Underground metal mining pdf

The 3D model of a modern underground mine with access to the Underground solid mining mine is one of the various underground mining methods used to excavate solid minerals, usually those that contain metals such as ore containing gold, silver, iron, copper, zinc, nickel, tin and lead, but also includes the use of the same methods for excavation of gemstone ords such as diamonds or rubies. Soft rock mining refers to the excavation of softer minerals such as salt, coal or oil sands. Access to mine Underground access Access to underground ore can be achieved by reducing (ramp), sloping vertical shaft or adit. Reducing the portal Reduction can be a spiral tunnel that circles either the deposit flank or circles around the deposit. The reduction begins with the cut of the box, which is a portal to the surface. Depending on the amount of overload and the quality of the foundation, a galvanized steel culvert may be required for safety. They can also be launched into the wall of an open cut mine. Shafts are vertical excavations that have sunk next to an ore body. Mines are sunk for ore bodies, where transport to the surface through a truck is not economical. The shaft of transportation is more economical than freight transportation at depth, and the mine can have both a descent and a ramp. Adits are horizontal excavations towards a hill or mountain. Adits are used for horizontal or almost horizontal ore bodies where there is no need for a ramp or shaft. The decline often began on the high wall of an open cut mine, when the ore body has a paid grade sufficient to support underground mining, but the ratio of bands has become too large to support the methods of open cast mining. They are also often built and maintained as emergency access to underground work and a means of moving large equipment to work. Access to ore. Levels are dug horizontally from a lower or shaft to access the body's ore. The feet are then excavated perpendicularly (or near perpendicular) to the level in the ore. Mining development vs. mining there are two main stages of underground mining: mining development and mining. Mining development consists of excavating almost entirely in (not valuable) waste rock in order to gain access to ore. There are six stages in mining development: remove previously blown material (dirt from the round), scaling (removing any unstable rock slabs hanging from the roof and sidewalls to protect workers and equipment from damage), installing support or/and reinforcement using shotcrete, etc., drilling rock face, loading explosives, and exploding explosives. To start mining, the first step make a way to go down. The path is defined as Decline, as described above. Before the start of the decline, all pre-planning of the power plant, drilling, dehydration, ventilation and, mud removal of objects Sure. The extraction is further broken down into two methods: a long hole and a short hole. Short holes are similar to mining, except in ore. There are several different methods of extracting long holes. As a rule, the extraction of long holes requires two excavations in ore at different heights below the surface, (15 m - 30 m from each other). Between the two excavations, holes filled with explosives are drilled. The holes are blown up and the ore is removed from the bottom excavation. The ventilation main article: The underground ventilation door of the mine to direct ventilation to the old lead shaft. The ore bunker in front is not part of the ventilation. One of the most important aspects of underground hard rock mining is ventilation. Ventilation is the main method of cleaning hazardous gases and/or dust produced by drilling and explosive activity (e.g. silica, NOx), diesel equipment (e.g. diesel particles, carbon monoxide) or to protect against gases that naturally emanate from rock (e.g. radon gas). The ventilation is also used to control underground temperatures for workers. In deep hot mines, ventilation is used to cool the workplace; However, in very cold places the air is heated to just above zero before it enters the mine. Vent lifts are usually used to transfer ventilation from the surface to workplaces, and can be modified for use as emergency evacuation routes. The main sources of heat in underground solid rock mines are the virgin temperature of the rock, machines, automatic compression and fissile water. Other small factors are the heat and explosive blows of the human body. Ground support Some support tools are needed to maintain the stability of the holes that are excavated. This support comes in two forms; local support and support on the ground. Ground support for the ground support area is used to prevent major ground failures. The holes are drilled into the back (ceiling) and walls and a long steel rod (or stone bolt) is set to hold the ground together. There are three categories of rock bolt differentiated by the way they engage host rock. They: Mechanical Bolts Point Anchor Bolts (or Shell Expansion Bolts) are a common style of ground support area. Point anchor bolt is a metal bar with a diameter of 20 mm to 25 mm, a length from 1 m - 4 m (size is determined by the engineering department of the mine). There is an extension shell at the end of the bolt that is inserted into the hole. As the bolt is tightened by installing the drill the expansion shell expands and the bolt tightens the holding of the rock together. Mechanical bolts are considered temporary support because their lifespan is reduced by corrosion, how they are not downloaded. In areas requiring more support than a point anchor bolt, loaded resin ribs are used. The rebar used similar in size as the point anchor bolt, but has no shell extension. Once the rebar hole is drilled, polyester resin cartridges are installed in the hole. The bolt fixture is installed after the resin and rotates with a mounting drill. This opens the tar cartridge and mixes it up. After the resin hardens, the drill spinning tightens the bolt fixture holding the rock together. Re tar grout fixtures are considered permanent ground support with a lifespan of 20-30 years. Cable bolts are used to bind large masses of rock in the hanging wall and around large excavations. Cable bolts are much larger than standard stone bolts and fittings, usually between 10-25 meters in length. Cable bolts grout with cement solution. Friction friction stabilizer (often referred to as the Split Set generic trademark) is much easier to install than mechanical bolts or faded bolts. The bolt is hammered into a drill hole that has a smaller diameter than a bolt. The pressure from the bolt on the wall holds the stone together. Friction stabilizers are particularly susceptible to corrosion and rust from the water if they are not loaded. Once the grout friction increases 3-4 times. Swellex is similar to friction stabilizers, except that the diameter of the bolts is smaller than the diameter of the hole. High-pressure water is injected into the bolt to extend the diameter of the bolt to hold the stone together. Like a friction stabilizer, swellex is poorly protected from corrosion and rust. Local ground support local ground support is used to prevent small rocks from falling from the back and ribs. Not all excavations require local ground support. A welded wire mesh is a metal screen with holes measuring 10 cm x 10 cm (4 inches). The mesh is held on the back using point anchor bolts or resin grout fixtures. Shotcrete is a fiber-armable spray on the concrete that covers the back and ribs preventing small rocks from falling. Shotcrete thickness can be from 50 mm to 100 mm. Latex membranes can be sprayed on the backs and ribs, similar to shotcrete, but in smaller quantities. Stope and retreat against the stope and fill the stop and retreat Sub-Level Caving Subsidence reaches the surface at the underground Ridgeway mine. Using this method, mining is planned to extract the rock from stops without filling the voids; This allows the wall to rocks the cave in the mined foot after all the ore has been removed. The stop is then sealed to prevent access. Stop and fill where large bulk ore bodies need to be mined at great depths, or where leaving ore poles is uneconomical, an open cork filled with fills that can be cement and stone mixture, cement and sand mixture or cement and tailings mixture. This method is popular because refueling stops support adjacent stops, full extraction of economic resources. Mining Methods Schematic Cut Cut Chart The production is based on the size, shape, orientation and type of ore produced. The ore body can be a narrow vein, such as a gold mine in Witwatersrand, an ore body that can be massively similar to the Olympic Dam mine, Southern Australia, or the Cadia-Ridgeway Mine, New South Wales. The width or size of an ore body is determined by the grade as well as the distribution of ore. The fall of the ore body also has an impact on the mining method, for example, a narrow horizontal vein of the ore body will be mined by room and pillar or longwall method while vertical narrow veins of the ore body will be mined open stop or cut and fill the method. Further consideration should be given to the strength of the ore as well as the surrounding rocks. Ore body placed in a strong self-sustaining rock can be extracted by an open stop method, and an ore body placed in a poor rock may need to be cut and filled, where the void is constantly filled as the ore is removed. Selective extraction techniques cut and fill prey is a method of extracting short holes used in steep dive or irregular ore zones, particularly where the hanging wall limits the use of long hole techniques. The ore is extracted horizontally or slightly sloping slices, and then filled with rock, sand or tailings. Either the filling option may be consolidated with a specific one or left unconsolidated. Cut and fill prey is an expensive but selective method, with the benefits of low ore loss and dilution. Drift and filling are similar to incision and filling, except that it is used in ore zones that are wider than the drift method will allow to be mined. In this case, the first drift develops in ore and is filled using consolidated pouring. The second drift moves next to the first skid. This continues until the ore zone is mined across the entire width, after which the second incision will be launched on top of the first incision. Stopping compression is a method of extracting short holes, which is suitable for sharply dipping halos. This method is similar to cutting and filling the prey, except that after the explosion, the broken ore remains in the foot, where it is used to support the surrounding rock and as a platform with which to work. Only enough ore is removed from the foot to drill and blast the next slice. The stop emptied when all the ore was blown up. Although this is very selective and allows for low dilution, as most of the ore remains in the foot until the mining is completed, there is a delay in returning capital investments. VRM/VCR: Vertical Retreat Mining (VRM), also known as vertical crater retreat (VCR), is the method by which the mine is divided vertical zones with a depth of about 50 meters with the help of an open stop, mining from the bottom up. Large diameter holes of the long hole are drilled vertically into the ore body from above by using a hole in the hole hole necessary drills and then explosive horizontal slices of body ore in the pruning. The ore exploded when it was extracted in stages. This search is done from the bottom of the developed section. The last ore clean-up is done using remotely operated LHD machines. The system of primary and secondary stops is often used in the extraction of the VCR, where the initial stops are extracted in the first stage and then the thrusting is cemented to provide support for the wall to explode successive stops. Side chambers will be mined in a pre-planned sequence after hardening the filling. The massive mining techniques of Block speleology are used to mine massive steeply immersed orebodies (usually low class) with high looseness. The undercut with the exit of the carriage is operated under the ore body, with a draw excavation between the top of the carriage level and the bottom of the pruning. The bells serve as a place for rock caving to get into. Because of the loose ore body over the first explosion of the cave and falls into the bells. As ore is removed from the bells of the ore body cave, providing a steady flow of ore. If the cave stops and the removal of ore from the bells continues, a large void may form, which can lead to sudden and massive collapse and potentially catastrophic winds throughout the mine. Where caving continues, the earth's surface can collapse into superficial depression, such as those at climax and Henderson molybdenum mines in Colorado. This configuration is one of several to which miners use the term glory hole. Orebodies that don't cave easily sometimes are the prerequisites of hydraulic fracturing, explosive, or a combination of both. Hydraulic hydraulic fracturing is used for pre-construction of a strong rock roof over coal-fired long-walled panels, as well as for induction of caving in both coal and solid mining. Room and mining post : The room and the mining post are usually done in a flat or gently immersed in the ore bed of the organs. The pillars remain in place as normal while the numbers are mined. In many rooms and pillars, the pillars are washed, starting at the farthest point from the stop-access, allowing the roof to collapse and fill the stop. This allows for more recovery as less ore remains in the pillars. Removing ore In mines that use rubber-weary equipment to remove large ore, ore (or dirt) is removed from the foot (called mated or waterlogged) using central articulated vehicles (named boggers or LHD (Load, Haul, Dump machine)). These units can be used using diesel engines or and resemble a low-lying front loader. LHD works through electricity to use rear cables that are flexible and can be extended or recalled on Coil. The ore is then dumped into a truck that has been dragged to the surface (in smaller mines). In deeper mines, ore is dumped down the ore pass (vertical or near vertical excavations), where it falls to the level of collection. At the collection level, it can get primary crushing through the jaw or taper, or through a rockbreaker. The ore is then moved by conveyor belts, trucks or sometimes trains to the mine to be lifted to the surface in buckets or passes and emptied into bunkers under a surface frame for transport to the mill. In some cases, the underground primary crusher feeds a sloping conveyor belt that delivers ore through a sloping shaft directly to the surface. Ore is fed down ore passes, with mining equipment accessing ore bodies through decline from the surface. The Deepest Mines Home article: The list of the deepest mines in the world is the Mines Of Mponeng and TauTona (western deep levels) in the Witwatersrand region of southern Africa, which currently operate at depths exceeding 3,900 m (12,800 ft). The deepest inactive mine in Asia is Kolar in the Indian region of Karnataka, closed in 2001, with the main shaft reaching a depth of 10,560 feet (3,220 m). This region is also home to the harshest conditions for hard rock mining, with temperatures of up to 45 degrees Celsius (113 degrees Fahrenheit). However, massive refrigeration units are used to bring temperatures up to about 28 degrees Celsius (82 degrees Fahrenheit). The deepest inactive hard rock mine in North America is the Empire Mine in Grass Valley, California. Closed in 1956, the main shaft reached a depth of 11,007 feet (3,355 m). The total length of all mines is 367 miles (591 km). The deepest active hardwood mine in North America is the Kidd mine in Canada, which produces zinc and copper in Timmin, Ontario. At a maximum depth of 9,889 feet (3,014 m), this mine is the deepest base metal mine in the world, and its low surface height means that the bottom of the mine is the deepest non-sea point available on earth. The Penna LaRonde Shaft (#3 shaft) is considered to be the deepest single mine in the Western Hemisphere. The new #4 a 2,840m (9,320ft) shaft down. The LaRonde mine was completed in June 2016 at a depth of 3,008 m (9,869 ft), the deepest long open-stop well in the world. The deepest active mine in Eurasia and Asia is the Rocky Nornickel mine in Talnah. In September 2018, it reaches a depth of 2,056 m (6,745 feet) below the surface. The deepest mine in Europe is the 16th uranium mine mine in Pibram, Czech Republic, at an altitude of 1838 m. The deepest solid mines in Australia are copper and zinc lead mines Mount Isa, in South Africa, at an altitude of 1,800 m. The deepest platinum-palladium mines in the world are located on Merenski Reef, in south Africa, with a resource of 203 203 Troy ounce, currently worked at a depth of about 2,200 m (7,200 feet). The deepest well is the Kola super-deep well in the Murmansk region. At an altitude of 12,262 m, it is the deepest artificial extreme point on Earth. See also Adit Gold Mining Pinge Shaft Mining Act 1872 Stop Links - de la Vergne, Jack (2003). Hard Rock's handbook. Tempe/North Bay: Mackintosh Engineering. page 2. ISBN 0-9687006-1-6. Https://www.math.uwaterloo.ca/~nwormald/papers/DOT2.pdf.;D ecline design in underground mines using limited trajectory optimization - b c d e f Puhakka, Tulla (1997). A guide to underground drilling and loading. Finland: Tamrock Corporation. 153-170. Cite has an empty unknown parameter: co-authors (help) - b c Puhakka, Tulla (1997). 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