

ANALYSIS OF MEASURING STOCK OPNAME OF CEMENT SUPPORTING RAW MATERIALS BY TOTAL STATION

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ABSTRACT

PT Semen Indonesia (Persero) Tbk is a BUMN (State-Owned Enterprise) company that operates in the cement industry in Indonesia and even abroad. PT Semen Indonesia (Persero) Tbk is located in Sumberarum Village, Kerek District, Tuban Regency, East Java Province. PT. Semen Indonesia (Persero) Tbk implements an open pit mining system using the Quarry method. This company is always close to mining activities where they can run if they meet the requirements of the Work Plan and Budget (RKAB) requirements per the Decree of the Minister of Energy and Mineral Resources No. 1806 K/30/MEM/2018. Mining activity planning is the most crucial aspect in designing mine designs, as a reference for achieving production targets and analyzing stock reserves of production raw materials. Stock taking is a temporary storage place after undergoing the transportation process from the mining front so that it can be ensured that the quality of the limestone can be maintained as originally. (Aliyusra Jolo, 2017). The method used in this research involves field surveys, taking detailed points according to the shape of the appearance, and processing the data using AutoCAD Civil 3D software which has a Triangular Irregular Network (TIN) working concept. The results of the research show that in stock-taking, after calculating the area and volume, we obtained an area of 4634,266 m² for stock opname 1, an area of 2916,728 m² for stock-taking 2, 1669,189 m² for stock-taking 3, and the total area of stock opname was 6298,750 m². And for the volume itself, the resulting volume was 24,204,084 m³ for stock opname 1, an area of 14,263,732 m³ for stock opname 2, 4321,165 m³ for stock opname 3, and the overall stock opname area was 42,788,981m³. As a result, this limestone stock will be used as a supporting material for cement production.

Keyword: Cement, Mining, Raw Materials, Limestone, Stock Opname

Introduction

Natural resources are one of the primary sources of capital in national development. Therefore, they must be utilized as much as possible to benefit the people by paying attention to the preservation of the surrounding environment. Rapid global development, driven by increased infrastructure development and technological progress, is the main driver for the growth of various industries in Indonesia (Nainggolan & Horman, 2022). Mining is one activity that utilizes natural resources and increases infrastructure development and technological progress. Mining business activities are an effort to explore and process non-renewable natural resources. PT Semen Indonesia (Persero) Tbk is a BUMN (State-Owned Enterprise) company that operates in the cement

industry in Indonesia and abroad. This PT is collated in Sumberarum Village, Kerek District, Tuban Regency, East Java Province. PT. Semen Indonesia (Persero) Tbk implements an open mining system using the Quarry method. This company is also never far from mining activities, where mining activities can run if they meet the Work Plan and Budget (RKAB) requirements per the Decree of the Minister of Energy and Mineral Resources No. 1806 K/30/MEM/2018. Mining activity planning is the most crucial aspect of designing mine designs as a reference for achieving production targets and analyzing raw material stock reserves. Stock opname surveys in the past were often carried out using a theodolite. However, as time went by,

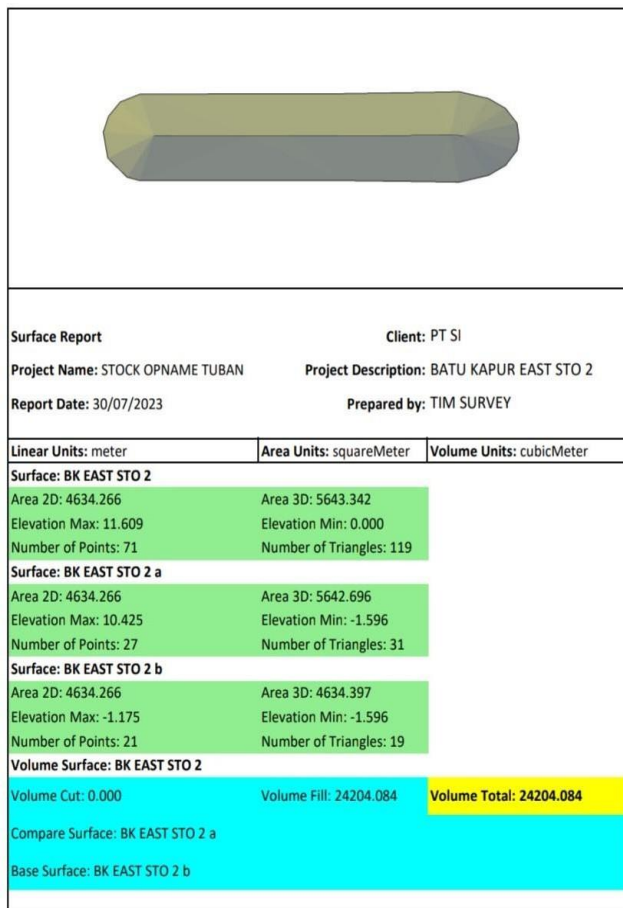


Figure 3. Examples of stock taking calculation results Total Stations began to be used for stock opname surveys. In carrying out mining activities, PT. Semen Gresik (Persero) Tbk needs to carry out production calculations (stock opname) to determine the achievement of production targets set by the company. Production calculations can be carried out using the measurement method using a total station directly in the field or by weighing. Stock opname measurements are usually carried out indoors. This research was carried out in an open space and used a total station where the tool's accuracy was 1 second.

Methodology



Figure 1. Research Location

This research was conducted in the limestone mining area of PT. Semen Indonesia Group (SIG) Tbk is located in the Ladang Area, Sumberarum, Kerek, Tuban Regency, East Java, with coordinates 111° 30'–112° 35' East Longitude and 6° 40'–7° 18' South Latitude. The research location can be seen in figure 1.

This research method involves field surveys and obtaining topographic measurement results. There are two types of tools and materials used during the research process, namely hardware and software. For hardware, we use laptops, SOKKIA total stations, milestones, and retort stands. Meanwhile, the software we use is AutoCAD Civil 3D and Microsoft Office 365. The materials used during practical work are data from stock opname measurements and mine progress data at PT. Semen Indonesia Group.

Mining progress data processing uses AutoCAD Civil 3D 2012 software by updating the latest topographic data against topographic data for the following month, then comparing and editing according to actual topographic conditions. After that, the process of creating contours and digital surface modeling is carried out to estimate reserves and production volumes. The contour interval used is 2 m with an elevation of 30 m - 36 m. Meanwhile, the stock opname data processing is carried out using AutoCAD Civil 3D 2012 software, which has the working concept of Triangular Irregular Network software. In stock taking, area and volume calculations are also carried out. The flow diagram used during research can be seen in Figure 2.

Result and Discussion

The results and conclusions showed that the volume of stock opname and mining progress had been calculated at PT. Semen Indonesia Group is located in Tuban, East Java. Data collection was carried out using the SOKKIA Total Station by knowing the reference point first. The SOKKIA Total Station has an angular accuracy of two seconds and a laser capability of up to 500 meters. This is a combination of specifications that can be relied upon for measurements for construction and topography. Reference points are used as binding and control points for measurements. This reference point has definite coordinate values. This reference point uses the ground surface elevation of the stockpile and mining areas (for mining progress) as the cut point and the benchmark (BM) point around the measurement location. The next stage of data collection is scanning.

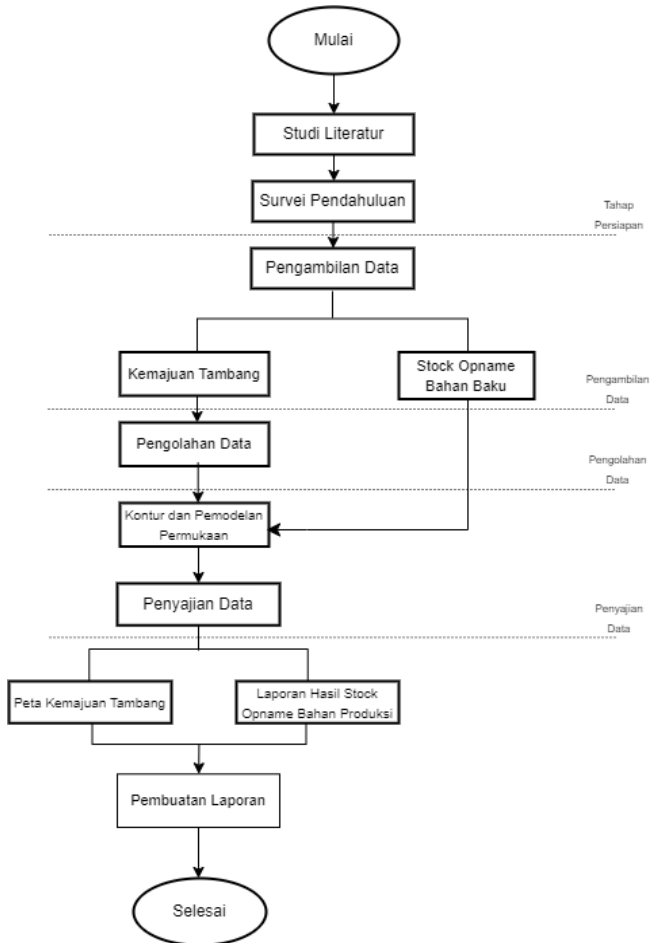


Figure 2. Research flow diagram

Scanning is carried out in two ways, namely, without a target, meaning that the position of the scanning point can be freely determined without paying attention to the target's presence, and the second way is using a target then we conducted the data processing. Data processing itself uses AutoCAD Civil 3D software.

Figure 3 shows that the green table shows the value of the area of the stock opname place itself, while the blue one shows the value of the stock opname volume. Next, the mining progress data processing is carried out using AutoCAD Civil 3D 2012 software by updating the latest topographic data to topographic data in the following month, then comparing and editing according to actual topographic conditions and carrying out the process of creating contours and surface modeling digitally for purposes estimated reserves and production volume for a contour interval of 2 m with an elevation of 30 m - 36 m. Below, there will be a comparison of the mine progress plan with the actual mining progress that has been made.

In this research we will show the differences in mining progress that have been measured.

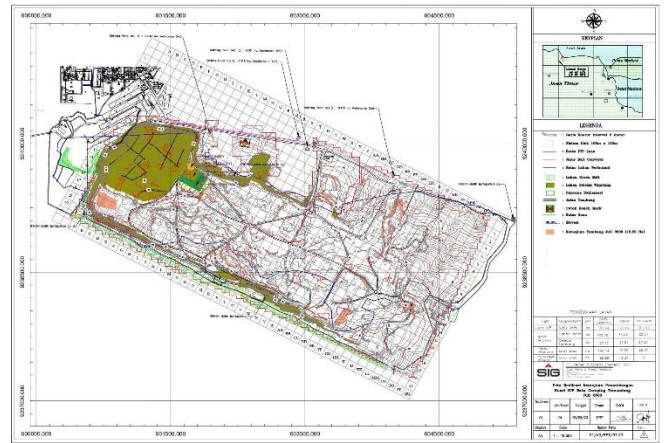


Figure 4. Map of Mining Progress results

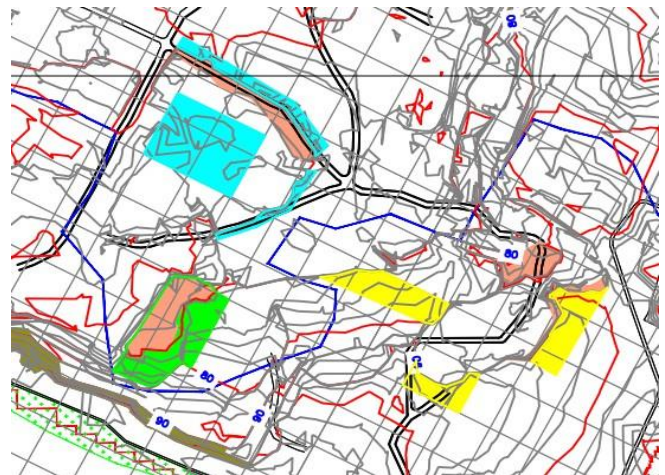


Figure 5. Mine Progress Plan

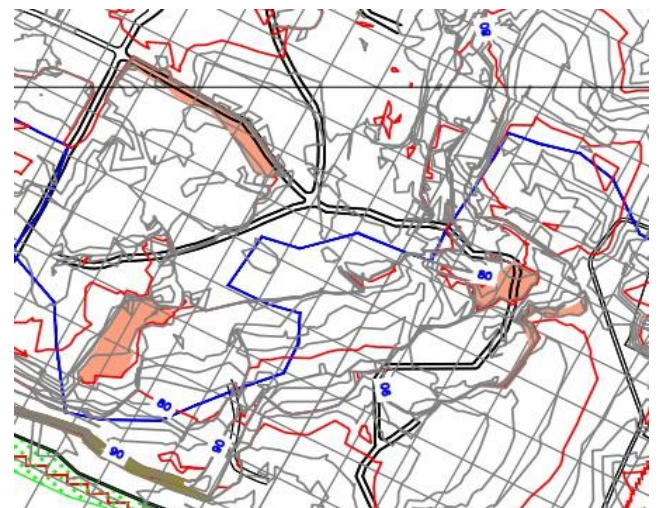


Figure 6. Realization of Mining Progress

Figure 5 shows the blocked colors green, blue, and yellow, which are plans for mining progress which are then realized in Figure 6, which can be marked by the disappearance of these colors and being replaced by a new mine design pattern with an IUP area in the Batu Gamping area of 752.84 ha, in the Tlogowaru area, it has an area of 120.04 ha, and finally the area in the Mliwang area is 201.60 ha.

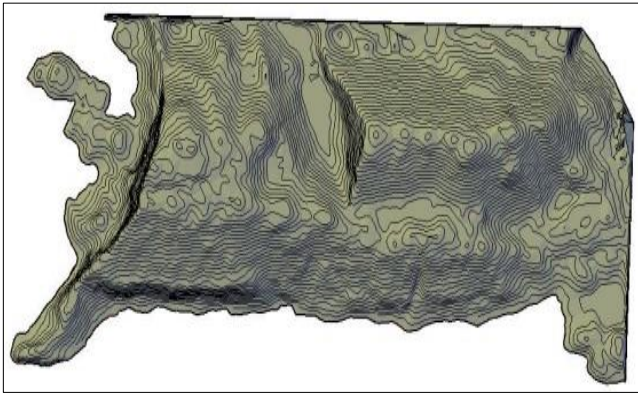


Figure 7. Mine Progress Plan

Meanwhile, stock opname data processing is carried out using AutoCAD Civil 3D 2012 software, which has the working concept of Triangular Irregular Network software. In stock opname, area and volume calculations are also carried out, where for the calculation of the area itself, the resulting area is 4634,266 m² for stock opname 1, an area of 2916,728 m² for stock opname 2, 1669,189 m² for stock opname 3, and the overall area of stock opname is 6298,750m². And for the volume, the resulting volume is 24,204,084 m³ for stock opname 1, an area of 14,263,732 m³ for stock opname 2, 4321,165 m³ for stock opname 3, and the overall area of stock opname itself is 42,788,981m³. Later, this limestone stock will be used as a supporting material for cement production.

Conclusion

The results obtained from conducting research at PT. Semen Indonesia (Persero) Tbk, measurements of raw material stock opname and mining progress can be concluded as follows:

1. The data collection stage is carried out using a terrestrial laser scanner with two methods, namely using a target and free (without a target), with the advantage that if you use a target, it will be easier in the data processing stage. In the measurement itself, the accuracy obtained for the total station tool is 1 second, while the measurement accuracy is less than 1 cm.
2. Results of mining progress data processing at PT. Semen Indonesia Group, namely the IUP area in the Batu Gamping, is 752.84 ha, in the Tlogowaru area is 120.04 ha, and the Mliwang area is 201.60 ha.
3. Results of mining progress data processing for open areas which are used as active land areas for the IUP area in the Batu Gamping area, which is

- 408.38 ha, in the Tlogowaru area, which has an area of 44.38 ha, and the Mliwang area is 28.31 ha
4. The results of data processing for stock opname inform that the area is 4634,266 m² for stock opname 1, the area is 2916,728 m² for stock opname 2, 1669,189 m² for stock opname 3, and the overall area of stock opname itself is 6298,750m²
5. The results of data processing for stock opname itself inform that the volume is 24204,084 m³ for stock opname 1, the area is 14263,732 m³ for stock opname 2, 4321,165 m³ for stock opname 3, and the overall volume of stock opname itself is 42788,981m³.

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