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THE PIT DESIGN PLANNING AND PLANNING RESULT EVALUATION OF OVERBURDEN FRONT FROM WEST TO EAST USING MINESCAPE VERSION 5.7 SOFTWARE AT PT XYZ

by
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Article Info	ABSTRACT
	PT XYZ is a private company managed by foreign company was engaged in coal mining sector located in Muara Enim, South Sumatera. This company conducts open mining system or surface mining. The overburden volume production calculation applied by PT XYZ used software that is Minescape 5.7. Software. The objectives of this research was creating a front design of overburden from west to cast with elevation of #10 to 0 and the calculation of cut and fill volume of overburden planning and the joint result used Minescape 57. Software, comparing the amount of cut and fills volume and determining the factors causing the difference of the overburden volume calculation using Minescape 5.7. Software. The method used was material stockpiling method and disposal stability became the author's basis to recommend a disposal in pit which can accommodate safe product to be implemented in the field. Based on the calculation results using Minescape 5.7. Software in May, the obtained overburden volume was 587.36 BCM. From the analysis results related to the Minescape 5.7. Software calculation comparison between the progress and the joint of the cut was 428.62 and the fill was 20.48. *This is an open access article under the CC BY-SA license.*

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1. INTRODUCTION
Background

The Lematang Coal Lestari Coal Mining Company, known locally as PT XYZ, is a foreign-managed private company engaged in coal mining whose territory is in the Muara Enim area, South Sumatra. This company performs mining with an open mining system or surface mining. This company can be said to be a contractor because it is only a manager. As for the mining authority itself held by PT Musi Prima Coal. For its own production, PT XYZ (LCL) cooperates directly with PT Goa Hoang Energi Musi Mandiri Indonesia (GHEMMI) as a company operating as a Steam Power Plant (PLTU) whose energy source is supplied to Lahat to be sent to various other areas.

The initial activity of the mining process is land clearing and overburden stripping which aims to remove the overburden layer with mechanical means so that the oveburden coal mining process can be carried out which has been stripped and then transferred to a landfill called disposal. must be excavated from the pit in order to obtain coal.

The slope safety factor at the disposal is also another factor that needs to be discussed in planning the disposal, landslides can occur due to the driving force exceeding the opposing force originating from the shear strength of the soil along the plane of the slide.

The stability of the soil on the slope of the disposal will affect environmental aspects, one of the problems caused is a slide, the damage caused by this landslide is not only in the form of direct damage such as damage to facilities in the mining area and loss of life, including indirect damage such as loss of operational costs.

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Based on the description above, it is necessary to make a design plan in disposal to produce a stable and optimal slope for disposal by considering the location and taking into account the location, material storage capacity, and material stockpiling methods, as well as the stability of the disposal is the basis for the author to recommend an in-pit disposal which can accommodate safe production to be implemented in the field.

In the world of mining, mine measurement is very important to learn because it relates to construction, exploration and exploitation. Measurements in the world of mining play a very important role because from the results of survey mapping surveys in the field data will be obtained regarding mine progress surveys, excavation directions and elevation of the mining area and from this mapping survey it can also calculate the volume of overburden and uncovered coal, so that Surveys are an engineering part that plays an important role in the company and the results of measurements carried out by the survey team will be used as a reference in production calculations.

Calculation of production volume of overburden applied by PT Lematang Coal Lestasi is done by using software, namely Minescape 5.7 Software. Minescape 5.7 software is one of the integrated software designed for the mining industry, while another alternative is used by PT Lematang Coal Lestasi to find out the volume excavated using AutoCAD 2009 and calculate the transport equipment rate multiplied by the average capacity of the mechanical equipment vessel the results of which are recorded by the Checker. However, the calculations carried out by the checkers are still used as a reference or benchmark for reporting production results to the owner.

Scope of problem
The limitations of this research problem are:
1. This research is focused on the design of the west to east overburden front, elevation +10 to 0 and the calculation of cut and fill volume overburden planning and the joint results with Minescape software version 5.7 in May 2022.
2. The method used is Minescape version 5.7 software.

Research Objectives
The purpose of implementing this research are:
1. Designing a front overburden from west to east with an elevation of +10 to 0 and calculating the volume of cut and fill overburden planning and the results of the joint use the Minescape Version 5.7 software and in the PT XYZ mining area in May 2022.
2. Comparing the amount of cut and fill volume from survey activities *planning* with the result of joining the field in the mining area of PT XYZ.
3. Looking for the factors causing the difference in the calculation of overburden volume using Minescape version 5.7 software at PT XYZ.

Research Benefits
The benefits of research are:
1. Be able to find out the amount of cut and fill volume resulting from planning and joining surveys using Minescape Version 5.7 software in the mining area of PT XYZ.
2. Obtain the difference from the comparison of cut and fill volumes from survey activities in the mining area of PT XYZ.
3. Can find out the factors that can cause the difference between the calculation of cut and fill volume with Minescape software version 5.7.

2. LITERATURE REVIEW
Mapping Survey Tool
Mine planning is planning that can include prospecting, exploration, feasibility studies Mining preparation and construction of mining infrastructure and facilities, occupational health and safety (K3), environmental processing and monitoring (MAJ Martadinata, 2019).

Planning Function
According to (Farhan Lubis, Jelly, 2017) the planning function depends on the type of planning used and the intended goals, but in general the planning function can be stated as follows:

Planning Objectives
The objective of the mine planning stage is to establish mine production for an ore deposit that will (MAJ Mardianata, Sepriadi, 2019):

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Method of Stripping Overburden

The thing that must be considered in overburden stripping is the stages of excavation that must be carried out correctly, namely the digging of topsoil must be separated from the overburden underneath. This is intended so that during the reclamation of ex-mining land, technically the nature and characteristics of the humus soil and the soil beneath it are very much different (Suderajat, 2013).

Methods of Calculation of Coal Reserves

Coal reserves are important in determining the economics of deposit mining. The level of certainty of estimated reserves determines the risk of the economic feasibility of the mine and guarantees return on capital (capital investment). The estimation of coal resources and reserves includes the classification (categorization) of the calculation of coal resources and reserves.

The calculation of these reserves is the most vital thing in exploration activities. The calculation referred to here starts from the resources to the reserves that can be mined which is the final stage of the exploration process. The results of the calculation of mineable reserves will then be used to evaluate whether a planned mining activity is feasible for mining or not. The reserve calculation methods include:

1. **Cross Section Method**

    The cross section method is a resource estimation method which has the main stages of dividing the deposit into blocks by creating a geological section at certain intervals where the distance is the same or different according to the geological conditions and mining needs (Popoff Constantine, 1966).

2. **Polygon Method**

    The polygon method is a simple method compared to other methods, because the calculation of deposit reserves does not pay much attention to the patial structure of the area to be observed and does not pay much attention to data from the surrounding drill points.

3. **Kriging method**

    Kriging is a geostatistical method used to estimate the value of a point or block as a linear combination of the sample values around the point to be estimated.

4. **Isoline Method**

    The isoline method is a method used for ore deposits where the thickness and grade decrease from the middle to the edge of the deposit. Isoline is a curve that connects points that have the same quantitative value, this method is used with the assumption that the value is between two continuous points and changes gradually

Point Marks - Points in the Field and Their Uses

According to (Yusuf and Hamzah 2020) for surveying land, both measuring distances and measuring angles, equipment and tools are needed. According to their nature and use, survey and mapping points can be divided into 2, namely:

Polygon Measurement

In the context of measuring the mapping of an area using the terrestrial method, first the measurement of the basic framework of the area is carried out through the distribution of the basic framework points and a polygon measurement is carried out, namely measuring angles and distances to the basic framework points.

Mapping Survey Tool

Survey and mapping work is a job that requires a high degree of accuracy so that equipment is needed to support the success of the work.

Stative Measurement and Setting Procedure

Default V90 static data is not in the RINEX format, if you want to use the RINEX format, settings must be made in the GNSS Receiver Manager Software software. Connect the device to a PC or laptop device → select the appropriate COM → select open → then select the static menu → check the RINEX record → select set → when finished select Close.

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Minescape Software Version 5.7

Minescape is an integrated mine planning software specifically designed for the mining industry covering all aspects of mine technical information, from exploration data to mine production scheduling. A fundamental part of Minescape is its open system features and expandability.
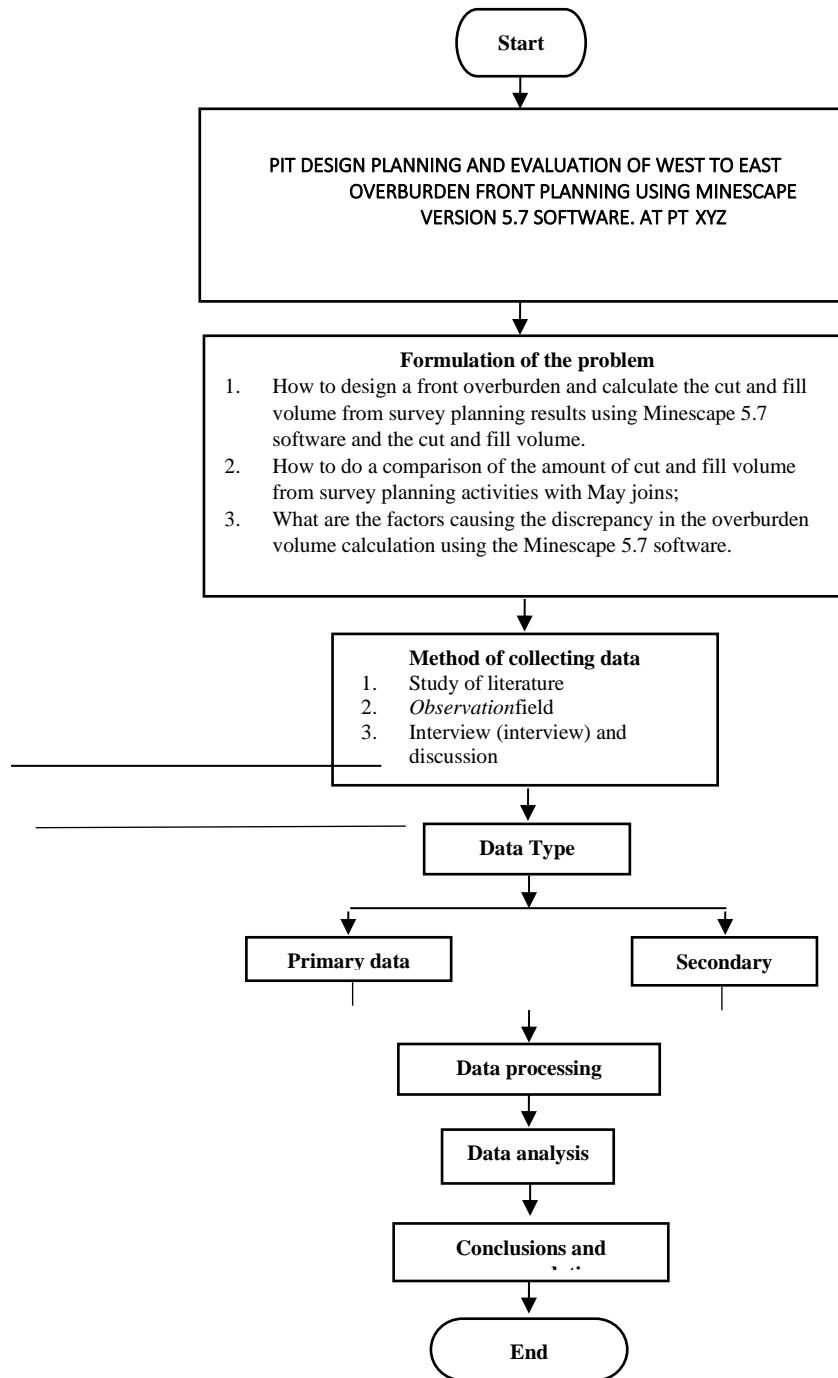
3. RESEARCH METHOD

Types of Research

The type of research used in this research is descriptive research with data in the form of quantitative. This research is meant to investigate the circumstances, conditions or other things that have been mentioned, the results of which are obtained in the form of research reports. For this research, it uses primary and secondary data.

Time and Place of Research

This implementation was carried out on May 25 2022 to June 25 2022. The research location and data collection were carried out at PT XYZ, Job Site, Muara Enim Regency, and South Sumatra Province.

Research Flow Chart

The research method used in this research as shown in Figure 3.1 is:

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Figure 3.1 Research Flow Chart

Research Methods

This research method is as follows:

1. Observation

   Observation is a method that is carried out by conducting direct observations regarding the activities of measuring and taking coordinates and elevation points +10 meters above sea level to 0 meters above sea level in the East to West Pit of Ovenburden to get a comprehensive picture of how the procedure for measuring and processing data is in the mining area of PT XYZ.

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2. Data retrieval
   The type of data taken in the studythis is :
   a. Primary Data
      Primary data is data collection that is carried out directly from the field. This primary data includes taking the coordinates along with the elevation of the point coordinates that have been taken in the mining area as well as photos and documentation mine site at PT XYZ.
   b. Secondary Data
      Secondary data, namely data collection and library archives of PT XYZ as library material for this research report. This secondary data includes topographical planning maps for May, May joint maps and data from cut and fil planning results and ovenburden production joins.

Interview (Interview)

Interview (Interview) is a data collection technique with hold direct communication and discussion with field supervisors and employees in the office and mining area at PT XYZ.

Data Processing

Data Processing is the process of processing and analyzing all data obtained both from field observations, data collection and direct interviews with employees of PT XYZ.

Results and Discussion

Results and Discussion are the results of data processing and analysis in the form of mine planning maps, topographic maps in May 2022, contour maps in May 2022, Overburden volume cut and fill in May 2022, and results of comparisons between volume cut and fill planning calculations and data join.

Data Analysis

Data analysis is the process of analyzing the factors causing the difference between overburden production volume calculations and Minescape version 5.7 software.

Conclusions and Suggestions

Conclusions and suggestions are conclusions drawn based on the results of data processing in the implementation so that from the results of data processing it is hoped that field study problems can be solved regarding the factors causing the difference between the calculation of overburden production volume and minescape software so that it can increase production and increase profits for the company.Conclusions and recommendations

3. RESULTS AND ANALYSIS
Research Results

1. **Front Overburden Design Making Process**
   The process of making front overburden designs and calculating cut and fill volumes with Minescape software version 5.7 can be done in the following steps.
2. **Measurement and Data RecordingRetrieval of Elevation Coordinate Points Using the High target V30 Plus rtk.**
   Activities for taking coordinates and recording data and elevation using the high target v30 plus tool. The process of measurement and data collection was carried out at PT XYZ. The steps in the process of taking coordinates and recording elevation data use the high target v30 plus.
3. *Download data from the high target v30 plus rtk tool to the computer*
   From the results of taking coordinate point measurement data during field measurements, raw data is obtained. The measured data is exported first to the computer for the next data processing stage, via USB which is already available on the high target v30 plus device. Then the data will be imported to the laptop.
   For the process of changing data formats and exporting data from the device to the computer. Can be seen in Figure 4.1.
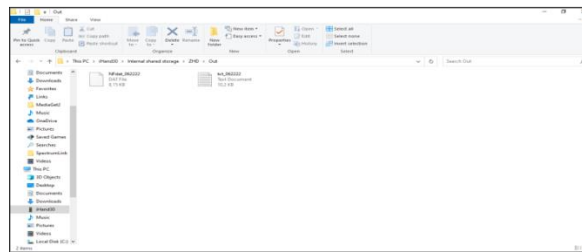
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Figure 4.1 Download Data from High Target v30 Plus to Computer

4. *Editing and Processing of Coordinate Point Data on a Computer*

After all the data from the High Target V30 Plus tool has been copied to the flash drive, the next step is to make edits via Microsoft Excel. It can be seen that the data cannot be exported to the computer because the format is still SDR and the data is still messy, this cannot be read by the Minescape software.

5. *Making a Monthly Planning Map*

In the process of making a monthly planning map, the data to be combined is daily data such as roof, floor, disposal area, roads and coordinate point measurements in the field, the daily data is made one unit into data per week and from the data per week it is combined so that it becomes a map. monthly planning which volume will be calculated, and will be reported to the owner as the owner of the IUP.

6. *Topographic Map Making*

The topographic map aims to determine the condition of the mining area, because this topographic map will be used as a reference or as a top surface in cut and fill volume calculations with minescape vision 5.7 software. The topographic map used is the topographical map for March which has been combined with progress at the end of April so that the topographic map for April will be used as the top in calculating the cut and fill volume in May.

7. **Contour Map Making Process**

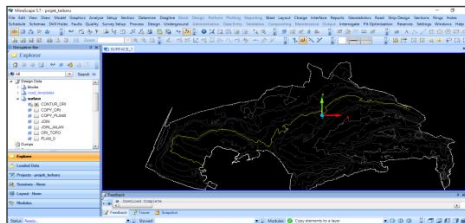This process aims to make it easier to know the elevation to be designed.

Figure 4.5 Contour map

8. **West to East Front Overburden Design Process Elevation +10 to 0**

This process aims to show the actual appearance of the field, but the Minesscape software only displays three-dimensional images but is exactly the same as the appearance on the ground as can be seen in Figure 4.6.
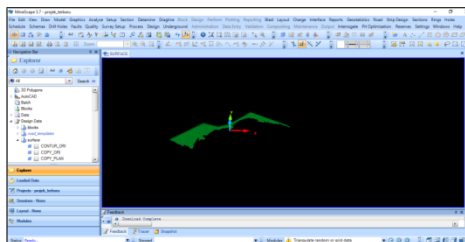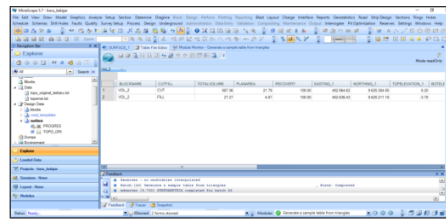

Figure 4.6 May Planning Design

9. **Calculation of Volume Cut and Fill Planning for May Overburden**

One of the software that is often used in the mining world which is often used for cut and fill volume calculations Using Minesscape Software Version 5.7

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Figure 4.7 Results of Volume Cut and Fill Planning for May

10. **Calculation of Cut and Fill Overburden Volume Results of Joins in May Using MinesScape Software Version 5.7 in May**

   One of the software that is often used in the mining world which is often used for cut and fill volume calculations is Minescape software, because Minescape software has the right level of accuracy in describing the original real shape in the field. Because in the Minescape software the shape of the triangle is clearer even with the relatively close distance of the crest and toe coordinate points, it can be seen clearly so that it makes it easier to make planning maps. The steps for calculating cut and fill in May with Minescape software version 5.7 can be seen in Appendix 7. The results of calculating cut and fill volumes combined with Minescape software version 5.7 can be seen in Figure 4.8.
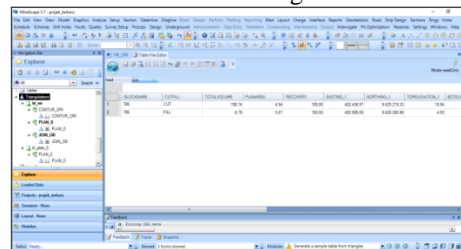
Figure 4.8 Results of Volume Cut and Fill Join for May

Discussion

1. **Comparison of Volume Overburden Cut and fill Planning and Join using Minescape Software Version 5.7**

   From the results of data processing and the creation of mining area maps carried out by PT XYZ surveyors using Minescape Verson 5.7 software and also obtaining the total cut and fill volume as a whole (all planning) PT XYZ only excavates overburden while for coal getting activities it is carried out by PT ghemmi, The results of calculating the volume cut and fill planning and joining with the Minescape 5.7 software aim to find out the difference between the two calculation results which can increase profits for both companies. For more details, see Table 4.1.

Table 4.1 Data Cut and Fill Planning

*Software*minecraft 5.7	
Cut	587,79
Fill	27,27

Table 4.2 Data Cut and Fill Join

*Software*minecraft 5.7	
cut	158.79
Fill	6,79

2. **Factors Causing the Difference between Those Affecting the Calculation of Volume Cut and Fill Data Planning and Data Join Using Minescape Software Version 5.7.**
   a. An avalanche occurred in the excavation area.

   As a result of high rainfall and lack of supervision on the slope bench, it causes landslides in the excavation area. Excavation has been carried out in this area and the results have been recorded by the checkers. As a result of the occurrence of this landslide, it will pile up the area that has been

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excavated. It should be in the area where the measurement will be carried out, but due to the occurrence of an avalanche, the measurement cannot be carried out because in this area the prism stick is invisible and dangerous for the survey workers themselves so that the volume of the survey results will be down.Can be seen in Figure 4.9.

Figure 4.9 Landslides in the Excavation Area

b.   Weather factor

One of the determining factors for interference when taking coordinate points is the weather. 4.10.

Figure 4.10. Weather Factor

c.   Causative Factors From the Mapping Survey Measurement Results

Laying out coordinate points that are less effectiveIt is less effective so that the data input code is wrong or there is also signal interference due to something being obstructed during data collection in the field and can be seen onin Figure 4.11.

Figure 4.11 Placement of Coordinate Points

d.   Less than optimal the production team maximizes the progress provided by the company.

This process is excavation that has been planned for the month of May which has been given by the company and the production party in charge of carrying out the planning until the target desired by the company is achieved, which can be seen in Figure 4.12.

Figure 4.12 Excavation Process

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CONCLUSION

Based on the discussion that has been done, it can be concluded as follows:

Based on the results of research analysis in the field, the following conclusions are obtained:

1. The process of making the design and calculating the cut and fill volume was obtained. The results of calculations with the Minescape Vision 5.7 software in May resulted in an overburden volume of 587.36 BCM

2. From the results of the analysis regarding the comparison between calculations with the Minescape software, it is obtained planning data and the results of joining the results for the cut is 428.62 and for the fill it is 20.48.

3. Factors causing the discrepancy between cut and fill planning and join calculations with Minescape software version 5.7.
   a) An avalanche occurred in the excavation area
   b) Causative Factors From Survey Measurement Results
   c) Weather factor
   d) The production team is less than optimal in maximizing the progress provided by the company.

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