STUDY THE POSSIBILITIES OF IMPROVING TECHNOLOGICAL EQUIPMENT MAINTENANCE ACTIVITY FROM QUARRIES

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ABSTRACT: Continuous operation, safety and with high efficiency technological equipment that forms the technological flow of magmatic rocks quarries, can ensure by improvement maintenance activities but also reliability and in finally the equipment availability. In the same time all maintenance actions must be directed also to recondition equipment by methods to restore their initial technical characteristics and allow prevent wear their working part. Present paper deals with the issue of reducing and preventing accidental falls implications in increasing the period of operation equipment from the equipping quarries in which are obtained crushed rock required construction of roads.

KEY WORDS: flow sheet, technological equipment, maintenance activity, magmatic rock, crusher

1. INTRODUCTION

Continuous operation in complete safety and with profitableness of technological equipment that forms the flow sheet of magmatic rock quarries can be ensured by improving maintenance activities, but also the reliability and availability of equipment.

At the same time all maintenance actions must be directed to recondition equipment and methods to bring back the original technical characteristics and allow their active prevention of wear parts.

This paper deals with the issue of reducing and preventing accidental falls with implications for increasing the life of the equipment from endowment of quarries in which are obtained aggregates for constructing the roads.

2. MACHINE MAINTENANCE OF CAREER

2.1. General

In the Bata career, placed in Bata locality, Arad county, belonging to SC Diabas Bata Ltd., extract, process and sell magmatic rocks with priority destined for highway construction and other civil works.

Production flow consists of mobile and semi-mobile equipment structured as follows:

- flux primary crushing;
- flux crushing-secondary sorting-tertiary;
- flux loading-transport rock unrocked;
- feed storage loading finished products;
- flow sorting refuse tertiary crushing;

2.2. Maintenance equipment Bata career

Maintenance activity flows above is done on a yearly maintenance schedule of equipment that make production workflows above, drawn at the end of the year for next year, which includes specific work so periodic maintenance system functional type preventive-planned, namely: periodic test (V_p) , partial revisions (R_p) overhaul (R_g) and system of repairsplanned preventive: technical revisions (R_t) , current repairs (R_c) and capital repairs (R_k) .

Figure 1 shows the annual maintenance schedule for tertiary crusher production belonging flux crushingsecondary sorting-tertiary. Annual maintenance graphic is drawn up taking into account the expected sales volume for the year to which it relates, each unit being the budgeted number of hours required to achieve production. Graph annual maintenance include planned interventions daily, weekly, monthly and yearly.

Due to uncertainties regarding sales volume, availability of equipment or other causes which can intervene in the production process at the end of each month to prepare for the next month, a weekly maintenance schedule in figure 2, which are referred to specifically, depending the situation, scheduled maintenance and current repairs.

Interventions daily, weekly and monthly by the operators of the quarry equipment, based on daily maintenance sheet (fig. 3), weekly maintenance sheet (fig. 4) and monthly maintenance sheet (fig. 5).

Annual intervention are made by service technicians belongs to a service firm approved by the equipment manufacturer and is based on annual maintenance sheet (fig. 6).

| Miante | fiantenance annual plan tertiary crusher Sandvik UH 420 2013 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------|--|--------------|---------|-----------|------|-----------|------|------|----------|------|-----------|-----------|-----------|-----------|-----------|-------|-----------|-----------|-------|----------|-----------|-------|-----------|-----------|---------------|-----------|-----------|----------|-----------|-----------|
| No | Description verification | jar | 1 201 | - | fet | 13 | + | ma | r.13 | + | apr.1 | 3 | may | 2013 | ĻΫ | n 201 | 13 | jul 2 | 013 | au | 9.13 | + | sep.1 | -+ | oct.1 | 13 | nov.1 | 13 | dec. | .13 |
| Daily - | Operators | 51 5 | 2 53 | 54 5 | 1 52 | 53 | 54 S | 1 52 | 53 S | 4 51 | S2 5 | 3 54 5 | S1 52 | 53 54 | 4 S1 | 52 53 | 3 54 5 | 1 52 | 53 54 | S1 S2 | 83 5 | 14 51 | 52 53 | 54 5 | 1 52 5 | 3 54 5 | 1 52 5 | 3 54 5 | 51 52 | 53 54 |
| 1 | Check the lubricating oil tank | | | | | | | | | | | | | | | | | | | | | | | | | | | | | \square |
| 2 | Check the oil level in the tank Hydroset | + | + | \vdash | + | \vdash | + | + | \vdash | + | \vdash | ++ | ++ | | ++ | + | ++ | ++ | - | | ++ | + | \vdash | | ++ | ++ | - | | | ++ |
| 3 | Check that all shut-off valves between the tanks and pumps are fully open | 4 | _ | \square | _ | \square | _ | | | | \square | \square | | | \square | | \square | \square | | | \square | | | Ш | 11 | \square | 44 | | | \square |
| 4 | Check that no material accumulated on the lower body arms | + | + | \vdash | + | \square | + | - | \vdash | - | | ++ | + | \vdash | +++ | _ | ++ | | _ | \vdash | ++ | _ | \vdash | | ++ | ++ | | | | + |
| 5 | Check that the lubricating oil back into the tank and clean | + | + | \vdash | + | \vdash | + | + | \vdash | - | \vdash | ++ | + | \vdash | ++ | + | ++ | + | _ | \vdash | ++ | + | \vdash | | ++ | ++ | | | | + |
| 0 | Check if there are broken oil pipe | + | + | \vdash | + | + | + | + + | \vdash | + | \vdash | ++ | ++ | \vdash | ++ | + | ++ | ++ | + | \vdash | ++ | + | \vdash | | ++ | ++ | - | +++ | +++ | ++ |
| | Check the CSS value | + | + | \mapsto | + | \vdash | + | + | \vdash | + | \vdash | ++ | + | | +++ | + | ++ | ++ | + | - | ++ | + | \vdash | | ++ | ++ | +++ | +++ | ++ | ++ |
| 9 | Check that the material did not block the feed hopper or distributor and | + | + | H | + | Ħ | + | Ħ | | T | H | Ħ | | | Ħ | + | Ħ | Ħ | + | | Ħ | + | + | Ħ | Ħ | Ħ | T | | | + |
| | does not block loading aperture | | | | | \square | | | | | | \square | | | \square | | \square | | | | \square | | | | \rightarrow | | | | | \square |
| 10 | Check if hear abnormal noises crusher | + | + | \vdash | + | \vdash | + | + | | - | \vdash | ++ | + | | ++ | + | ++ | + | - | | ++ | - | | | ++ | ++ | | | | ++ |
| 11 | Check if you hear noises in the pump lubrication | + | + | \vdash | + | \vdash | + | + | \vdash | + | \vdash | ++ | + | \vdash | ++ | + | ++ | ++ | + | | ++ | + | \vdash | | ++ | ++ | ++ | +++ | ++ | ++ |
| 13 | Check the on temperature return | + | + | ++ | + | H | + | + | \vdash | + | \vdash | ++ | ++ | \vdash | ++ | + | ++ | ++ | + | \vdash | ++ | + | \vdash | ÷ | ++ | ++ | | ++ | ++ | + |
| 14 | Check the pressure Hydroset and if amortization of manometer is correct | + | + | \square | + | Ħ | | T | | | \vdash | + | | | \square | + | ++ | | | | ++ | | | ET. | | | - | | | Т |
| 45 | Ohe shifts to pressure rights sink a shaft houring | + | + | \mapsto | + | \square | + | - | \vdash | - | \vdash | ++ | + | | +++ | + | ++ | ++ | + | - | ++ | - | \vdash | | ++ | ++ | | | | + |
| 15 | Check oil pressure in the main system lubrication and system lubrication | + | + | \vdash | + | H | + | + | \vdash | + | \vdash | ++ | ++ | | ++ | + | ++ | ++ | + | | ++ | + | \vdash | ÷ | ++ | ++ | - | ++ | - | ++ |
| 16 | pinion shaft at normal operating temperature | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17 | Check that no oil leaks | | | | | | | | | | | | | | | | | | | | | | | | | | | | | \pm |
| 18 | Check if there are loosen screws | | | | | | | | | | | | | | | | | | | | | | | | | | | | | \Box |
| 19 | Check that oil heaters work | | + | | | | | | | | | H. | | | H | | 11 | | | | H | | | ++ | | ++ | 44 | 44 | | + |
| 20 | Check the distance between the nut and the end of sub camp | + | + | \square | + | \square | + | - | | - | | | | | | + | \square | + | _ | | \square | + | | | +++ | ++ | | | | ++ |
| 21 | Check for any contamination increase or change the filter oil decanter return eg: an abnormal amount of metal particles | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22 | Clean the return belt drums | | | | | | | | | | | | | | | | | | | | | | | | | | \mp | | | \square |
| Weekly | / - Operators | + | +- | - | - | H | - | - | | - | | ++ | - | | - | - | | - | - | | | - | | ┢┿ | +++ | ++ | +++ | +++ | ++ | + |
| 1 | main lubrication systems and pinion shaft | | \perp | | | | | | | | | \square | | | Ш | | \square | | | | ш | | | | ш | \square | | | | \square |
| 2 | Clean the dirt separator and inspect oil tank main lubrication system | \downarrow | | | | | _ | | | | | | | | 1 | _ | 1 | | | | 1 | | | | | | 4 | | | \square |
| 4 | Check crushing joints against wear and damage | + | + | | + | H | + | | | + | | ++ | ++ | | +++ | + | ++ | ++ | + | | +++ | + | | - | ++ | ++ | | | - | ++ |
| 5 | Check wear and stretch of the V-belts | + | + | | + | H | + | | | | | ++ | | | ++ | - | ++ | ++ | - | | +++ | - | | | ++ | ++ | | | - | + |
| 6 | Clean the valve damping gauge Hydroset | | | | | | | | | | | | | | | | | | | | | | | | | | | | | \square |
| 7 | Check the air pressure (blower or regulator in operation) the system super pressure sealing against dust | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8 | Check the hose and filter system with super pressure sealing against dust and tank tightness | T | T | | T | Π | T | Т | | Γ | | T | | | Π | T | Ħ | | | | Ħ | T | | | | | T | T | | Π |
| 9 | Check the condition of conveyor belts | | | | | | | | | | | | | | | | | | | | | | | | | | | | | \pm |
| Month | y - Operators | _ | | | _ | | _ | _ | _ | _ | | | | _ | | _ | | | | _ | | _ | _ | | | | | | | _ |
| 1 | Clean the drain plug pinion shaft housing Check if the ring is worn dust | + | + | \vdash | + | \square | + | + | | + | | ++ | + | - | + | - | ++ | + | | + | - | + | | ++ | + + | ++ | ++ | ++ | ++ | ++ |
| 3 | Check the condition of rotating scraper dust over the necklace | + | + | ++ | + | Ħ | + | Ħ | | Ħ | | H | ++ | - | ++ | -11 | H | ++ | | + | m | + | | Ħ | 11 | ++ | $\pm \pm$ | 1 T | ++ | ++ |
| 4 | Check all screws | + | + | | + | | + | | | | | | | | + | | H | | | | | | | tt | | | $\pm \pm$ | | | + |
| 5 | Check the clearance between the sleeve and the sleeve bearing spindle top | Τ | | | | Π | Τ | Π | | | | П | | | П | | П | П | | | | | | Π | П | П | П | П | П | П |
| 6 | Check the level of the upper bearing grease | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 | Clean the level of the upper bearing grease | | | | | | | | | | | | | | | | ш. | | | | | | | | | | 11 | | | |
| 8 | Check operation of oil return flow switch | | | | | | | | | | | 11 | | | | | ш. | | | | | | | | 11 | | 11 | | | |
| Annua | I - Sandvik | _ | _ | _ | | - | _ | | | _ | | | | _ | | _ | | | _ | _ | | _ | | | | | | | | _ |
| 1 | Check (using gauges) between the centerpiece and mantle and concave | + | + | | | H | + | H | \vdash | + | H | ++ | ++ | + | H | + | ++ | + | + | + | H | + | \vdash | ++ | ++ | ++ | ++ | ++ | ++ | ++ |
| 2 | ring between the upper body | + | 1 | | | \square | + | | | | \square | \square | | | \square | _ | \square | \square | | | \square | | | Щ | \square | \square | ++ | ++ | \square | \square |
| 3 | Check the bearing grease seal superior in terms of wear | _ | + | | | \square | _ | | | | \square | + | + | \square | + | | \square | + | | | \square | | | ⊥ | + | ++ | ++ | ++ | + | + |
| 4 | Check the gas pressure in the accumulator Drain the oil tank | + | + | | | \vdash | + | + | \vdash | + | \vdash | ++ | + | \vdash | ++ | + | ++ | ++ | + | + | ++ | + | \vdash | ++ | ++ | ++ | ++ | ++ | ++ | ++ |
| | Drain the Oritanic | + | + | | | H | + | H | \vdash | | H | ++ | + | + | ++ | + | ++ | ++ | + | + | ++ | + | \vdash | ++ | ++ | ++ | ++ | ++ | ++ | ++ |
| 0 | Change the oil filter element and clean the dirt separator system Hydroset | + | + | | | \vdash | + | + | | | \square | ++ | + | \square | ++ | + | ++ | + | _ | | ++ | | \square | +++ | ++ | ++ | ++ | ++ | ++ | + |
| - 8 | Check upper bearing clearance Check the wear upper body and lower body | + | + | | | \vdash | + | + | \vdash | + | \vdash | ++ | ++ | \vdash | ++ | + | ++ | + | + | + | ++ | + | \vdash | ++ | ++ | ++ | ++ | ++ | ++ | ++ |
| 9 | Check the chevron seal wear | + | + | | | H | + | + | + | + | ++ | ++ | + | \vdash | + | + | ++ | + | + | + | H | + | \vdash | ++ | ++ | ++ | ++ | ++ | + | ++ |
| 10 | Check the contact tapered upper and lower body | | | | | | | | | | | | | | | | | | | | | | | T | | | \square | | | |
| 11 | Check wear and corrosion spindle sleeve | | | | | | | | | | | | | | | | \square | | | | | | | \square | | | \mp | | | \square |
| 12 | Check if the lower ring seal is worn | + | - | | | \vdash | - | | | | | + | + | | + | - | ++ | + | | | + | | | ++ | ++ | + | ++ | ++ | + | + |
| 14 | Check wear and eccentric scratch | + | + | | | H | + | + | + | | + | + | + | + | + | + | ++ | + | + | + | + | + | \vdash | ++ | ++ | ++ | ++ | ++ | ++ | ++ |
| 15 | Check the wear plate eccentric wear | | | | | | | | | | | | | | | | | | | | | | | Ħ | | | | | | \pm |
| 16 | Check wear and scratch of bush lower body | - | - | | | H | 1 | - Fi | | | \square | T I | \square | | Ħ | T | H F | -11 | - | | ΗĪ | 1 | \square | Ħ | \square | + | 47 | $+ \Box$ | +1 | \square |
| 17 | scratch | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18 | Check wear gear | | | | | | | | | | | | | | | | | | | | | | | | | | | | | \pm |
| 19 | Check the barrel bushing wear and scratch Hydroset | - | - | | | \vdash | - | | | | \square | + | +1 | | H | - | + f | +1 | | | H | | | ₩. | + | + | + | + + | +1 | +1 |
| 20 | Check operation temperature indicator Check operation of safety thermostat TG1 and thermostat heat exchanger | + | + | | | \vdash | + | + | \vdash | + | \vdash | + | + | \vdash | + | + | ++ | + | + | + | ++ | + | \vdash | ++ | ++ | ++ | ++ | ++ | ++ | ++ |
| 21 | TG2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

Fig. 1. Graph annual maintenance for tertiary crusher

| 31.10.2013 Example of the second | Updated | | | | | | | | | | | | | | | 53 | 1105 | T | 779 | | 1 | | wee | ekly | mai | nter | nanc | e | | | | |
|--|--|----------|----------|-------|------|-----|------|--------|----|---|----|----|----------|----|---------|--------|------|----|---------|----------|----|---------|------|-------|-------|---------|-------|-------|---------|----------|----|-----------|
| Function and Name Ing. Thanov -T. Daniel CAREER BATA Image: Construct of the construction of the construc | 31.10.2013 | | | | | | | | | | | | | | | 1 Care | 1000 | | | | 2 | | mo | nthly | / ma | inte | nan | се | | | | |
| Ing. Thanov - T. Daniel | Function and Name CAREER BATA 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| MAINTENANCE GRAPHIC OF MOBILE EQUIPMENT FROM CAREER BATA FOR NOVEMBER 2019 Equipment T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S S M T W T F S< | Ing.Tihanov -T.Daniel | | | | | | | | | | | | | | | | 61.1 | | | | 4 | | rep | airs | / pla | anne | ed ir | nterv | etio | ns | | |
| Equipment T K | MAINTENANCE GRAPHIC OF MOBILE EQUIPMENT FROM CAREER BATA FOR NOVEMBER 2013 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Equipment 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 F S S M 1 W 1 W 1 W 1 W 1 W 1 W 1 W 1 W 1 W 1 W | MAINTENANCE G | | | | | | | | - | | | | | | | - | | - | - | | - | | - | | - | - | | | | - | | |
| Excavator Liebher 944 1 <th1< th=""></th1<> | Equipment | | 2 | 1 | | 5 | 6 | M 7 | 8 | 9 | 10 | 11 | 12 | 13 | M 14 | 15 | 16 | 17 | F 18 | 19 | 20 | M 21 | 22 | 23 | 24 | F 25 | 26 | 27 | M 28 | 29 | 30 | 31 |
| Excavor Lebrer 944 1 1 1 2 1 2 1 Frontal leader Volvo 1 2 1 2 1 2 1 2 1 <td>E</td> <td><u> </u></td> <td>~</td> <td>5</td> <td>4</td> <td></td> <td></td> <td>· '</td> <td>0</td> <td>5</td> <td>10</td> <td>2</td> <td>12</td> <td>15</td> <td>14</td> <td>15</td> <td>10</td> <td></td> <td>10</td> <td>13</td> <td>20</td> <td>21</td> <td>22</td> <td>23</td> <td>24</td> <td>23</td> <td>20</td> <td>21</td> <td>20</td> <td>23</td> <td>50</td> <td>51</td> | E | <u> </u> | ~ | 5 | 4 | | | · ' | 0 | 5 | 10 | 2 | 12 | 15 | 14 | 15 | 10 | | 10 | 13 | 20 | 21 | 22 | 23 | 24 | 23 | 20 | 21 | 20 | 23 | 50 | 51 |
| Frontal leader Volvo 1 | Excavator Liebherr 944 | | | | 1 | | | | | | | 3 | | | | | | | 1 | | | | | | | 2 | | | | | | |
| L220 L1 1 1 2 1 1 2 1 </td <td>Frontal leader Volvo</td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | Frontal leader Volvo | | | | 1 | | | | | | | 2 | | | | | | | 1 | | | | | | | 2 | | | | | | |
| Frontal leader Volvo 1 2 1 2 1 2 1 2 1 | L220 L1 | | | | | | | | | | | - | | | | | | | | | | | | | | - | | | | | | |
| Frontal leader Volvo L180 1 2 1 2 1 2 1 2 1 2 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 <th1< th=""> 1 <th1< th=""> 1 1 <th1< td="" th<=""><td>Frontal leader Volvo</td><td></td><td></td><td></td><td>1</td><td>⊢</td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td><u> </u></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td>⊢</td><td></td><td></td><td></td><td></td><td></td></th1<></th1<></th1<> | Frontal leader Volvo | | | | 1 | ⊢ | | | | | | 2 | | | | | | | 1 | <u> </u> | | | | | | 2 | ⊢ | | | | | |
| L180 1 1 2 1 2 1 2 1 1 Primary crusher Sandvik 1208 1 1 1 1 2 1 | Frontal leader Volvo | | | | | | | | | | | - | | | | | | | | | | | | | | - | | | | | | \square |
| Primary crusher Sandvik 1208 1 <th< td=""><td>L180</td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td></th<> | L180 | | | | 1 | | | | | | | 2 | | | | | | | 1 | | | | | | | 2 | | | | | | |
| Sandvik VF 200 1 | Primary crusher | | | | 1 | | | | | | | 1 | | | | | | | 1 | | | | | | | 2 | | | | | | |
| Image: Second station Software for the state of the | | <u> </u> | | | | - | | | | | | | - | | | | | | | - | | | | | | | | | | \vdash | | - |
| Screening station Sandvik UF 320 1 | Sandvik UH 420 | | | | 1 | ⊢ | | | | | | 1 | | | | | | | 1 | | | | | | | 2 | | | | | | |
| Sandvik UF 320 I I I I I I I Screening station Powerscreen 2100 1 2 1 2 1 2 Screening station Fintec 540 1 2 1 2 1 2 Dumper Volvo A35D 2 2 1 2 1 2 Generator Nostromtechnik 1 2 1 2 1 2 Revisions scheduled Volvo 122012 Revision 500 hours operation 1 1 1 1 | Screening station | | | | 1 | | | | | | | 1 | | | | | | | 1 | | | | | | | 2 | | | | | | |
| Screening station Powerscreen 2100 1 2 1 2 1 2 1 2 1 | Sandvik UF 320 | | | | | _ | | | | | | | | | | | | | | | | | | | | _ | | | | | | |
| Powerscreen 2100 I <td>Screening station</td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | Screening station | | | | 1 | | | | | | | 2 | | | | | | | 1 | | | | | | | 2 | | | | | | |
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| Generator Nostromtechnik 1 2 1 2 1 Revisions scheduled Volvo 1 220 1 2 Revision 500 hours operation Ing. Tihanov -T.Daniel | Dumper Volvo A35D | | <u> </u> | | 2 | - | - | | | | | 2 | - | | | | | | 1 | ⊢ | | | | | | 2 | - | | | \vdash | | |
| Nostromtechnik 1 1 2 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 2 1 1 2 1 2 1 1 2 1 2 1 1 2 1 2 1 1 2 1 1 2 1 1 2 1 2 1 1 2 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 1 2 1 | Generator | | | | | | - | | | | | | | | | | | | | | | | | | | | | | | | | -1 |
| Revisions scheduled Ing. Tihanov -T.Daniel Volvo I 220 L 2 Revision 500 hours operation | Nostromtechnik | | | | 1 | | | | | | | 2 | | | | | | | 1 | | | | | | | 2 | | | | | | |
| Volvo 122012 Revision 500 hours operation | Revisions scheduled | | | | | | | | | | | | | | | | | | | | | | Ing | Tib | ano | иТ | Dar | niel | | | | |
| | Volvo I 220 I 2 | Rev | visio | on 50 | 00 h | our | s op | erati | on | | | | | | | | | | | | | | nıg. | | ano | | Jai | | | | | |

Fig. 2. Graphic weekly maintenance of equipment

Daily maintenance tertiary crusher Sandvik UH 420

| Tertian | crusher Sandvik IIH /20 | | Data: | | |
|---------|--|---|--------|-------|--------------|
| No | Operation | When | Page | Check | Observations |
| 1 | Check the oil level in the tank lubrication | Before starting the crusher | 66 | | |
| 2 | Check the oil level in the tank Hydroset | Before starting the crusher | 83 | | |
| 3 | Check that all shut-off valves between the tanks and pumps are fully open | Before starting the pumps and crusher | | | |
| 4 | Check that no material accumulated on the lower body arms | Before starting the crusher | | | |
| 5 | Check lubricating oil back into the tank and clean | After starting the pump lubrication | 66 | | |
| 6 | Check for broken oil lines | After pump start | | | |
| 7 | Check lubrication circuit works correctly pinion shaft | Idling | 80 | | |
| 8 | Check the value CSS | Idling | 29 | | |
| 9 | Check that the material did not block the feed hopper or distributor and does not block loading aperture | Idling | | | |
| 10 | Check if abnormal noises crusher | During crushing | | | |
| 11 | Check if you can hear noises in the pump lubrication | During crushing and before | | | |
| 12 | Check the oil temperature return | During crushing | 70 | | |
| 13 | Check the current or power consumption of the motor | During crushing | 31 | | |
| 14 | Check the pressure Hydroset and if amortization of manometer is correct | During crushing | 83 | | |
| 15 | Check the temperature of the pinion shaft housing | During crushing | | | |
| 16 | Check the oil pressure in the main system and lubrication system lubrication pinion shaft normal operating temperature | During crushing | 69, 80 | | |
| 17 | Check for oil leaks | During crushing | | | |
| 18 | Check for loose screws | During crushing | | | |
| 19 | Check the oil heaters work | Out of work crusher | 74 | | |
| 20 | Check the distance between the nut end and as bearing | Out of work crusher | 96 | | |
| 21 | Check for any contamination increase or change the filter oil decanter return eg: an abnormal amount of metal particles | Out of work crusher and lubrication pump | 78 | | |
| 22 | Clean the return belt drums | Out of work crusher | | | |
| | PERFORMED: NAME AND SIGNATURE | | | | |

Fig. 3. Daily maintenance sheet tertiary crusher

| | Weekly maintenance tertiary crusher tertiar Sandvik UH 420 | | | | | | | | | | |
|----------|---|--------------------------------------|------------|-------|-------------|--|--|--|--|--|--|
| | | | | | | | | | | | |
| Tertiary | / crusher Sandvik UH 420 | | Data: | | | | | | | | |
| No | Operation | When | Page | Check | Observation | | | | | | |
| 1 | Inspect the oil filter (check the red button on the sensor pressure drop) main lubrication systems and pinion shaft | Crusher and lubrication pumps off | 68, 77, 84 | | | | | | | | |
| 2 | Clean dirt separator and inspect oil tank main lubrication system | Crusher and lubrication pumps off | 67, 75 | | | | | | | | |
| 3 | Check joints against wear and damage | With crusher off | 96 | | | | | | | | |
| 4 | Check for noise from the pump | During crushing | 68, 81, 84 | | | | | | | | |
| 5 | Check V-belts wear and stretch | With crusher off | | | | | | | | | |
| 6 | Clean damping valve gauge Hydroset | With crusher off | 86 | | | | | | | | |
| 7 | Check air pressure (blower or regulator in operation) of super pressure sealing system against dust | Operation in idle | 49 | | | | | | | | |
| 8 | Check hose and filter system with super pressure sealing against dust and seal the tank | With crusher off | 49 | | | | | | | | |
| 9 | Check condition of the belts conveyor | With belts conveyor off | - | | | | | | | | |
| | PERFORMED: NAME AND SIGNATURE | | | | | | | | | | |

Fig. 4. Weekly maintenance sheet tertiary crusher

Monthly maintenance tertiary crusher Sandvik UH 420

| Tertiar | Y crusher Sandvik UH 420 | Data: | | | | | |
|---------|---|-----------------------|-------|--------------|--|--|--|
| No | Operation | Page | Check | Observations | | | |
| 1 | Clean the drain plug pinion shaft housing | 59 | | | | | |
| 2 | Check that the sealing ring is worn dust | 46 | 46 | | | | |
| 3 | Check the condition of rotating scraper dust over the necklace | e 46 | | | | | |
| 4 | Check all screws | | |] | | | |
| 5 | Check the clearance between the sleeve and the sleeve bear spindle top | ing _{94, 98} | | | | | |
| 6 | Check the level of the upper bearing grease | 60 | |] | | | |
| 7 | Clean the ventilation of the upper bearing cap and upper bod | y 94 | | | | | |
| 8 | Check operation of oil return flow switch | 70 | | 1 | | | |
| | PERFORMED: NAME AND SIGNATURE | | | | | | |

Fig. 5. Monthly maintenance sheet tertiary crusher

|--|

| Tertiar | crusher Sandvik UH 420 | Data: | |
|---------|---|-------|--------------|
| No | Operation | Check | Observations |
| 1 | Check whether the clearance pinion and shaft eccentric | | |
| 2 | Check (using gauges) between the centerpiece and mantle and | | |
| | between the upper body and concave ring | | |
| 3 | Check the bearing grease seal superior in terms of wear | | |
| 4 | Check the gas pressure in the accumulator | | |
| 5 | Empty oil tank | | |
| 6 | Change the oil filter element and clean the dirt separator system Hydroset | | |
| 7 | Check upper bearing clearance | | |
| 8 | Check wear upper body and lower body | | |
| 9 | Check the seal wear chevron | | |
| 10 | Check the contact tapered upper and lower body | | |
| 11 | Check wear and corrosion spindle sleeve | | |
| 12 | Check the lower ring seal is worn | | |
| 13 | Check clearance between bar and hub sprocket mounting | | |
| 14 | Check wear and eccentric scratch | | |
| 15 | Check the wear plate and eccentric wear | | |
| 16 | Check scratch and wear of the bush lower body | | |
| 17 | Check the thickness of the axial bearing assembly, check the | | |
| | wear and scratch | | |
| 18 | Check wear gear | | |
| 19 | Check the barel bushing wear and scratch Hydroset | | |
| 20 | Check operation temperature indicator | | |
| 21 | Check operation of safety thermostat TG1 and thermostat heat | | |
| 21 | exchanger TG2 | | |
| | PERFORMED: NAME AND SIGNATURE | | |

Fig. 6. Annual maintenance sheet tertiary crusher

Observations operators arising both from technical revisions, current repairs and equipment are recorded from the operation logbook equipment (figure 7) and take knowledge of the maintenance department head.



Fig. 7. Logbook equipment for quarry machinery

3. CONCLUSIONS

After analyzing the risk of possible failure of production flux based on entries operators, plan and prioritize current and capital repairs.

Planning and prioritizing current repairs are made taking into account a number of issues such as:

- the impact of possible failures on production flux career;

- the complexity and time to repair;

- availability of spare parts;

- possibility execution repair with its own personnel or service contracted personnel;

- the cost of current repairs.

Programming to perform capital repairs of equipment production flux is based on manufacturer

recommendations for specific equipment parts who reached their maximum quote of wear and that through the failure can cause loss of life, loss of equipment, contamination of the environment.

Programming for capital repairs taken into account the technical inspection prior capital repair and logbook entries from the equipment during operation of two current and capital repairs.

So after the current repairs and capital repairs inspection work is done by the head of the maintenance department personnel assisted by interventions performed, inspection is completed by accepting the work performed followed by putting into service of equipment or refusal to accept work and remediation any deficiencies.

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