DEVELOPMENT OF RAW MATERIALS' EXPLOITATION FOR THE CEMENT PRODUCTION IN THE OPEN PITS »PARTIZAN« AND »PRVOBORAC« OF THE »DALMACIJA CEMENT« COMPANY

Slavko VUJEC, Borislav PERIĆ and Biljana KOVAČEVIĆ

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The article presents the exploitation of mineral raw materials for the cement industry of Split from the beginning of this century till today. Geological and geomechanical characteristic of the open pits »Partizan« and »Prvoborac«, located within the same deposit and the technological exploitation process with basic parameters of successibility in both pits are detailedly discussed. The works of open pits' reclamation which has to be carried out simultaneously with the exploitation itself are also considered, as well as the perspectives of further exploitation development, in accord with modern tendencies to the mining technology development.

Introduction

According to their production volume, the open pits »Partizan« and »Prvoborac« belong to the biggest producers of mineral raw materials for the cement production in this country. The whole raw material production provides the cement factories having the same name as the pits, which deal within the »Dalmacija cement« company in Solin and are located on the Kaštela Gulf coast in the vicinity of the pits.

The both open pits are located within the boundaries of common exploitation mine field on a single bed of the mineral raw material spreading from the Kozjak mountain in the north to the Kaštela Gulf in the south, and from the Klis in the east to the Kaštela Štafilić in the west. The open pit »Partizan« covers the western part of exploitation field, while the »Prvoborac« has developed in the eastern part, so that the distance between them amounts cca 800 m according to the present situation.

Marl exploitation for the Portland cement production on the locality of the existing open pit »Prvoborac« started still at the beginning of this century. The exploitation was first performed in the first marl bed and, later in the second one, too. In 1928 the first skip hoisting was introduced at the elev. +76 and 1930 the glory-hole method was introduced in exploitation of the first marl layer. In this period still two skips were built: on the elev. +40 in the western part and on the elev. +46 in the eastern part of the excavation field. Glory-hole maintained till the mid-sixties and was performed on two horizons, developed first on the elev. +40 and later on the elev. +24. The elev. +24 represents the final depth reached by glory-hole exploitation. The applied glory-hole method is presented by Figure 1.

After glory-hole exploitation on the first marl layer, 1964 in the exploitation of the second marl layer, the open pit excavation with multiple—raw blasting of raw material mechanized loading and transport was introduced. This phase of the open pit exploitation to 1989 was characterized by the increased exploitation of marl as the highest-quality mineral raw material in the deposit, begin found in two layers: the first, southern one with the thickness of 60 m and the second, northern one with the thickness of 55 m, the distance between them being 150—250 m.

Further forcing of mere marl layer exploitation would be reflected on the future open pit development in a damaging way and it would unavoidably lead to a successive liquidation due to inability of keeping the pit geometry stable and of developing the pit in depth.

By reconstruction of the cement factory »Prvoborac«, beside marl exploitation, also the possibility for other kinds of mineral raw materials existing in the deposit has been created recently, with an additional homogeneity in order to attain a uniform content CaCO₃ of cca 76%. On this basis a new conception of the open pit »Prvoborac« development was established (discussed in the Main Mining Project at the beginning of 1989) enabling further exploitation through a longer period of time.

By the open pit »Partizan«, whose exploitation started later and developed by a system similar to the open pit »Prvoborac«, a new exploitation con-
ception of all kinds of mineral raw materials in the deposit was accepted 1979, after the new rotary furnace »Polysius« was put into operation in the cement factory, and this was also presented in the Main Mining Project of Exploitation.

The identical assumptions for further development were accepted for both open pits, because they are on the same deposit and have very similar characteristics of raw material sediments. Yet, there are certain differences due to different situations of earlier performed exploitation works, which were considered as a basis for the new conception of development.

The creation of the new conception of development for the open pits »Partizan« and »Prvoborac« followed a detailed study of natural characteristics of the deposit, geomechanical exploitation conditions, technological conditions of mechanization application and other technological parameters which make the basis for the choice of the most favourable solutions and presuppositions to attain optimal technical and economic exploitation effects.

The dynamics of exploitation development, production capacity and mineral raw material quality are entirely compatible with the requirements of the cement factories, which during last 10 years have increased the volume of cement production by reconstruction of the existing and construction of new rotary furnaces.

Geological characteristics of the deposit

The wider area of the deposit consists of eocene flysch sediments characterized by the rhythmicity of sedimentation.

General strike of these sediments is almost compatible with the direction east–west, from east-southeast to northwestwest but there are slight deviations present. Beds are under the angle of 30°–35° in the direction northnortheast towards the Kozjak reef.

Geological cross-sections express clearly an obvious multiple exchange of existing petrographic members. Within this exchange two wider zones of limestone marl (»tupinac«) are especially expressive, making a particularly favourable raw material for cement production and in their environment the open pits were most intensively developed. The thickness of these zones varies considerably, as a rule it is greater in the area with smaller slope. Figure 2 illustrates the geological profile 20 of the open pit »Partizan«.

The entire deposit within boundaries of exploitation field was tested by exploratory drilling. On the location »Partizan«, 129 boreholes were drilled in total length of 5815 m, and 122 boreholes in total length of 5866 m on the location »Prvoborac«. The content CaCO₃ was proved on the samples from each metre of the borehole. The recapitulation of
LEGEND (Legenda):
- Mixture of marl, sandstone and limestone
  (Izmjena lapora, pješčenjaka i vapnenca)
- Marl and clay-marl
  (Lapor i glinoviti lapor)
- Calcarenite, calcisiltite
  (Kalkarenit, kalcisiltiti)
- Numulitic marl
  (Numulitski lap)
- Limestone marl, marly limestone
  (Vapnenčki lapor, laporoviti vapnenac)

Fig. 2. Geological profile through the deposit of open pit Partizan (After B. Lukšić 1974)

Table 1 (Tablica 1.)

<table>
<thead>
<tr>
<th>Type of mineral raw material</th>
<th>OPEN PIT «PARTIZAN»</th>
<th>OPEN PIT «PRVOBORAC»</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Vrsta mineralne sirovine)</td>
<td>Ekspl. rezerve</td>
<td>Ekspl. rezerve</td>
</tr>
<tr>
<td></td>
<td>A+B+C cat.</td>
<td>A+B+C cat.</td>
</tr>
<tr>
<td></td>
<td>CaCO₃ (%)</td>
<td>CaCO₃ (%)</td>
</tr>
<tr>
<td>Limestone</td>
<td>21 587 000</td>
<td>26 401 000</td>
</tr>
<tr>
<td>(Vapnenac)</td>
<td>90.48</td>
<td>88.04</td>
</tr>
<tr>
<td>Marl (lapor)</td>
<td>15 042 000</td>
<td>19 157 000</td>
</tr>
<tr>
<td>Clay-marly raw material</td>
<td>65 416 000</td>
<td>31 866 000</td>
</tr>
<tr>
<td>(glinovito-laporovita sirovina)</td>
<td>71.39</td>
<td>73.17</td>
</tr>
<tr>
<td>Limestone-marly raw material</td>
<td>13 622 000</td>
<td>34 311 000</td>
</tr>
<tr>
<td>(vapnenčko-laporovita sirovina)</td>
<td>78.13</td>
<td>79.44</td>
</tr>
<tr>
<td>TOTAL (UKUPNO)</td>
<td>115 667 000</td>
<td>111 735 000</td>
</tr>
</tbody>
</table>

Table 2. (Tabella 2.)

<table>
<thead>
<tr>
<th>OPEN PIT (Površinski kop)</th>
<th>Reserves within open pit planned contours</th>
<th>Average CaCO₃ content</th>
<th>Production capacity (t/year)</th>
<th>Life-duration of open pit (year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>«PARTIZAN»</td>
<td>(rezerve uzastupljene projektnim konturama pov. kopa)</td>
<td>(sadržaj CaCO₃) (%)</td>
<td></td>
<td>(Života doba površinskog kopa)</td>
</tr>
<tr>
<td></td>
<td>(t)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>52 655 000</td>
<td>75.90</td>
<td>2 050 000</td>
<td>25.7</td>
</tr>
<tr>
<td>«PRVOBORAC»</td>
<td>38 060 000</td>
<td>75.99</td>
<td>1 100 000</td>
<td>34.6</td>
</tr>
</tbody>
</table>

Open pits' contours comprise the reserves according to the presentation in Table 2.

Since a larger share of so called »high cement raw material« is present in the area confined by open pits, there is a possibility of extending the duration—life of the pits to over 100 years, if northern boundaries of the exploitation field and open pits containing »low cement raw material« as a larger share would be expanded for cca 120 m.

Geomechanical characteristics of the deposit

In order to provide the stability of working and final inclines at both open pits, intensive testings of geomechanical properties of mineral raw material sediments have been performed in the area of exploitation. As the obtained results are very similar, just the investigations at the open pit »Prvoborac« are presented here, where the following activities were carried out:

1. detailed recording of discontinuity, i.e. occurrences in layers and systems of fractures and the performance of contour diagrams,
2. sampling of representative rock blocks and separation of samples by mechanical treatment,
3. laboratory testings of samples and defining of basic physical—mechanical rock properties,
4. stability analysis of working and final level inclines.

Laboratory testing implied the definition of density, uniaxial compressive strength, tensile strength by the Brazilian test, then direct shear test of undisturbed samples, direct shear strength test of rock cubes and shear along the discontinuity plane for naturally rough, polished and moistened fracture plane. Testing results have been statistically treated to obtain competent parameters for physical-mechanical rock properties presented in Table 3.

Compressive, tensile and shear strengths are by the use of Sobotka's equation included into an even envelope curve of limiting stress circles for the A group of greater strength and the B group of less strength, (figure 3).

The stability of working and final level inclines was analysed according to the criterion of discontinuity and the criterion of potential sliding plane through the rock mass, and the elements of working and final inclines were established as presented on Figures 4 and 5.

Table 3. (Tablica 3.)

<table>
<thead>
<tr>
<th>Rock characteristic (svojstvo stijene)</th>
<th>Symbol (simbol)</th>
<th>Unit ( jedinica)</th>
<th>A-group of greater strength (A-grupa veće čvrstoće)</th>
<th>B-group of less strength (B-grupa manje čvrstoće)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulk density (zapreminski mas)</td>
<td>( \rho )</td>
<td>kg/m(^3)</td>
<td>2578</td>
<td>2578</td>
</tr>
<tr>
<td>Uniaxial compressive strength (jednoosni tlak)</td>
<td>( \sigma_u )</td>
<td>MPa</td>
<td>68.86</td>
<td>25.16</td>
</tr>
<tr>
<td>Tensile strength (vlačna čvrstoća)</td>
<td>( \sigma_{\text{m}} )</td>
<td>MPa</td>
<td>2.98</td>
<td>2.63</td>
</tr>
<tr>
<td>Normal shear strength component under angle (normalna komponenta čvrstoće na smicanje pod kutom):</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) = 30(^\circ)</td>
<td>( \sigma_{\text{ua}} )</td>
<td>MPa</td>
<td>72.38</td>
<td>37.56</td>
</tr>
<tr>
<td>b) = 45(^\circ)</td>
<td>( \sigma_{\text{ub}} )</td>
<td>MPa</td>
<td>40.29</td>
<td>16.55</td>
</tr>
<tr>
<td>c) = 60(^\circ)</td>
<td>( \sigma_{\text{uc}} )</td>
<td>MPa</td>
<td>19.94</td>
<td>6.26</td>
</tr>
<tr>
<td>Cohesion (Kohesiija)</td>
<td>( c )</td>
<td>MPa</td>
<td>0.286</td>
<td>0.286</td>
</tr>
<tr>
<td>Angle of internal friction (Kut unutranjeg priza)</td>
<td>( \psi )</td>
<td></td>
<td>40.8</td>
<td>40.8</td>
</tr>
</tbody>
</table>

Fig. 3. Parameters of rock strength
Sl. 3. Parametri čvrstoće stijene.

Fig. 4. Working slope of the open pits »Partizan« and »Prvoborac«
Sl. 4. Radna kosina na površinim kopovima »Partizan« i »Prvoborac«

Fig. 5. Final slope of the open pits »Partizan« and »Prvoborac«
Sl. 5. Završna kosina na površinskim kopovima »Partizan« i »Prvoborac«
Conception of the open pits’ development

Foundation for the conception of the exploitation of the open pits »Partizan« and »Prvoborac« is discussed in the main projects and is based on the extension of exploitation activities from the narrow working area »tupina« in the central part of deposit to the northern area with the so-called »high cement raw material« spreading to the boundaries of approved exploitation field. Such a conception of common production of several components according to established ratios, beside additional homogeneity in the structures of cement factories, enables to attain constant quality of mineral raw material with the content of about 76% CaCO₃, which is the basic requirement for the technological process of cement production.

Such a conception is maximally adapted to the existing activities at the open pits, so that further works of opening new levels as well as of development and exploitation make as a whole a continuous transition to the new—planned solutions.

Production capacity is defined according to the needs of cement factories, thus the established exploitation conception enables quick restructuring to larger production if necessary.

Technological solutions for further development of formerly formed levels and for the opening of new ones are based on the same principles for both open pits. Essential structures are the main traffic arteries located approximately in the middle of the deposit southwards from the crushing plant and to the most distant working level in the north. They are built according to the standards for the two—way traffic and adapted to the situation of the ground with maximal slope of 8% (rise in the direction of empty vehicles’ movement). Maximal length of the main traffic arteries at the open pit »Partizan« amounts cca 1700 m, and at the open pit »Prvoborac« cca 2300. All levels at the pits were opened by immediate cutting from the main traffic arteries, whereby the flexible production is attained enabling simultaneous works on several working levels in all types of mineral raw material and the accomplishment of homogeneity already in the technological production process itself. Besides, by such solutions an independent development of each level is enabled within the determined dynamics of the pits’ development, the shortest distance of mineral raw material transportation and reliable and economical operation of the complete technological process. The illustration of the opening and the level development is presented in Figures 6 and 7.

Both open pits are of height type, the fundament level of the open pit »Partizan« being located at the elev. +80 and of the open pit »Prvoborac« at the elev. +90. According to height, the division was made into levels at the elev. +80, +100, +120, +140, +160, +180 and +200 at the open pit »Partizan«, and at the open pit »Prvoborac« at the elev. +90, +110, +130, +150, +190 and +210. Differences in the formation of levels are the consequence of the former particular approach to the development of these pits as independent productive mining structures, so that their identity could not be established in the new conception either. However, in the plan for the open pit »Prvoborac«, which followed that for the open pit »Partizan« after eleven years, the connection of these two open pits in the field of geological cross—section No.2 was planned (Figure 8). By the solution of linking, the lowering of the open pit »Prvoborac« in the cross—section No. 2, for 10 m is assumed, so it will be mined along the length of 125 m of this part of the pit along the slope of 8%. To the advantage of such solutions there is also the fact, that the area supposed for the linking has not been under exploitation so far.

Technological process of the exploitation

The exploitation technology was chosen on the basis of consideration and analysis of the most relevant factors influencing the guiding of technological process e.g.: natural characteristics of the deposit, the aimed production capacity and the mineral raw material quality, characteristics of the existing and chosen mechanization, experiences from the exploitation of mineral raw materials at these and other open pits of the »Dalmacija cement« company up to now. According to such consideration the discontinuous system of mining, loading and transportation of mineral raw material was accepted as the most favourable for existing exploitation conditions.

The principle parameters for the open pit such as: bench height and bench width, working slopes and final slopes are defined on the basis of the carried out geomechanical estimations of stability and practical experiences which guarantees for the performance of exploitation in stable conditions of working environment.

The mineral raw material deposit is covered with a thin layer of waste (in average cca 0.5 m) and in the exploitation technology there are practically no bigger problems with overburden. Overburden is removed by bulldozer piling to the working level wherefrom it is loaded and delivered to overburden bench located in the southern part of the open pit.

In the technological process of exploitation there were some problems and restrictions that found adequate solutions in the planning documentations, the most relevant among them being the following:

- determination of precise production dynamics according to particular types of mineral raw material and to individual levels, in order to attain constant quality of the mixed mineral raw material with the content of cca 76% CaCO₃,
- solution for mass blasting technology by restriction of explosive consumption for one degree of firing and totally on the blasting field for the parts of open pits in direct vicinity of a settlement,
- exploitation performance with as slight devastation of the area and environment pollution as possible, and the establishment of sanation measures continuously during exploitation, which is especially important considering the location of open pits in the tourist area.
Fig. 6. Development of the open pit «Partizan» (4th phase)
Sl. 6. Razvoj površinskog kopa «Partizan» (4. faza)

Fig. 7. Development of the open pit «Prvoborac» (2nd phase)
Sl. 7. Razvoj površinskog kopa «Prvoborac» (2. faza)

Fig. 8. Situation of linking the open pits «Partizan» and «Prvoborac»
Sl. 8 Situacija spajanja površinskih kopova «Partizan» i «Prvoborac»
Table 4. (Tablica 4.)

<table>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(površinski kop osvrane u 1988.)</td>
<td>(površinski kop osvrane u 1988.)</td>
</tr>
<tr>
<td>1. production capacity of mineral raw material</td>
<td>t/year</td>
<td>1 190 000</td>
<td>788 699</td>
</tr>
<tr>
<td>2. production capacity of overburden</td>
<td>m³/year</td>
<td>1 100 000</td>
<td>19 395</td>
</tr>
<tr>
<td>3. drilling volume for multiple raw-blasting (oblom buktenja za masovno müiranje)</td>
<td>m³/m³</td>
<td>37 594</td>
<td>26 207</td>
</tr>
<tr>
<td>4. drilling volume for multiple raw-blasting (oblom buktenja za masovno müiranje)</td>
<td>m³/m³</td>
<td>0.789</td>
<td>0.0638</td>
</tr>
<tr>
<td>5. volume of loading machines (volumen utovarnih sredstava)</td>
<td>m³</td>
<td>12</td>
<td>6.4</td>
</tr>
<tr>
<td>6. production capacity per m³ of loading machine (proizvodnja po m³ utovarnih sredstava)</td>
<td>m³/m³</td>
<td>39 667</td>
<td>47 945</td>
</tr>
<tr>
<td>7. volume of transportation machines (volumen transportnih sredstava)</td>
<td>m³/m³</td>
<td>80</td>
<td>34.8</td>
</tr>
<tr>
<td>8. production capacity per m³ of transportation machine (proizvodnja po m³ transportnih sredstava)</td>
<td>m³/m³</td>
<td>5 950</td>
<td>8.817</td>
</tr>
<tr>
<td>9. number of employers (broj zaposlenih)</td>
<td>emp/year</td>
<td>96</td>
<td>45</td>
</tr>
<tr>
<td>10. production effects (proizvodni uEinc)</td>
<td>m³/m³</td>
<td>4 958</td>
<td>4 383</td>
</tr>
<tr>
<td>11. oil consumption (potrosnja nufte)</td>
<td>l/m³</td>
<td>1.34</td>
<td>1.04</td>
</tr>
<tr>
<td>12. consumption of oil and lubricant (potrosnja ulja i maziva)</td>
<td>kg/m³</td>
<td>0.084</td>
<td>0.062</td>
</tr>
<tr>
<td>13. consumption of explosives (potrosnja eksploziva)</td>
<td>kg/m³</td>
<td>0.044</td>
<td>0.41</td>
</tr>
</tbody>
</table>

Basic indications of the successful exploitation at the open pit «Partizan», where the exploitation according to the above discussed conception has been carried out for ten years already, and the comparative data realized in 1988 and planned 1989 for the open pit «Prvoborac», where the introduction of this conception is in progress, are expressed in Table 4.

Reclamation of the open pits

The exploitation in the open pits «Partizan» and «Prvoborac» up to now has considerably altered the landscape round the town of Split. This fact is an important problem having in mind, that Split is one of major transition centres of tourism on the Adriatic coast.

 Destruction of the vegetation and degradation of the Solin coast brings about the need for systematic carrying out of the reclamation activities, which would continuously remove i.e. alleviate the disturbances due to exploitation.

Carrying out reclamation works is based on the solutions in the Project of Reclamation of the Open Pits in the Factory Dalmacija Cement completed 1979 by the Institute for Adriatic Culture and Karst Reclamation, Split - The University of Split, composed of:

- biologic-technical reclamation works, i.e. planting of trees, bushes and climbers on the terraces and plateaus of the open pit and
- technical-camouflage works i.e. installation of wire nets covered with climber plants on the cuts and cliffs.

These solutions are already in application at the open pit «Partizan» simultaneously with the deposit exploitation (Figure 9) and the same is also supposed for the open pit «Prvoborac», after the solutions from the new «Main Mining Project» start to be applied.

Perspectives of further exploitation development

By the realized connection of the open pits «Partizan» and «Prvoborac», new perspectives for further progress of the entire technical process of mineral raw material exploitation will be created. Such perspectives are based on the real possibilities of performing certain technological actions which will increase the complete production to a higher technical level and make it considerably more efficient and profitable.
The technological actions have essentially technical and organizational character and are based on the following assumptions:

- organization of mineral raw material production as a united whole, which would attain a more complete and rational use of mechanization, decrease of the number of employers, increase of labour productivity, more efficient work organization and more profitable production. Logical development of a united open pit from the west towards the east forming the final pit contours would offer the possibility of successive performance of final reclamation works immediately after the advance of exploitation works, which would considerably improve the ecological conditions,

- concentration of works in the narrow production area and introduction of mechanization of larger capacity would considerably improve basic technological and economic parameters of exploitation,

- by organizational solutions of transportation it is supposed that for the existing production level
only one common hall could be used with the plant for rough homogeneity, which would avoid the expensive investment to build one new hall more (Figure 10).

Modern tendencies for the growing efficiency of mining technology, which is oriented to mass production and a more complete mechanization and automatization of the technological process require such an approach whose application of the discussed technological solutions would provide real hope for the realization of these objectives.

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LITERATURA:

Razvoj eksploatacije mineralnih sировina za proizvodnju cementa na površinskim kopovima »Partizan« i »Prvoborac«, »Dalmacija cement« — Solin
S. Vujec, B. Perić i B. Kovačević

U članku je prikazana eksploatacija mineralnih sировина za cementnu industriju Splita na površinskim kopovima »Partizan« i »Prvoborac«. Početak ovog stolača lapor je, kao najkvalitetnija sировина za proizvodnju cementa ekstrapordiran primjenom metode dijeliva (glory hole method), koja je prikazana na slici 1. Sredinom desetih godina prešlo se je na eksploataciju lapora površinskim kopom uz dobivanje mineralne sировine masovnim miniranjem, te mehaniziranim utovarom i transportom.

Rekonstrukcijom tvornice cementa »Partizan« i »Prvoborac«, stvorena je mogućnost eksploatacije i drugih vrsta mineralne sировine, prisutnih u ležištu koje se dodatno homogeniziraju s ciljem postizanja ujednačenog sadržaja CaCO₃ od cca 76%, što je osnovni zahtjev tehničkog procesa proizvodnje cementa. Na istom području, postavljena je i nova koncepcija razvoja površinskih kopova »Partizan« i »Prvoborac«, obrađena u novim Glavnim rudarskim projektima 1979. godine, odnosno 1989. godine.

Oba kopa nalaze se u istom ležištu koje čine naslage eocene-senčnog fiša. Na slici 2 prikazan je karakteristični geološki profil, na kojem je jasno vidljiva višestruka izmjena pterigrofaških članova.

Ležište je prisutna i izrađena tektonika s povijesnim slojevima po pružanju i najišvrsnijim i pojavoš i početnim rasjedima.

Ležište je utvrđeno procijenjivanjem početnog dijela ležišta, a rekapitalizacijom količina i kvalitete mineralnih sировина prikazan na u tablici 1. Projektiranim konturama površinskih kopova obuhvaćen je del del u tablici 2.

U svrhu osiguravanja stabiliteta radnih i završnih kosina, obavljena su na oba površinskih kopa detaljna geometrijska ispitivaja, dostavljeni rezultati prikazani su u tablici 3 i na slici 3. Analiza stabilnosti načinjenja je po kriteriju diskontinuiteta i kriteriji potencijalne kružne plohe kroz stijensku masu, te su usvojeni elementi radnih i završnih kosina, kako je prikazano na slikama 4 i 5.

Temelj koncepcije eksploatacije na površinskim kopovima zasnovani se na proširenju eksploatacionskih radova s uskog otkopnog fronta »tupina« u središnjem dijelu ležišta, na sjeverno područje s tzv »niskom« komponentom i južno područje s »visokom« komponentom, te utvrđivanje precizne dinamike proizvodnje po pojedinim vrstama mineralne sировine i pojedincima četirima u cilju postizanja konstantne kvalitete miješane mineralne sировine sa sadržajem CaCO₃ od cca 76%

Kapacitet proizvodnje definiran je prema potrebama tvornica cementa, s time da postavljena koncepcija eksploatacije omogućuje brzo prestrukturniranje i na veću proizvodnju u slučaju potrebe.

Osnovne objekte na oba površinska kopa predstavljaju saobraćajnice, locirane približno po sredini kopa, od drobljenog postrajenja na jugu do najudaljenijih radnih etaža na sjeveru. Kopovi su visinkog tipa, s po sedam radnih etaža visine 20 m, s time što je osnovna etaža na površinskom kupa »Partizan« na koti +80, a na kupa »Prvoborac« na koti +90 (prikazano na slikama 6 i 7).

Radi prirodnih karakteristika ležišta, zadanog kapaciteta proizvodnje i kvaliteta mineralne sировине, karakteristika postojeće i odabrane mehanizacije, te dosadašnjih iskustava na ovim površinskim kopovima, usvojen je diskontinuirani sistem dobijanja uvođenja i transporta mineralne sировине.

Osnovni pokazatelji uspješnosti eksploatacije na površinskim kopovima »Partizan« i »Prvoborac«, prikazani su u tablici 4.

Za koprje je od velike važnosti provođenje sanacionih radova paralelno s eksploatacijom, zbog njihove biljne gradu Splitu, kao jednom od glavnih tranzitnih centara turizma na obali Jadranog mora (slika 9). Perspektive daljnjeg razvoja eksploatacije na ova dva kopa nalaze se u njihovu spajanju (slika 8 i 10), čime bi se cjelokupna proizvodnja podigla na viši tehnički nivo i učinila efikasnijom i rentabilnijom.