Program for the implementation of strategies in downtime and impediments to failures in long drilling developed at TECNM Campus Fresnillo

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ABSTRACT
In the present project of the Higher Technological Institute of Fresnillo, in the area of mining engineering, a theoretical-practical research project is developed that focuses on the loss of time and processes in long drilling. In operations carried out with this long drilling procedure, production costs increase and profits are reduced. Training programs will provide better dexterity to operators, making their practical tasks easier and safer. This will guarantee growth and profits at a level, personal and business in the mining field, with the reduction of accidents, downtime and bad practices with the correct training of operators.

Keywords: Long drilling, safety, training, time, manual, analysis, dilution.

1 INTRODUCTION
This research, formed by the mining engineering career, is developed for an improvement in the long drilling process or tumbe by sections where a theoretical practical project will be developed that responds to a training program on downtime in drilling, which is a mining process of high production that in each shot you can knock down blocks of up to 30 meters and make a massive chain to obtain optimal production, however, this process is very delicate because dilution increases the costs in this knocking process which generates losses and does not makes it so doable.
Have a training program. In this process, where bad practice harms the useful life of the machinery or can cause accidents to people, in addition to seriously reducing their production, workers can be aware of the correct use of the machinery and what the process entails.

The correct execution of this process is necessary since the planning of this mining method in principle, it requires using a front towards the vein and a backfill backing to avoid the weakening of the ground and this could cause a settlement of fellings or sky due to the magnitude of the work.

2 METHOD DESCRIPTION

The study of time and motion is a very helpful technique for companies, which is not currently valued. Time and motion study One of the most widely used techniques to overcome deficiencies and increase worker productivity is work study, defined as the systematic examination of methods for carrying out activities in order to improve the effective use of resources and Establishing performance standards with respect to activities had its origins at the beginning of the 20th century, with the work carried out by Frederick W. Taylor and continued a few years later by the Gilbreth couple (Kanawaty, 1996).

Movement study involves the analysis of the basic movements of the hand, arms and body used to carry out a task. It includes the design of the workplace, the environment, as well as the tools and equipment used in the operation, in addition they must consider above all the safety of the workers (Meyers, 2005).

The influence of bad practices is due to Psychosocial work factors are organizational conditions (Mintzberg, 1993), they are psychosocial work conditions that as such can be positive or negative. Their number is very large and their classification and organization depends on the approach chosen. When such conditions are adequate, they facilitate work, the development of personal work skills and high levels of job satisfaction, business productivity and motivation states in which workers achieve greater experience and professional competence. (Kalimo, 1988)

This is an important value to get a job efficiently and effectively. Based on the summary, the complete time study is determined for the Long Drilling cycle. Time Study, Equipment Installation, Average Time per Hole, and Hole Loading. The method is applicable to mineral bodies with highly competitive characteristics and with dips greater than 45° so that said angle is greater than the rest angle of the fragmented mineral. With the above, efficient results are achieved in lagging operations, since in this way The flow of the mineral is done by the action of the force of gravity towards the extraction area. (ACOSTA, G. Armando. 2010)

The mining method for the Antares Norte body, where the quality of the rock is good, is primary and secondary stopes with sublevels and vertical drilling with banks of 15 [m] to 30 [m] power, drilling
diameter to 4 ½ [in]. The template used is 2.50 [m] of edge and 3.00 [m] of spacing and the filling is with tepetate with 2 to 3% cement in the primary recesses. (Daniel Isaac Ramirez Valtierra 1978)

Distribution of mineralization It is desirable that the mineralization of the body presents a homogeneous distribution throughout the structure. This issue is of great importance, since the method is not selective and any “horse” of tepetate or non-economic areas will need to be felled, which will most likely increase the dilution percentage. Presence of threads or economic detachments parallel to the main structure.

If there are falls or branches of economic mineral along or beyond the contacts, it is not possible to mine them since exploitation is complicated and gives rise to excess dilution. (Dyane, Grondin Louise, Matte 2009)

Support for boards and ceilings. It is always advisable to support the ceiling and tables of the sublevels due to the high levels of vibrations generated by blasting, which tend to produce rock loosening. In the case of the boards, the reinforcement is done with long anchors based on steel cables, which makes it possible to stop a high percentage of sterile material releases, which is the main cause of the dilutions that reduce the expected value. of the mineral. It requires a large amount of economic geology and geotechnical information in its design, otherwise the design will lead to frustrating results regarding the stability, dilution and recovery of in situ ore and broken ore. Dilution rates in the range of 20-25%. (Gastelum, G. 1998)

Once the CP (counter well) and the sublevel of the stope are opened, a counter well is placed at one end of the sublevel to start drilling vertically, then load and shoot them and thus obtain the free face. Once the counterhole is finished, the shot is carried out in stages to achieve its opening and thus generate an exit successively, the detonation of the first drilling lines is carried out to obtain a new free face which will serve as an exit for the subsequent cuts. The ore lying down begins to be left behind by the lower access and/or base of the stope.

Before starting any activity, it is checked that the work area is solidified, ventilated, anchored, anchored, lit, whitewashed, has a telephone and Leaky fider cable, a niche and a sentinel.

Facilitator and construction resident make known what is stipulated in said procedure and verify its application. It is the responsibility of the collaborators to apply this procedure. It is the responsibility of the security department to apply and update this procedure as changes arise in the method.

At the end of the drilling or work shift, the equipment is turned off and de-energized. The equipment remains there in the work area so that the next shift can continue with the drilling. Before cutting off the power to the sentinel panel, the operator must check the metal part of the electrical panel with the “angelito” voltage tester; if everything is fine, de-energize the panel. It is important to note that the bank must be tripped when the equipment drilling is 12 meters away from the cut, that is, after firing
a line a distance of at least 10 meters from the equipment to the vertical cut. (explanatory sketches are attached) The cutting of the descending bank must always be further forward than the ascending bank, this for the protection of personnel during the loading of explosives or supervision of the lower bank, a protective cap of at least one size must be worn. protection line on the upper bank.

Personnel should never remain below or above a previously drilled area as there is a risk that it could collapse.

Table 1. Immediate reaction plan

<table>
<thead>
<tr>
<th>RISK</th>
<th>CORRECTIVE ACTION</th>
<th>PREVENTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living electricity</td>
<td>Fastened power lines</td>
<td>Maintenance of power lines</td>
</tr>
<tr>
<td>Fall of an object from a height (rock, materials)</td>
<td>Area and bed inspection</td>
<td>Anchored and sailed works</td>
</tr>
<tr>
<td>empty drop</td>
<td>Do not perform maneuvers next to the board without putting on the harness</td>
<td>Use harness, lifeline and hold on to anchor and steel cable</td>
</tr>
</tbody>
</table>

Source: Prepared by the authors themselves.

Compressor start:
1. Self-observation of PPE in shape
2. Check for knocks or external damage to the compressor
3. Visually verify that it is energized
4. Check that there is no current leakage, with the Voltage detector; little angel
5. Press the power button
6. Open the purge valve for 30 seconds
7. Close purge valve
8. Leave the compressor area

2.1 BASIC MAINTENANCE

Apply the basic Maintenance Card for Simba Operators. Check the fire suppression system and portable fire extinguisher. (COMPANY MINING LA PARREÑA SA DE CV 2003)

3 TMCCLELLAND'S THREE NEEDS THEORY

Need for achievement: Refers to the effort to excel, achievement in relation to a set of standards, striving for success.

Need for affiliation: Reflects the desire to belong to social groups, to interact socially with others. They have a great interest in establishing social relationships and feeling appreciated and accepted by their social group. These types of people would feel more comfortable in positions where they can be part
of a team, they opt for collaboration before competition, so they could perform better as employees than
as leaders.

Need for achievement: They tend to be attracted to achieving goals that reflect hard work or that
require certain skills and abilities to achieve them. They impose challenges on themselves and the
satisfaction of these people lies in the ability to overcome them. People in whom this need predominates
tend to be very effective on an individual level, and will handle themselves well in mid-level management
positions, or in some other positions that can provide them with constant challenges.

Need for power: These types of people are motivated by the desire to have an impact on others, in
order to influence or control their behavior, they obtain satisfaction in competitive situations in which one
party wins and the other loses. In those whose need for power predominates, they tend to be comfortable
in high-level management positions, easily managing to promote competitiveness and leadership.(Lozano
& Barragán 2015)

3.1 LOCKE'S GOAL SETTING THEORY

A second theory focused on the process is found in Locke's theory of goal setting, the individual's
motivation to achieve the goals they set will be determined by the goals themselves or by the simple fact
of having set them. This objective will mark the type of effort and involvement of the subject, as well as
the satisfaction obtained from his work depending on how much it brings him closer to his objectives.

Functions of the goals

Goals, according to Edwin Locke's goal setting theory, have various functions:

1. They help focus action and attention on the task.
2. They mobilize the energy, resources and effort of the individual.
3. They increase persistence and perseverance.
4. They help develop strategies

3.2 SELF-EFFICACY

According to E. Locke, self-efficacy is the person's belief that they are capable of carrying out a
certain task, achieving a certain goal. The greater self-efficacy, the greater confidence in the skills that
will allow you to achieve that goal. Goal setting, by focusing on behavior, involves the development of
the person's motivation. Motivation will increase if the person shows self-efficacy, if he thinks that her
behaviors will lead him to achieve the goal he set for himself. Feedback will occur between behavior, goal
and success.
The 5S is an original management technique from Japan and is based on 5 simple phases, thus the Japanese 5S or the 5S of quality are: Seiri (eliminate), Seiton (sort), Seiso (Clean), Seiketsu (Standardize) and Shitsuke (discipline). The objective of this method is to maintain and improve organizational conditions, order and cleanliness, as well as improve working conditions, safety, work environment, personal motivation and efficiency. A concept that continually applied to the management and administration of the workplace leads to a process of continuous improvement, managing to improve productivity, competitiveness and quality in companies.

SHIKARI – CONSTANCE. It is the ability of a person to stay firmly on a course of action.

SHITSUKOKU – COMMITMENT. It is to comply with what was agreed.

SEISHOO – COORDINATION. To achieve a quality work environment, unity of purpose, harmony in rhythm and timing is required.

SEIDO – SYNCHRONIZATION. To maintain the pace at work, there must be a work plan, specific rules that indicate what each person must do.

4 METHODOLOGY

The study of work is a systematized evaluation of the methods and work system used to carry out productive activities.

To reduce times, an elimination of bad practices will be applied with adequate training for workers through the 5 s. Make a table with the impediments and the time it takes for each one. To solve the main psychosocial problems that are mostly the cause of the impediments and errors that result in this operation some self-help theories are implemented.

Generate strategies to improve the use of equipment and skill and awareness for workers through manuals and steps for the correct use of equipment and machinery. Identification of failures in dissolution the use of a designed format called “Development Review Form” which is an agreement between the planning, mining and geology departments that indicates the distance at which the development of an extraction cruise must be completed.

- Skill training of workers in their tasks in drilling
- Establish drilling objectives Have access to the work area and analyze movements Collect data on drilling times
- Apply theory and hypotheses to improve drilling
- Dilution Application Optimization
- Machinery use training
- Skill training of workers
To achieve expected results, the use of the following parameters must be verified

- Verify dilution application procedure is correct
- Verify proper use of tools by workers
- Check equipment before and after operation, ensure optimal operation
- Verify training is adequate for workers and that they have adequate physical condition and moral conduct as well as a positive environment.
- Verify personnel check-ups and meetings with industrial psychologists.

4.1 EXPECTED RESULTS

If the processes and observations that we have seen throughout this investigation are carried out, we can have favorable results and reduce downtime in drilling that can occur due to certain circumstances or unforeseen events that we may have throughout the long drilling and thus obtain a more complete manual with complementary information from other research.

- The activities in the long drilling that show a waste of time were identified and thus propose a solution to these problems.
- Drilling failures were reduced due to the elaborate analysis and forming solutions to these failures.
- The strategies proposed to solve the identified problems could be carried out.
- Problems in solution were identified and resolved successfully.
- The losses of time generated by the lack of practice or training in workers or operators were identified and a lack of skill in carrying out their corresponding activities was identified and thus a training manual was prepared to improve their ability to handle equipment and reduce downtime in this area.
- The strategies already proposed could be implemented and thus have a time reduction of 3%.
- Training in the use of machinery in long drilling so that operators have better use of the machines and thus have the machines in good condition due to good use and have greater results in their work and save time repairing equipment and reducing accidents.
- A time evaluation system was obtained for the activities carried out in the long drilling and thus being able to have control of what needs to be corrected.
5 CONCLUSIONS

The study of long drilling times and their derivatives is very important and more so as was carried out in this research since through the analysis of times and the information collected, several factors could be identified.

Studies of micro movements must be carried out to be able to classify them as efficient or not and thus be able to propose a solution and reduce wasted time and make it more efficient.

- The skill of the workers is important so that they have a better job performance and thus work more quickly and safely, benefiting the production and the mining company.
- The reduction in downtime benefits the company and the industry since production is delivered in a timely manner.
- The reduction in downtime is derived from several factors and that is why solutions for various situations must be implemented.
- Any setback that appears during long drilling is considered downtime or lost time.
- The work team must be at 100% so that work is done at 100% and there is loss of time,
- Maintenance of work equipment or machinery must be carried out from time to time and must be scheduled so that there are no inconveniences in work activities.
- Training is important both in maintenance and use of the equipment and in safety,
- Safety and reduction of downtime are linked since if you work safely and with established standards there will be no inconveniences or loss of time.

Withinformation on long drilling activities and applying the corresponding solutions and through the corresponding training and evaluations, a reduction in times could be achieved and thus the company and the mining industry and the personnel would benefit.

In this way you would work continuously and safely.

RECOMMENDATIONS

Apply a study of movements and times before carrying out the training and use the methods already described to be able to create a comparison of the changes and improvements that have been implemented after the correct application of this manual Identify the factors that cause a loss of time in work activities and propose a solution according to what has already happened and complement it with new knowledge obtained through this research and obtain the best possible solution. Adequate training personnel is required for both machinery maneuvers and psychosocial risk assessment, ensuring that workers have the most optimal conditions possible to perform their work.
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