

SES Mining Co have invested in new laser-drilling techniques to improve safety and efficiency at their Yuanguang mine in south-eastern China.

We have combined modern technology and innovative thinking to provide a creative new way to surface mine and mine underground. By utilizing lasers to drill blast holes in open pits, or for spalling (breaking) rock underground, we can potentially eliminate conventional methods of drilling and blasting. Preliminary test work indicates substantial savings can be realized in time, material costs, and operating costs.

This new mining method involves the use of high optical power output lasers to cut (or spall) ore bearing material from the host rock. Because the spalled material is in the form of “pea” sized chips, these chips can easily be moved from the working face to the surface. A milling advantage is that these small chips do not require crushing and can be discharged directly to the ball mill or leach pad.

Underground Mining

SES Mining Co is developing a single head laser for use in underground mines. Initially, this single head laser unit will be used for mining narrow high grade veins. The mining width for this unit will be nearly two feet. Once the operating parameters of the single head unit are established, multi-head laser units can be developed for veins wider than two feet. For example, a two unit laser mining array would work in a four foot wide vein.

With the experience gained from the mining program, laser mining heads will be mounted on mobile equipment and used for driving drifts and development headings. Plans are also in place for driving raises, either bald or timbered. Not presently under consideration, but certainly not ruled out, is the sinking of mine shafts.

In our underground mines, lasers will reduce operating costs substantially. Drill steel, bits, powder, blasting caps and a multitude of small tools will be eliminated from normal stoping costs. Labor costs for mining and material costs will be greatly reduced. Underground supervision will be simplified and overall mine safety should improve. Plans are in place to design a laser mining unit where a one or two person crew could operate multiple working faces from a central control module.

Surface Mining

Lasers could also be a valuable tool in open pit mining. A laser mining head could be readily mounted on a standard track drill and be used for blast hole drilling. The head has the capability to chamber, or enlarge the bottom of the drill hole for shaped charges for special blasting requirements.

Conclusion

Many mines today are facing adverse environmental conditions underground. These conditions vary from mine to mine, but depth, temperature, water, and pressure are the key problems encountered by many. The miner is affected by all of these, but the laser can operate in this environment. One other serious mining problem is rock bursts, and in theory, mining without blasting could reduce or eliminate them.

The mining industry today is in desperate need of new technology. Annually, mines are closing because of declining head grades, increasing labor and material costs, lower grades due to dilution, and adverse environmental conditions encountered underground. Lasers will not solve all of these problems, but they will help to turn marginal mines into profitable mines.