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Identification of Asphalt Distribution and Thickness Using Drill Data

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ABSTRACTS

Cross section and block model of sediment is a method to determine the distribution and thickness of the deposition material is layered and constantly. The aim of this study to determine the direction of distribution of asphalt on the research area. Some of the activities carried out in advance starting from the analysis of core drilling, where this activity is to delineate the results of drilling activity to find out some impurities on the asphalt. Furthermore, the data obtained from the drilling include a collar of data, assay data, survey data and lithologic data is processed in tools that are customized. From the data processing result: string average A-A '17.571meters, string B-B' 14.142meters, string C-C '14.857meters, string D-D', 15meters string, E-E '11.142meters, string F-F' 12.75meters, and string G-G '15.833meters. From the results that have been obtained, it can be concluded that the average 14.47109 meters thick string and direction of spread slightly thickened to the west.

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INTRODUCTION

Asphalt is an important material in the construction of road infrastructure, whose existence greatly affects the quality and durability of roads. Natural asphalt resources are often found in various specific geological formations and are resources of high economic value (Akin et al., 2020). To maximize the potential of these resources, the identification of asphalt distribution and thickness is essential in the exploration of mineral resources. The drilling method is one of the main techniques used to obtain accurate geological data in the analysis of asphalt distribution and thickness (Jiang et al., 2018).

Research related to the distribution and thickness of asphalt has been carried out by various researchers with various approaches. Akin et al. (2020) used geophysical methods to identify asphalt distribution in specific sediment formations, while Jiang et al. (2018) demonstrated the reliability of drilling data in analyzing the thickness and composition of natural asphalt layers. Zhang et al. (2017) developed a geostatistical model to predict the distribution of asphalt based on drilling data, and Smith et al. (2016) compared the efficiency between drilling methods and remote sensing in the exploration of these resources. In addition, Li et al. (2015) integrated drilling data with satellite imagery to improve the accuracy of asphalt layer identification. In the Southeast Asia region, Omar et al. (2014) highlighted the potential for asphalt deposits through field data collection techniques. Shafique et al. (2013) used numerical simulations to predict asphalt distribution patterns in certain areas, while Ahmad et al. (2012) emphasized the importance of validating drilling data to ensure the consistency of exploration results. Furthermore, Williams et al. (2011) utilized GIS technology to efficiently map asphalt resources, and Wang et al. (2010) analyzed the relationship between geological characteristics and asphalt layer thickness in different regions. However, these studies still largely focus on geophysical and remote sensing methods, leaving room for a more integrated approach using direct drilling data.

Although many studies have been conducted to study the distribution and thickness of asphalt, most still focus on remote sensing or geophysical methods. Research specializing in the integration of drilling data with local geological analysis is still limited, especially in areas with complex geological formations. This leaves a gap in understanding the relationship between the asphalt distribution, its thickness, and its geological formations.

This research offers a new approach by integrating live drilling data to identify the distribution and thickness of asphalt within an area. This approach provides more accurate results than previous methods, especially in regions with complex geological structures. The purpose of this study is to identify the distribution and thickness of the asphalt layer using drilling data as the main method. This study aims to provide a deeper understanding of the natural asphalt distribution pattern and the relationship between the thickness of the asphalt layer and local geological characteristics. In addition, this research is expected to produce a new approach that is more accurate than previous methods, especially in areas with complex geological structures. Thus, the results of this research can be an important reference for more efficient and sustainable exploration of asphalt resources.

METHODS

In the research stage, the cross section and block model methods were used for the purpose of identifying the distribution and thickness of the asphalt. The data used is data from exploration drilling in an area of 175x175 meters with a space of 25 meters. The number of drill points from the data obtained is 50 drill points. From all the combinations of data that have been obtained, they are then input and compiled into *the Microsoft Excel application* where data in the form of coordinates from the deployment of drill points in the form of *assay, collar, survey,* and *lithology data* are stored in the form of *a save csv* type.

In this study, the author identified the distribution and thickness of asphalt using the help of software, namely *ArcGIS software* and *Surpac 6.5.1 software*. The determination of the estimation point depends on the spread. For example, a space of 25 meters with X = 25, Y = 25 and Z = 1 meter, according to an orderly grid, the determination of the vertical grid can vary for example 5 meters, 10 meters, up to 20 meters but the description is not detailed, what is used in companies is usually the grid value Z = 1 meter so that the description is more detailed.

RESULTS AND DISCUSSION

The drill point data that has been processed in *Microsoft excel* which includes the drill hole coordinate data is then input into *the ArcGIS software*. The drill points formed in *the arcgis software* are in the form of 2D which will show the pattern of the distribution of drill points from above the ground surface. The drill point can be seen in the image below. From the results of the data processing that has been carried out, the distribution of asphalt drill points is obtained, which from the results of the analysis shows that the asphalt distribution pattern is evenly distributed at each drill point.

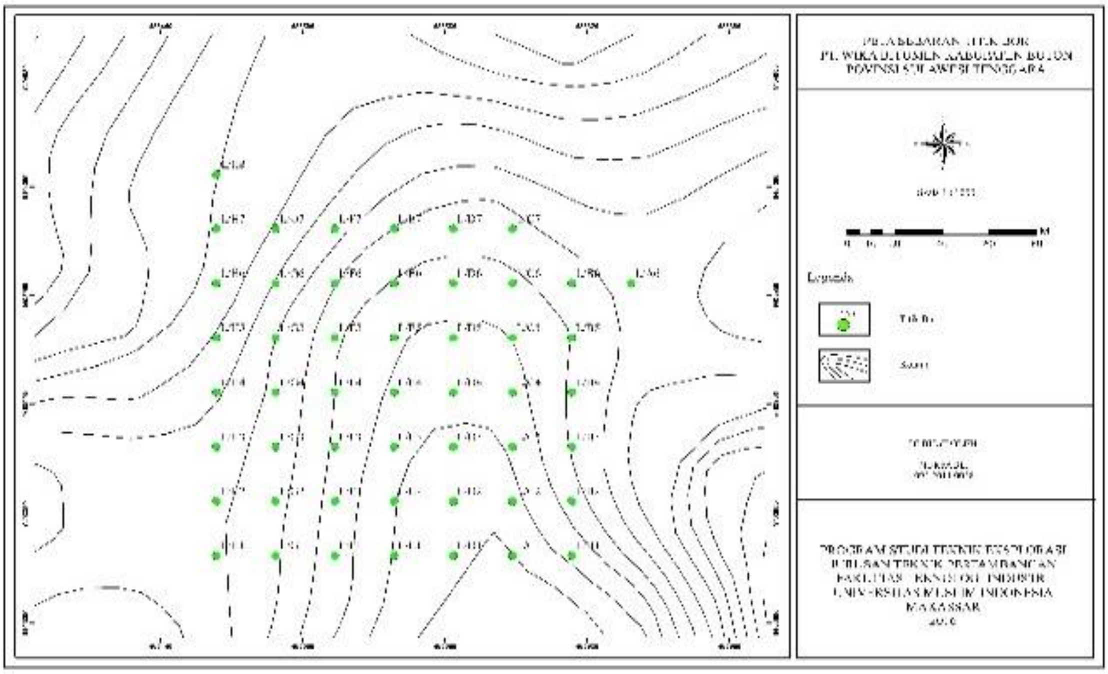

Figure 1. Map of the distribution of drill points.

The first step taken in estimating backups using *Gemcom Surpac* 6.5.1 software is to create *a database*. This *database* will then become a benchmark in the steps of creating model blocks in *Surpac 6.5.1* in the future. The components of the *database* are *assay*, *collar*, *lithology*, and *survey* data where all are available in csv file format. After the database creation is complete and the data has been imported, the next step is to move on.

A DTM is created from *string* data by forming a set of *non-overlapping*, adjacent triangles between points in *a string file*. The creation of model block constraints based on asphalt layers and their impurities is generated from *the Digital Terrain Model (DTM)* file, which is the shape of 3 dimensions obtained from *string* data, namely points that correlate *the top* and *bottom* points in the form of lines for each layer.

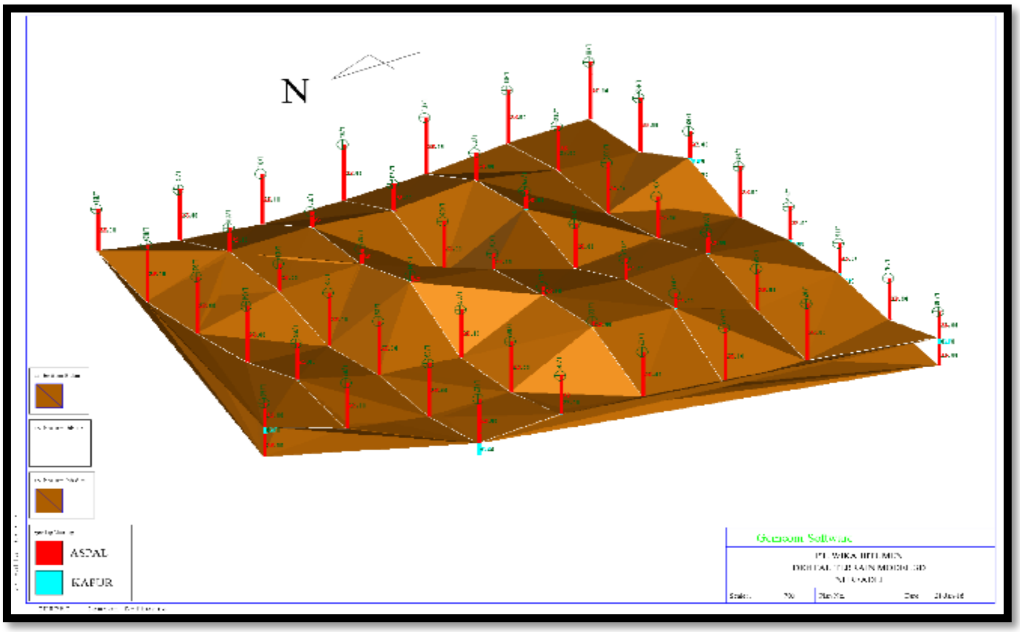

Figure 2. Correlation string lines for each *top* and *bottom* point on the asphalt of each hole.

A *string* is a three-dimensional sequence of coordinates describing some physical features, such as a line drawn in a sketch defining an important feature, as well as a string. *The* files generated in the mine are *strings,* such as contours, roadsides, boundaries of geological boundaries, stockpile ends, and others. All points defining a single *string* are stored in string sequence and assigned a common *string* number. To find out the average thickness of the asphalt, it is necessary to have a string result that correlates between *the top* and *bottom* points in each hole. For more details, you can see in the following picture.

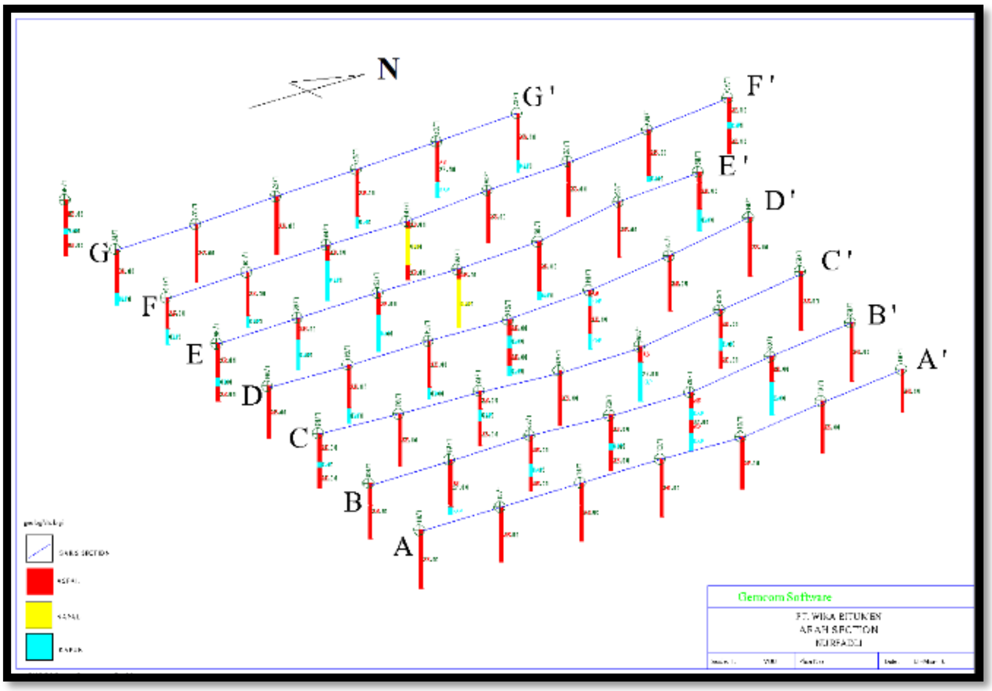

Figure 3. Section Direction

To determine the average thickness of each section, use the formula to find the average, namely:

$$\text{Average} = \frac{jumlah\ seluruh\ data}{banyak\ data}$$

Table 1. Average string results

String	Average String	Average Asphalt Thickness (M)
A-A'	17,571	14,47109
B-B'	14,142	
C-C'	14,857	
D-D'	15	
E-E'	11,142	
F-F'	12,75	
G-G'	15,833	

A model block is a form of *database* that provides a means for 3D modeling of the body of points and interval data such as *Drillhole sample* data. Provides a method for estimating the volume, tonnage, and average class of a 3D body from borehole data. Asphalt sediment modeling is an activity to find out the thickness of each layer of material in a three-dimensional form, from the coating we can find out the direction of the distribution of asphalt deposits or in which parts the asphalt deposits are thick and good for mining.

To make asphalt sediment model blocks, the required data is the data from drilling activities (drill *log data*). Furthermore, the *drill log* data obtained so that it can be used for the creation of model blocks is first separated into several parts, namely:

1. *Litology data* consists of: *hool id, dept from, dept to* and *lithology.*
2. *Data collar* consists of: *hool id*, coordinate points x, y, z, *dept* and *dip.*
3. *Survey data* consists of: *hool id, dept, dip* and *azimut.*
4. *Assay data* consists of: *hool id, dept from, dept to* and bitumen content.

Furthermore, the 4 data are input into *the surpac 6.5.1 program* to make the cross-section and block of the model. The images produced from the asphalt sediment model block making activities can be seen in the following figure.

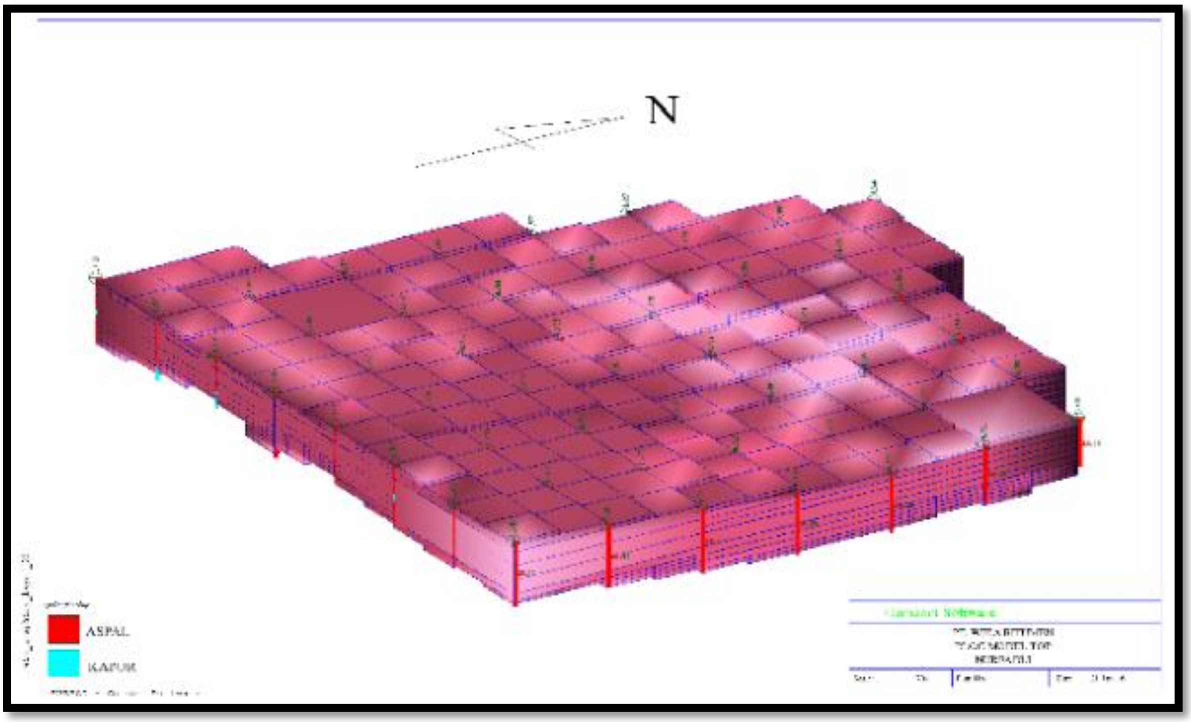

Figure 4. Top model blocks.

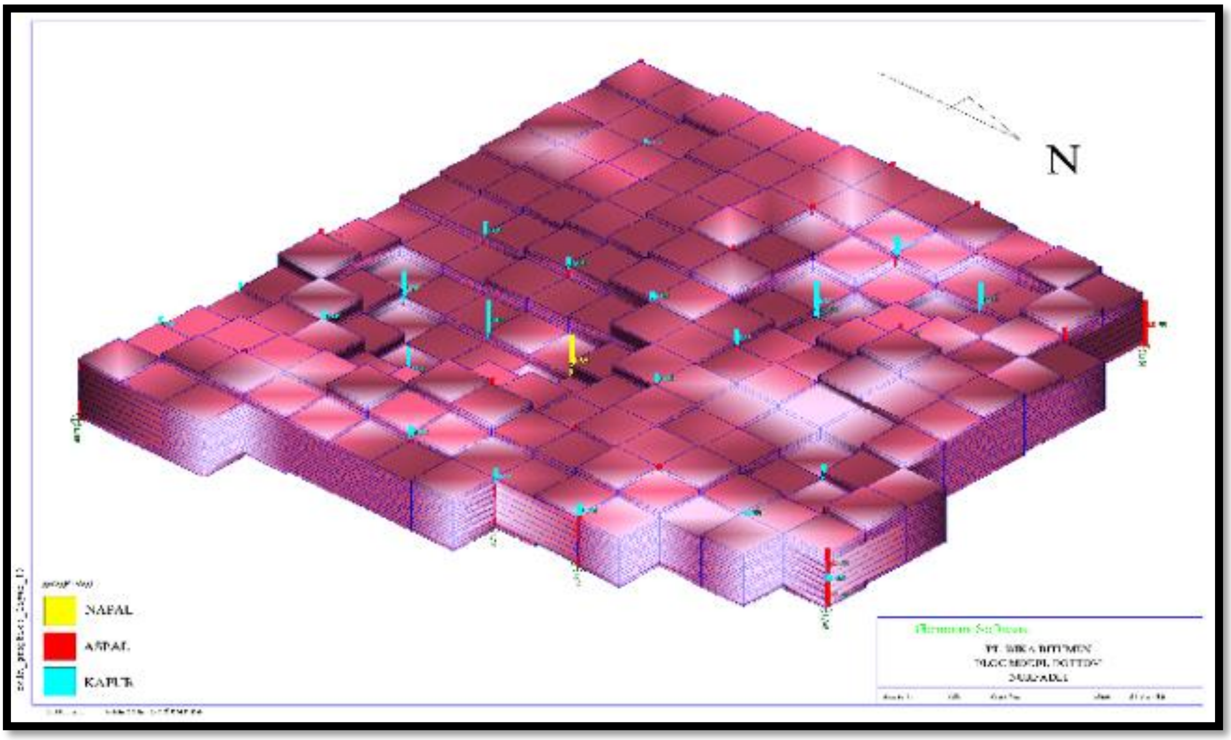

Figure 5. Bottom model block.

From the top model block drawing, it can be known the direction of the distribution of asphalt deposits or on any parts that are thickened because in the image each block is made different in color with the aim of making it easier to read the image in determining the direction of distribution and thickness of asphalt deposits. The bottom model block image is the bottom three-dimensional model block image. In the image it is very clear that the direction of the asphalt thickness varies greatly on each side of the model block. Some of the advantages of the results of the model blocks can be used as a reference or analysis data for subsequent mining planning, such as mining road planning and camp placement for employees later.

CONCLUSION

Based on the observations and results of data processing that have been carried out in the field, it can be concluded that the average spread and thickness of each *section* is 14.47109. From the results of each string, it can be concluded that the asphalt distribution pattern in the study area thickens towards the west.

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