

BULETINUL INSTITUTULUI POLITEHNIC DIN IAȘI
Publicat de
Universitatea Tehnică „Gheorghe Asachi” din Iași
Tomul LVIII (LXII), Fasc. 4, 2012
Secția
CONSTRUCȚII. ARHITECTURĂ

HYDRAULIC LIME OBTAINED FROM CHALK SANDSTONE ON LIVENI, BOTOȘANI COUNTY

BY

MIRCEA-GIGEL GALL¹ and DANIEL COVATARIU^{2,*}

¹ISC Antrepriza “IDEAL CASA” S.R.L., Iași

²“Gheorghe Asachi” Technical University of Iași
Faculty of Civil Engineering and Building Services

Received: September 5, 2012

Accepted for publication: September 30, 2012

Abstract. Natural building material’s study – stone, clays, balast – represents an important aim for the civil engineers, researchers and also for building material’s producers. In the Jijia river rehabilitation project was analysed many stone sources from different points of interest: geological, deposits quantities, environmental impact, acces possibilities. Botoșani County has some small ballast deposits, natural local reserves being hard to extract, but also some rich zones in natural stone at the surface of the ground. The Sadoveni-Liveni chalk sandstone deposits could be exploited with minimal investments in order to produce the hydraulic lime, which could be very necessary in local use, for construction and even in rehabilitation of damaged buildings.

Key words: hydraulic lime; chalk sandstone; fabrication stages.

1. Introduction

With the time passing, the stone products as building materials has more present interest: large scale stone for foundation, plating plates, stone pieces for roads, flagstones, ballast products for mortars and concretes, clays for ceramics.

*Corresponding author: *e-mail*: covadan@ ce.tuiasi.ro

Romanian stone deposits have different characteristics, from the compacted calcareous stone (Vașcău, Moneasa) diverse coloured, to the marble deposits (Rușchița) or Măcin granite, vulcanic tuffs from Bacău and Bistrița Năsăud, ballast deposits from the biggest rivers, which has been exploited from the ancient times.

Along the time, the stone was a basic resource from which was developed the other building materials: plaster from gypsum, lime from chalkstones, cement from clays and calcareous stones, ceramic product from clays, etc.

Moldavian stone resources are various: limestones in Bucovina, andesite in Călimani, tuffs in Bacău and Neamț Counties, grit stones along the Prut river, many ballast deposits on the Moldova and Siret rivers, clays stone pits used like binder or for the ceramic products.

Natural stone deposits from eastern part of Romania are dispersed and, many times, are presented so that the exploitation could be performed at the ground, without any layers removing, but without any convenient access paths.

1.2. Geological Situation

In Liveni perimeter, situated on the ground, stone shaped, the ancient reefed limestones deposits (Fig. 1). These deposits were created along the Prut river stream and on the inferior basin of its affluents and deposits representing



Fig. 1 – Chalkstone deposits from Liveni, Botoșani.

the continuation to the South of the deposit's strip which outcrop along the right bank of the Prut river, in the northside, on the Darabani territory. This thin deposit strip begins from North, in Oroftina de Sus village and laydown to South to the Dămideni village, both on the right bank of the Prut river.

In order to use this valuable and natural local resource it is necessary to carry out the following steps. A carefully choosing selection of the limestones is required, in order to be reach in minerals, adequate to lime powder production. The selected stones are submitted to a special burning process from which will result “lime clods”. In order to produce a qualitative hydraulic lime these “lime clods” will be grinded (Fig. 2), than will be transformed into a paste (which will be submitted to another technological process). All the period of processing the quality parameters will be carefully monitorized. Finally, after a pre-established processing period, the final product will be a high-quality hydraulic lime, which will be packed in hermetically closed paper bags. The hydraulic lime paste used in constructions processes will be transformed (in time) in its initial stage–limestone.



Fig. 2 – Very fine powder of limestone.

Advantages of hydraulic lime utilisation

The hydraulic lime is: a) ecologic; b) economic; c) non-toxic for the manufacturers; d) non-pollutant for the depositing area; e) at more than +1°C could be easily stored by an unlimited term, without any damages and without loss of the properties.

2. Hydraulic Lime Production Stages

2.1. Extraction, Crushing, Washing, Screening, Grinding Stones

Calcium carbonate is a natural product that can be found as marl, chalk, limestone or marble.

The very pure limestone that could be extracted to make lime is light to dark grey in colour with a CaCO_3 content of about 98% to produce calcium or dolomitic quicklime (CaO or CaO.MgO , respectively).

The pebbel-lime thus produced is screened, crushed or grounded and finally stored, all of this according to customer specifications (Fig. 3).



Fig. 3 – Extraction, crushing, washing, screening, grinding stones.

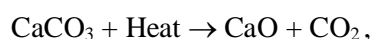
Limestone, either in the form of calcium carbonate (CaCO_3) or dolomite ($\text{CaCO}_3.\text{MgCO}_3$), is extracted (sorted by mass) selectively, according to its physical and chemical characteristics.

Gathered by mechanical loaders or buckets, the rocks are then transported and unloaded in crushers where they are washed, screened, crushed, grounded and stored according to their use.

2.2. Calcination and Production of Lime Powder

Part of the extracted stone, selected according to its chemical composition and granulometry, is calcinated at about $1,000^\circ\text{C}$ (Fig. 4) in different types of kilns, fired by such fuels as natural gas, coal, fuel oil, lignite, etc.

The CO₂ of the stone is released to produce calcined dolomitic lime or quicklime (CaO.MgO or CaO, respectively). According to the reaction



quicklime is produced.



Fig. 4 – Calcination of lime powder.

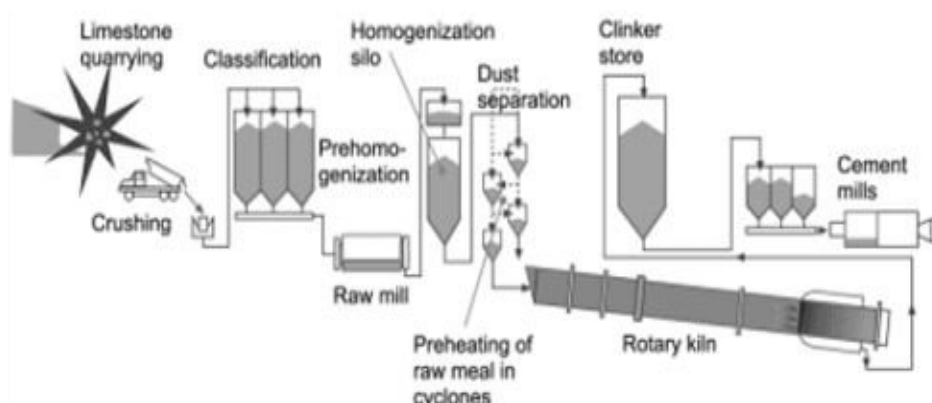


Fig. 5 – The simplified draught of the lime powder production.

3. Conclusions

Botoșani county is very poor in ballast deposits, local resources being very hard to exploit having many impurities, with a large quantities of clays and very fine sand, but with many exploitation zones at the ground.

In rehabilitation project of the Jijia river were been analysed many limestone sources as regards the geological nature, reserves, the nature impact, acces paths.

The Liveni zone could be very easy exploited (having surface's deposits) without major investments. Were analysed by the origin's rocks, the mineralogic compounds and the conclusion was that there are many qualitative deposits in that area.

REFERENCES

- Brânzilă M., *Contribution to the Establishment of the Age of the „Cryptomacra clays” of the Moldavian Platform*. Acta Paleontologica Romaniaae, **I**, 134-137 (1997).
- Bucur I.I., Nicorici E., Huică I., Ionesi B., *Calcareus Microfacies in the Sarmatian Deposits from Romania*. Studia Univ. Babeş-Bolyai, Geologia, **XXXVII**, 2, 9-16 (1992).
- Gall M.G., *Studies Concerning the Revaluations in Constructions Domain of the Limestone's Deposits from the Sadoveni – Liveni, Botoşani County* (in Romanian). Ph. D. Diss., "Gheorghe Asachi" Technical University of Iaşi, 2011.
- Groll L., Babor D., Covatariu D., Iordăchescu R., *Materiale de construcţii – Lucrări practice de laborator*. Edit. Soc. Acad. „Teiu Botez”, Iaşi, 2001.
- * * *Piatra naturală. Terminologie*. SR EN 12670:2002.
- * * *Metode de încercare a pietrei naturale. Determinarea coeficientului absorbţiei de apă prin capilaritate*. EN 1925:2000.
- * * <http://www.carmeuse.com/page.asp?id=59&langue=EN>

OBȚINEREA VARULUI PASTĂ DIN DEPOZITELE DE PIATRĂ DE VAR, ZONA LIVENI, JUDEȚUL BOTOȘANI

(Rezumat)

Studiul materialelor naturale ca surse de materiale pentru construcții – piatră, argilă, balast – a fost în atenția constructorilor, a producătorilor de materiale pentru construcții și a cercetătorilor din cele mai vechi timpuri. În proiectul de amenajare a râului Jijia s-au analizat mai multe surse de piatră în ceea ce privește natura geologică, rezervele, impactul asupra mediului, căile de acces. Județul Botoșani este sărac în produse de balastieră, resursele locale fiind greu de exploatat, cu un conținut mare de argilă și nisip foarte fin, dar prezintă și zone cu piatră naturală de suprafață. Depozitele de piatră de var din zona Liveni pot fi exploatate cu ușurință pentru a se produce varul pastă, care poate fi foarte necesar în exploatarea locală, pentru construcții sau chiar la reabilitarea clădirilor avariate/deteriorate.