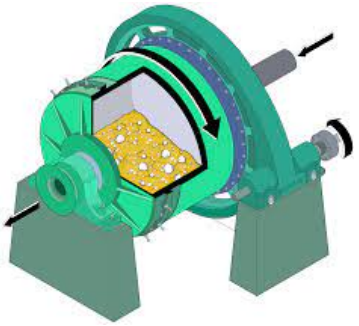

Figure 5. Ball mill for grinding

Ball mill + Spiral classifier combination
The overflow from ball mill (output) is fed to spiral classifier.
The coarse and fines are segregated in the classifier.
The coarse is recycled to the ball mill, whereas the fines are sent to floatation cells.

Figure 6. Ball mill- spiral classifier combination

Figure 7. Spiral classifier

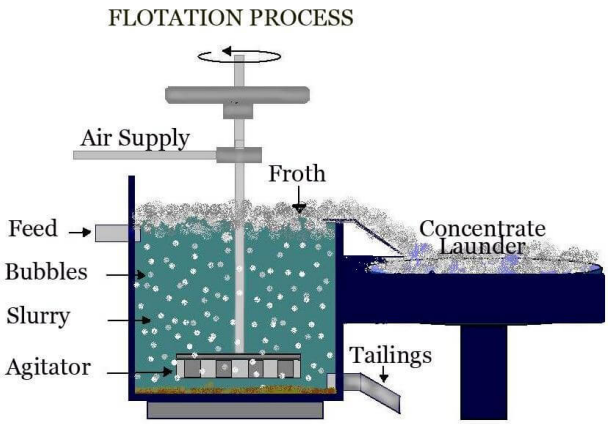

Figure 8. Froth floatation cell

Froth flotation is a process for selectively separating hydrophobic materials from hydrophilic. This is used in mineral processing, paper recycling and waste-water treatment industries.

- The sources of fill are rock, gravel, river sand and mill tailings. Previously hydraulic back filling was carried out by means of river sand.
- In some of the Indian mines, stopes were filled by river sand against timber barricades lined with bamboo mats.
- However, establishment of milling facilities at the pit head and availability of mill tailings completely revolutionized the filling system using back fill.