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LANDFILL STABILITY ANALYSIS AT THE OPEN PIT "GACKO", BOSNIA AND HERZEGOVINA - REPUBLIC OF SRPSKA[**]

Abstract

This paper gives the stability analysis of the Western and Eastern external landfill at the Open Pit Gacko, together with the problems that occurred during the last field visit.

Keywords: *Western and Eastern external landfill, stability*

INTRODUCTION

Long-term geological explorations pointed to the fact that the Gatac field represents a large coal basin, with the high quality coal reserves that are economically exploitable. In accordance with developed investment - technical documentation, the construction of the energy complex of Mine and Thermo Power Plant Gacko has begun in 1997. In 1982, in the area of the Western exploitation field, the "Gračanica" mine of coal was put into operation, with the annual capacity of 1.800.000 t of coal and 3.200.000 m^3 of overburden. The OP "Gračanica" is limited by the regulated riverbeds of the river Gračanica from the east, Mušnica from the south and Gojković stream from the west.

Since the beginning of the work at the OP "Gračanica", the technology of work has been applied, which has achieved the satisfactory results on the production of deforestation and coal.

The annual average of about 1,700,000 tons of coal and 3,500,000 m^3 of solid mass is detected in the mine. As a part of construction the first block of the Thermal Power Plant Gacko I, a part of infrastructure facilities was built, which will serve for the second phase of construction the Gacko II Thermal Power Plant.

Coal reserves in the Gacko coal basin are of great importance in energy balances of the Republic of Srpska. With the confirmed balance sheet, the reserves of 338 million tones and off-balance reserves of 66 mil. tons, it can be concluded that Gacko coal basin represents a stable source of energy for many years, both in the production of electricity and for the needs of other sectors of consumption. A precondition for such coal treatment is the efforts to improve the quality by selective excavation, homogenization, preparation and refinement, and expand the field of coal use. Figure 1 shows a view of the open pit.

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Figure 1 *Open Pit Gračanica and Thermo Power Plant*

DEVELOPMENT PLANS

Planned investments in the following period relate to the necessary modernization of the plant and equipment of the Mine and Thermal Power Plant. First of all, this includes: the acquisition of new mining machinery, expansion of ash dumps and landfills.

On the basis of confirmed lignite reserves, further construction of thermal power plants in Gacko is planned. This primarily refers to the R&D "Gacko II", which would enable the energy potential of the Gacko basin to be rounded up to a power generation plant of 2 x 300 MW.

In connection with the planned construction of the TPP "Gacko II", the extensive survey works were carried out and a comprehensive study was conducted on selection the location of the second phase of the Gacko mine as well as the technical project of the TPP "Gacko II".

One of the biggest carrier of the economic and economy development of the region, the Mine and Thermo Power Plant Gacko, also have a greatest impact on the environment of this part of region. Since this thermoenergetic source is located at the top of the river basin of the Trebisnjica River, monitoring and remediation of negative environmental impacts is an ongoing process, which will certainly be taken carefully with necessary activities.

THE MAIN MINING DESIGN

With the Main Mining Design of the Gacko open pit, the method of coal exploitation, as well as the definition of tailings disposal were defined in the entire century of exploitation.

Complete disposal will be done on the external and internal landfills, as follows:

- Outdoor landfill of the exploration Field B,
- Large exterior landfill (existing external landfill in the southwest of the open pit - East and West external landfill),
- External landfill Gelja Ljut (new external landfill to the south of the surface mine), and
- Internal landfill (excavated area of the Gacko open pit - Central Field).

Projected external and internal landfills are shown in Figure 2.

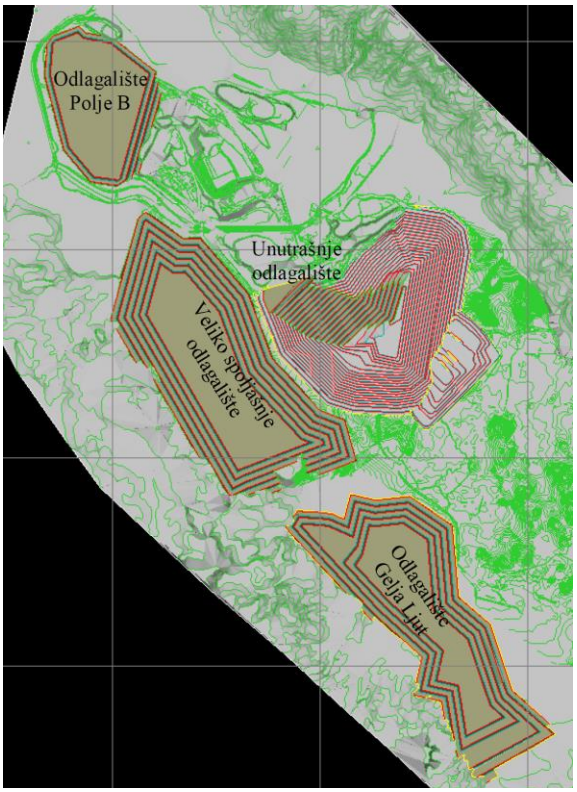

Figure 2 *Designed external and internal landfills*

The following constructive parameters have been adopted on the Large Outdoor Landfill that is located on the current West and East Outer Landfill: the height of landfill 83 m, and the inclination angle of 13º. Constructive parameters were obtained as a result of fulfilling the minimum safety factor for the characteristic final slopes of the landfill. The safety factor, according to the legal regulations for landfills, is Fs≥1,3.

WESTERN EXTERNAL LANDFILL

The disposal of overburden and barren rocks in the Western Outdoor Landfill is done by a system excavator-conveyor-spreader (known as BTO system). Due to an enormous amount of overburden and barren rocks foreseen by the Main Mining Design (113,843,680 [* 1000 m^3]), it is necessary to carry out the certain activities that will improve the geomechanical characteristics in order to satisfy the landfill stability, as well as the possibility of increasing the inclination angle, and thus reducing the soil degradation to whom the revelation and devastation are postponed.

According to the last recording, it was observed that the Western external landfill has a big problem of separation and bursting of deposited mass due to the increasing weight of deposited mass and poor compaction, or planning with a help of auxiliary mechanization

Figure 3 *View of the cracks in the landfill*

Measurements were taken with a manual corn penetrometer on the problematic part of the Western external Landfill (Figure 4).

Figure 4 *Manual corn penetrometer*

Figure 5 *Measuring zones*

The following cohesion values were obtained at several measuring points in three measuring zones (Figure 5):

- First zone - C = 38 to 42 kPa
- Second zone - C = 28 to 32 kPa
- Third zone - C = 15 to 19 kPa

The measurements confirmed that the compactness of material, especially in the second and third areas, was poor, which led to the bursting of deposited masses. The auxiliary machines are very little used. Such anomalies must be avoided to the maximum due to the future Great External Landfill.

Figure 6 *View of the Western External Landfill*

CONCLUSION

Since these landfills (Western and Eastern Landfills) are the basis for formation of a large external landfill with great dimensions, the requirements of geotechnical data are higher. It is necessary to compress and plan material with the auxiliary mechanization. In addition to this basic method of increasing the stability of the landfill, consideration is given to examining two ways of increasing geomechanical data using ash and slag from the thermal power plant. The way and method of mixing with deposited material will be tested in the MMI laboratories. The application of geotechnical data improvement is possible for all existing landfills.

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