**3. A vision of “The New Attractive Mine”**

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In this chapter we have tried to create a vision of a future mine, considering the working environment and attractiveness all the way from the mine planning stage.

The new deep metal mine was a true planning and co-operation success and a huge leap in mining history. A number of leading “European mining companies” had been inspired by the EU project "Sustained intelligent mining industry" abbreviated as SIMS. This successful project had provided a conceptual system for automated and flexible mining, based on drill and blast technology for fragmentation of the actual ore. Continuous mining with road headers was still only used in development works where conventional drilling and blasting was abandoned. The zero entry mine was now almost realised and the large “European manufacturers of advanced mining equipment” had contributed largely to the technological success, which had opened a new global market for them.

The new automated mining method made it possible to almost continuously produce desired ore qualities and quantities on customers demand. This was a big comparative advantage compared to the old traditional bulk production mines that still existed and struggled for their survival. The new mining system dramatically reduced the prevailing and traditional use of expensive storing and stacking of mined ore. With the new way to mine an important first step towards true Lean-mining was taken and gradually one bottle neck after another was discovered and eliminated. Metal recovery was very high and cut-off grades were reduced. It seemed as traditional mining had been a real waste of resources.

Advanced investment analyses had clearly shown that there were great financial benefits with the new automated mining technology. The costs for underground development works were reduced with about 50% compared with traditional mining methods and labour costs were reduced with more than that. This made it possible for the companies to make large investments in new technology and personnel competence and still be highly profitable. If profits for society and individuals also were included in the analysis the total expected financial benefits where overwhelming. Follow up of actual economical results showed even bigger savings than expected.

An unusual feature of the new mine was that open pit mining was avoided although the upper parts of the ore body were close to the surface. A green mining philosophy “In situ mining” was applied and most of the mining activities were invisible for people passing the mine site. Most of the waste material was directly used for backfill after recovering the metal content.

The mining companies had from the start of the project made use of a newly developed iterative planning methodology that reduced common initial design errors when they designed the new mine. Basic guidelines provided very useful demands for the mine designers. During the development works there had for example never been any real ventilation problems, stability problems or water drainage problems. No severe accidents or incidents had occurred so far and all mining activities were systematically risk assessed. The new mine had set a new world standard for results regarding health and safety results. Safety first was not only a simple a slogan, it was a complex and applied reality. In fact no major physical work or main activities were performed unless they had been computer simulated, evaluated and approved. This proactive way to handle production and safety risks had proven its value time after time. The old description of mining work as “Dark, dirty and dangerous” had definitively become out of date and irrelevant. Instead of being almost unpredictable and uncertain mining had become highly predictable. Some of the old miners meant that the original charm of mining was somewhat lost when all worked according to plans, but no one really wanted the old risky ways and days back.

One key to the success was the fact that the mine was already from the start designed for automation and socio technical principles with a work organization based on production teams and broad professional skills among management and miners. One of the mines most impressive features was the information and decision systems based on sensor technology and production analysis in real time. This made it possible for the personnel to actively steer and control the production instead of just passively react on deviations and alarms from an automated production process. This was a major difference and advantage compared with traditional control room work, in for example regular processing plants. Impressive results regarding product quality and production availability and stability had been achieved due to this proactive philosophy. The philosophy also made the miners work interesting and challenging.

The new remote operations control centres (so called ROCs) were designed to promote co-operation and creative problem solving in multi skilled teams. The working teams were mixed regarding age, experience, gender, competence, etc. Diversity had replaced conformity and this had proved to be a good base for creating “production scouts”, miners that were always ready and interested in improving the mining processes. Most of the team members were recruited from national and regional education programs that were specially developed with regards to the new demands that the mining sector had, basically that modern mining was an intellectual analytical work for wise and reliable persons. New education programs on all levels had been started and were recruiting well. Mining work had turned to be attractive, not only because the wages, but also because it was a very interesting work with good possibilities for personal and professional development in a safe and sound working environment.

The total progress had been astonishing although they only have started to utilize parts of the potential that the new technology and organisation offered. Investments in research and development work had paid off quickly and management were convinced that innovative R & D combined with a challenging vision had been and would continue to be the key factor for success.

**References**

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