

IMPROVING THE MECHANICAL PROCESSING PARAMETERS AND SIZES OF MINERAL AGGREGATES IN A STONE QUARRY

Cătălina Ianăși, University “Constantin Brancusi” of Tg-Jiu, ROMANIA

ABSTRACT: *Crushed mineral aggregates have a large utility in these days. The parameters of grinding influence the size degree of the aggregates. The machines and equipment contribute at the obtaining of the size degree of the aggregates. Depending the location of the stone processing equipment in the quarry the sizes degree of the aggregates and the mechanical parameters could be improved for a best utility. In this paper it is studied a possibility of positioning the machining equipment in a stone quarry in order to obtain a better degree of processing of the stone for different uses.*

KEY WORDS: *processing parameters, sizes, quarry, equipment*

1. INTRODUCTION

The machines and equipment used in a stone quarry are various. Most of them are for grinding but they are also a lot of machines used for transporting and storing stone [4]. The equipment used for crushing the stone are the crushers. The vibrating sieves are used to sort the material in different sizes. Also for transport the stone between the grinding machines are used conveyor belts [2,3]. They can have different length and width depending on the stone sizes. From this point of view, the stone sizes that can be obtained in general in the grinding process are: 0-4mm, 4-8mm, 8-16mm and 16-32mm and so on. For obtain this sizes it must have an arrangement of the grinding machines as the stone can get the optimal sizes in an easy way and with not so much costs and energy consumption. In the specialized literature there are many studies about the stone quarry and also about the quality and quantity of the stone which is processed with these equipment and also about the field of use of the stone.

2. EXPERIMENTAL STUDY

The machines can crush and grind the stone as we can get the necessarily sizes of stone [1,5]. Depending the use of these stone the

equipment and the machines can be arrange as we can obtain a very good stone processing yield so that the wear of the active elements of the machining equipment to be not high. This it means after studying the granularity of the stone, according to its mode of use, it is possible to elaborate in time several possibilities of arranging the equipment in a stone quarry to have a better result of the degree of processing the materials. In this paper the study of equipment arrangement was done in a stone quarry which has to obtain the stone sizes such as 0-4mm, 4-8mm and especially 8-16mm and 16-22,4 (32mm)mm being required on the market. The technological process for obtaining this sizes of the stone had to be modify and the machines and equipment had to be arranged in a new working way. The initial productivity of the stone quarry was 95t/h and after the new possibility of arrangement the productivity increased at almost 150t/h.

The initial arrangement was done with a bunker for raw material, vibrating screens, impact crusher and belt conveyors. The material from the bunker was transported to the vibrating sieves where it can obtain different sizes of aggregates such as: 0-4mm, 4-8mm, 8-16mm, 16-22,4 (32mm)mm. The rest of material bigger than 32 mm went to the impact crusher and

after that to the bunker being recirculated again for a better processing. The scheme

for the initial technological process it is shown in the figure from below:

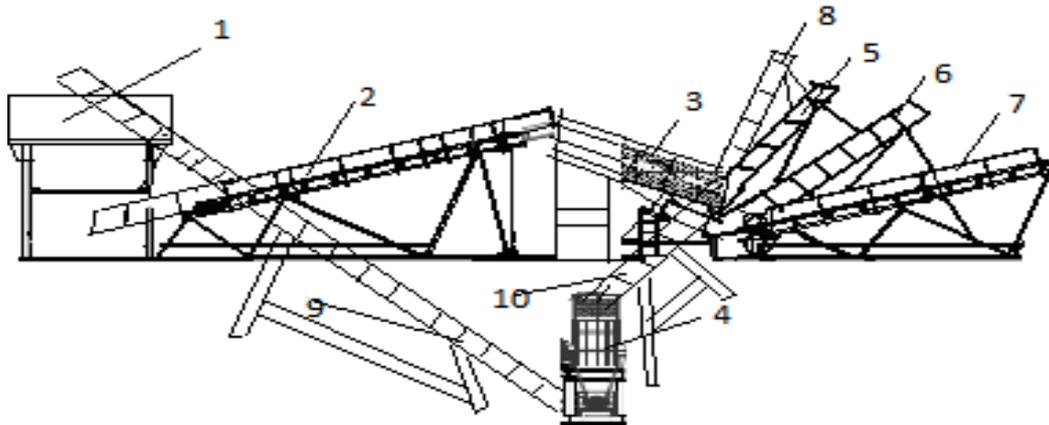


Figure 1. Scheme of initial technological process [2]

1-bunker for raw materials, 2-conveyor belt, 3- vibrating sieves, 4-impact crusher, 5-conveyor belt(4-8mm), 6-conveyor belt (8-16mm), 7-conveyor belt(16-22,4 or 32mm), 8-conveyor belt, (0-4mm) 9- conveyor belt(for recirculated material),10- conveyor belt(>32mm)

The problem that appeared in the crushing process was also the wear of the hammers and wear plates from the impact crusher. In the new configuration of the technological process the number of vibrating screens was modify depending on the size of mineral aggregates and also a new jaw crushers was insert on the line near the impact crusher as we can see in the next figure:

Including the jaw crusher and a new vibrating sieves the technological process was improved by obtaining less fine ground grinding material such as 0-4mm and more 8-16mm and 16-22,4 (32mm)mm. In the 0-4mm sort was also less fine ground grinding material like 0-1mm. In the next figure we can see the position of the two crushers.

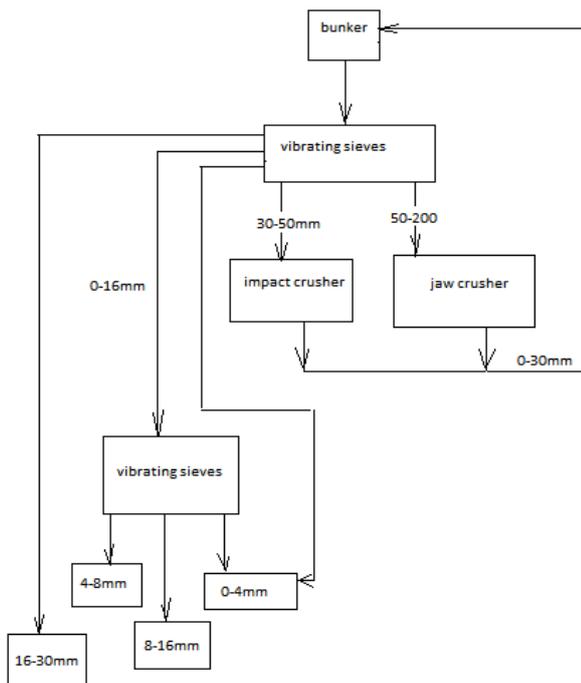


Figure2.Scheme of new technological process



Figure 3. Two crushers in the technological process

Once the material is inside the two crushers it suffers a lot of transformation. The stone are crushed and transformed in aggregates of different forms and shapes. After these

transformation the material is send back in the bunker and then in the vibrating sieves for being recirculated and sorting again.

Another advantage of this new technological process is also a very good stone processing yield and also the wear of the active elements of the machining equipment were not so high because of the two crushers that are working in the same time and increasing the processing yield.

In the figure 4 from below we can see the new vibratings sieves added in the new technological process.

Also in the figure 5 it can be seen the new arrangement of the machines and equipment used in the stone quarry for obtaining different sizes of mineral aggregates.



Figure 4. Two vibrating sieves in the technological process



Figure 5. New arrangement of the machines and equipment

It can be seen from the figure 5 that from the two crushers the material is recirculated to the bunker and to the vibrating sieves until there are obtained the sizes degree of the mineral aggregates asked by the technological processes.

3. CONCLUSION

In the activity of the stone quarry there are several important aspects like the productivity but also the quality of the obtained material at the same time. An

important requirement is also the satisfaction of market demands. That's why it is important to adapt the technological process with minimal cost, for getting a good productivity and satisfying the market demands. In the stone quarry we studied in this paper the initial productivity was 95t/h and after the new possibility of arrangement the equipment and machines the productivity increased at almost 150t/h. With another crusher (jaw crusher) and a new vibrating sieves the technological process was improved by obtaining less fine ground grinding material such as 0-4mm. The obtaining of more material as 8-16mm and 16-22,4 (32mm)mm was the main purpose by improving the technological process and meantime by improving the mechanical processing parameters of the grinding material in the stone quarry.

REFERENCES

- [1] <http://technolum.eu/products/hj-series-jaw-crusher.html>
- [2] Ianasi C., *Influence of geometric shape on the mechanical properties of components from infrastructure*, DOI: [10.5593/SGEM2014/B13/S4.112](https://doi.org/10.5593/SGEM2014/B13/S4.112)
Conference: 14th SGEM GeoConference on SCIENCE AND TECHNOLOGIES IN GEOLOGY, EXPLORATION AND MINING, pp 883-888.
- [3] Ianasi C. Mihut N., *Mechanical and geometrical characterization of the conveyors belts from mineral resources exploitation*, Advances Materials Researches, Vol 837(2014), pp 99-104, DOI :[10.4028/www.scientific.net/AMR.837.99](https://doi.org/10.4028/www.scientific.net/AMR.837.99)
- [4] https://issuu.com/masinisiutilaje/docs/m_u_feb_2014
- [5] <http://www.scrigroup.com/tehnologie/tehnica-mecanica/MASINI-SI-UTILAJE-PENTRU-MARUN34229.php>