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BOOK OF ABSTRACTS

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MACEDONIAN POWER PLANTS


ЗАРУЖЕНИЕ НА РУДАРСКИТЕ И ГЕОЛОШКИТЕ ИНЖЕНЕРИ НА РЕПУБЛИКА МАКЕДОНИЈА
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OPPORTUNITIES FOR REPAIRING THE UNLOADING BUNKER ON SHAFT GOLEMA REKA - SASA MINE

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ABSTRACT

The paper presents a repairing strategy for the damaged unloading bunker in the "Golema Reka" shaft hoisting system, including technology, equipment materials and work organization with special concern for workers safety. Several possibilities are reviewed and optimal approach is defined. Such works are of crucial importance for proper functioning of the "Sasa" Mine hoisting system and could serve as example for similar operations in underground mines.

KEYWORDS

Repairing, unloading bunker, hoisting system

1. INTRODUCTION

The Sasa Mine for lead and zinc in his long exploitations has passed through different developmental stages. In its two zones "Golema Reka" (where exploitation is completed) and "Svinja Reka" are applied different modes of transportation and hoisting, and it was usually with combined transport systems. At this point the current conception of exporting ore is through the system involving the hoist-heading shaft and its associated facilities, in zone "Golema Reka".

To lead the operational hoisting system except the shaft repairs it was necessary for repairs and for its accompanying facilities that include bunker unloading on the horizon 950th. During the previous exploitation of this hoisting system damage occurred on the sloping part of the bunker because of abrasive pieces of ore and on vertical - prismatic part of the bunker where there was damage to the reinforced - concrete support from the unloading ore from trucks.

These deformations on the bunker support significantly affect its stability and preventing further exploitation in zone "Golema Reka".
The purpose of this paper is to point out the possibilities for recovery and repairs of the unloading bunker for heading shaft "Golema Reka" and how could it effectively and safely be used to hoist the ore. In this paper a technical solution is presented for repairing the bunker. For the development of this paper materials were used , project documentation and experience of the firm Výstavba dolů Ostrava (VDO) and Banske projekty Ostrava (both of Czech Republic), which designed and conducted the repairs for the bunker.

2. DEFINING THE CONCEPT OF REPAIRING WORK ON THE UNLOADING BUNKER

Repairing work on the unloading bunker (Fig. 1), involves two independent activities:

- Repairing of the sloping floor on the bunker ring (fig. 2);
- Connecting the rest of the vertical part of circular bunker with the rectangular part of unloading bunker for belt conveyor (fig. 3).

Repair of the sloping floor of the bunker will be performed within the scope of the damaged lining on the floor of the bunker. Assume that the damage is up to a third of the size (perimeter) of the bunker. The floor in the specified range will be covered with steel rails welded to the console, which will be fixed by gluing anchors in the rock mass. Open space under the tracks will be filled with concrete.

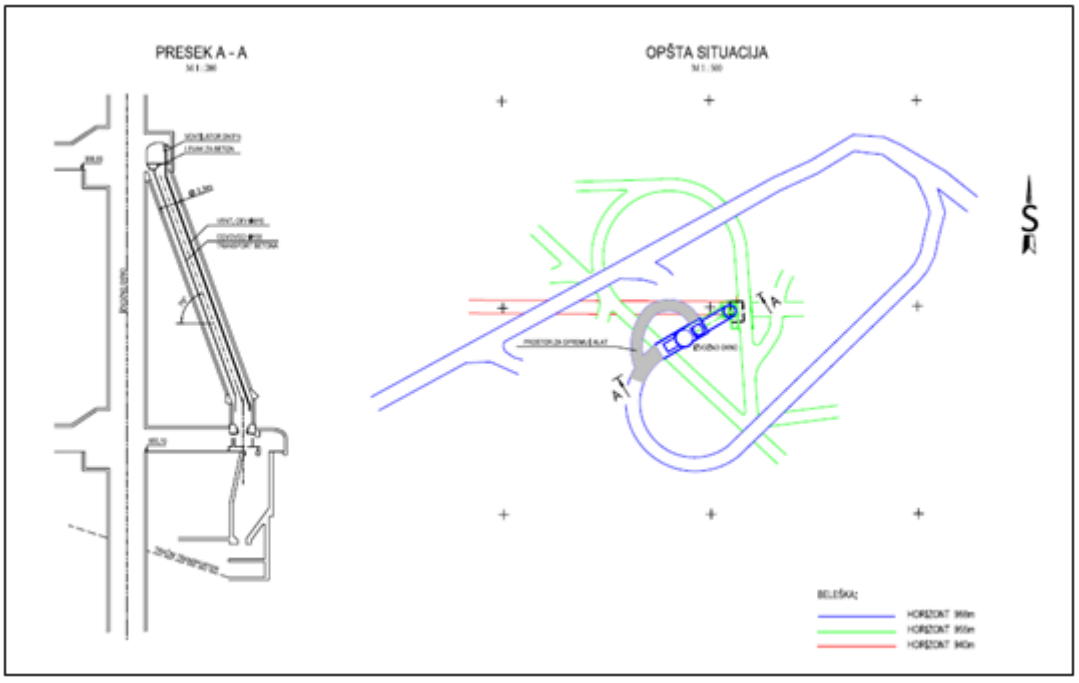

Figure 1: Vertical section and situation of unloading bunker

The technical solution for repairing the vertical part of the circular bunker will create a technological complex for unloading the ore from the concrete ring of heading shaft, on belt conveyor on elevation 940 m. To repair the damaged parts of the bunker we propose the intact parts to be preserved and more to avail free spaces without the need to add ore (ie embed clasp).
First you build a steel frame that will rely the preserved part of the reinforced coating of vertical circular bunker beneath the concrete ring**.** The framework will also serve to form a protective layer for providing safe working space in the concrete ring of the bunker, at elevation 955 m.

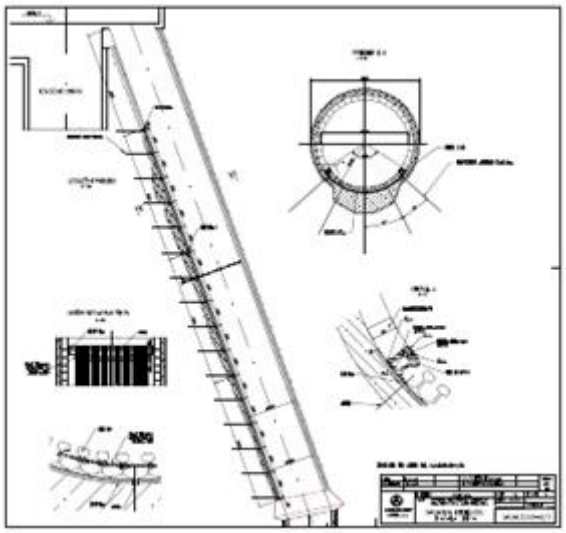

Figure 2: View of the technical solution for repairing the sloping part of the bunker

The process of repairing the bunker consists of closing the space between the existing damaged circular bunker and rectangular unloading bunker on belt conveyor. We suggest connecting of both bunkers to be technically resolved in the width of the circular bunker towards the sloping bunker axis (direction of the ore), so the building structures is out of the trajectory of movement ore.

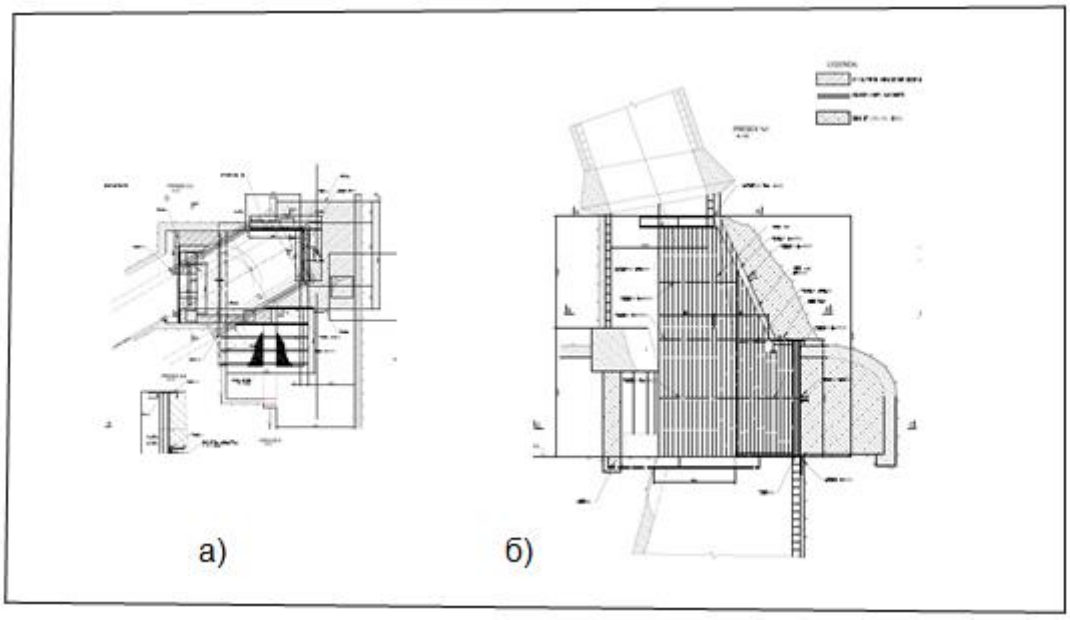

Figure 3: View of the technical solution for the repairing on prismatic part of the bunker
a) top view, b) front view

We recommend that the connection of the lower rectangular bunker and vertical part of the circular bunker to be resolved with vertical walls. The walls are tangential attached to the reinforcement of the bunker and ended up in the plane of the walls of the lower bunker. The walls are grounded to the cerclage on levels at lower bunker (955,1 m). They are made to height of 6,2 m, from which there are placed on steel framework that supports the preserved part of the reinforced layer on the vertical part of the circular bunker under the supporting concrete ring. The walls of the lower bunker in the space limited by tangential walls of circular bunker are constructing to a height of 3 m above the existing floor. From level of +3 m, space of the bunker closes with slanting wall connected to a steel frame that supports the preserved part of the reinforced layer on the vertical part of the circular bunker. The sloping wall is attached on a steel girder, placed perpendicular to the axis of the sloping part of the circular bunker.

3. SPECIFICATION OF THE REQUIRED MATERIALS

To perform the repairing work for the unloading bunker is necessary to supply the following materials:

- ***repairs of the sloping floor of the bunker:***
  glued anchors L = 1,5 m, 90 pieces
  console 5800x200x20, 14 pieces
  console 5800x400x20, 2 pieces
  steel rod 7500x150x20, 6 pieces
  steel rod 7500x50x30, 6 pieces
  rail S49 l = 7500mm, 60 pieces
  concrete C25/30 (B30) 15 m^3

- ***protected floor***
  embed carriers
  UPN300, l = 4500 mm, 2 pieces
  UPN300, l = 1900 mm, 4 pieces
  UPN300, l = 1400 mm, 2 pieces
  timber 3700x100x100 mm, 26 pieces
  concrete C25/30 (B30) 0,3 m^3

- ***carriers of foundation***
  embed carriers
  IPN300, l = 3900 mm, 2 pieces
  IPN300, l = 4300 mm, 2 pieces
  concrete C25/30 (B30) 0,3 m^3

- ***demolition of existing structures***
  concrete-reinforced structure 1,3 m^3

- ***vertical walls of the lower bunker***
  lower frame UPN300, 1 piece
  glued anchor l = 0,5 m, 8 pieces
  upper frame UPN300, 1 piece
  carrier of sloping wall UPN300, l = 3200 mm, 1 piece
  carrier of sloping wall IPN300, l = 3200 mm, 1 piece
  S49 bus 31 kom., total length 101 m
  UPN160, l = 2000mm, 2 pieces
  concrete reinforcement 12 pieces.

- ***vertical north wall***
  UPN160, l = 3600mm, 1 piece
  Rail S49, 16 pieces., length 94 m
  UPN160 l = 2000mm, 3 pieces
  Concrete reinforcement 18 pieces

- ***south vertical wall***
  UPN160, l = 3600mm, 1 piece
  rail S49, 21 pieces, total length 116 m
  UPN160, l = 2600mm, 1 piece
  UPN160, l = 2350mm, 1 piece
  UPN160, l = 1700mm, 1 piece
  concrete reinforcement 19 pieces.

- ***slanting wall***
  rail S49, 21 pieces, total length 75 m,
  UPN160, l = 2600mm,

concrete reinforcement 7 pieces.

- ***concrete barriers***
  vertical shuttering for suport, 8,0 m^2, 2 pieces
  concrete C25/30 (B30) 25 m^3

- ***walls between the columns***
  concrete C25/30 (B30) 9,5 m^3
  steel for control input 165 kg.

- ***concrete buffer above 988 m elevation***
  concrete C25/30 (B30) 12,5 m^3

- ***lower roof of the bunker***
  U100, l = 3300 mm, 3 pieces
  U100, l = 2800mm, 1 piece
  sheet with a thickness of 10 mm, 4,5 m^2.

4. ORGANIZATION OF THE WORK

4.1 Transportation of the materials

The place for handover between the developer and the contractor will be in bypass of the heading shaft, on elevation 988 m. Steel materials will be delivered to the site in the purchase length. On the level 988 contractors will process the steel material into the desired dimension. In the workplace, on level 955 m the material will be delivered through the sloping bunker with ropes and crane. During transportation with ropes, workers are removed in the transition pit on that level. Fine material can also be transported through the workplace short passage coupled to the bunker floor on level 955 m. The concrete will be produced on the surface. On level 988 m the concrete will be delivered by the loader. In the bypass on the level 988 m filled funnel will be installed to transport the concrete through the sloping bunker through pipelines.
Movement of workers during the time of repairing the sloping bottom of the bunker will run from level 988 m using metal stairs with insurance. On the workplace during the repairing stadium of the vertical part of the bunker workers are transported on level 955 m through the shaft.

4.2 Supplying the workplace with energy

The developer will provide a connection to electricity, including lighting near the shaft on level 988 m and 955 m. Consumers of compressed air will be joined on the similar way (drilling machines, etc..) on the levels.

4.3 Ventilation of the workplace

Work performed during the repairing of the bunker concrete ring on elevation of 955 m are performed in flowing air flow. Taking into account that the repairing work on the floor of the sloping bunker will be performed from the level of the filled bunker that will interrupt ventilation air flow. In order to provide appropriate working conditions on the workplace it is necessary to install fan with ventilation pipe diameter of Ø 315 mm. The fan is located in the bypass of the heading shaft on level 988 m.

4.4 Management with working group

Before each shift a person responsible for technical supervision of the workplace should be appointed as head of the working group. The head of the working group has the following duties:

- Organize and manage the work group,
- Communicate with the control authorities of the mine,
- Provides communication with the crane operator,
- Control the equipment of the working group in terms of personal safety.

4.5 Signaling and communication equipment

For the transportation of materials in the bunker between elevation +988 m and +954 m crane is used, set on elevation +988 m. Signaling equipment for handling the crane is provided with air gig, set on the same level with the crane on elevation +988 m and with signal cable set across on the entire length of the bunker.
For the signaling cable user manual is used . Tables with instruction manual signs are placed on the crane and workplace in the bunker. Regardless of cable signaling, work unit communicates with the crane operators with portable radio connection (Motorola), supplied by the manages of the mine. Besides STOP signal the handling with crane is conducted in accordance with the signal communication that is always confirmed in advance with radio communication.
During the transportation of materials in the bunker elevation at 955 m workers are removed and placed in the shaft passage of the elevation.

5. CONCLUSION

Repairing of the unloading bunker on heading shaft "Golema Reka" in "Sasa" mine is necessary in order to put in function the hoisting system. To successfully solve this problem it is necessary to perform repairs of damage from sloping (ring) and prismatic part of the unloading bunker. Manufactured technical solution in this paper guarantees that unloading bunker will be stable and the same object can be exploited a longer period of time without any special damages.

6. REFERENCES

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