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Analisis Desain Disposal Pada Penambangan Pt. Vale Indonesia, Tbk

Herichzon Tandiasa[1], Syamsuddin[2], Gina Audina[3] , Hendra Sani[4]
Program Studi Teknik Pertambangan, Fakultas Teknik Universitas Pejuang Republik Indonesia Indonesia
Email : gina.audina0111@gmail.com

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Abstract

PT Vale Indonesia Tbk (PTVI) is a subsidiary of Vale, a global mining company based in Brazil. Before being named PT Vale Indonesia Tbk, the company located in South Sulawesi was named PT International Nickel Indonesia Tbk. (PT INCO). The research problem is how to calculate the disposal design that requires later storage that can be used overburden material from the nearest Pit and the amount of geometry of each design that has been made. The method used to analyze using Vulcan software version 9.0, using formulas, interview methods and documentation. The results showed the total disposal design capacity of 12,213,531 (wmt), Disposal Storage Capacity of 18,791,082 (wmt) and Geometry s_disp_block_2g0_01: Slope Angle: 40^0, Number of Benches: 2 and Width of Storage: 40,791,082 (wmt) and Geometry s_disp_block_2g0_02: Slope Angle: 26^0, Number of Benches: 2 and Berm Width: 40m (40,835), Geometry s_disp_block_2g0_03: Angle of Slope: 34^0, Number of Benches: 2 and Width Width: 40m (40,835), Geometry s_disp_block_g04 Slope 45^0, Berm Width 42m (42,092), Number of Bench 5, 40 M), Slope Angle 45^0, Number of Benches 6, s_disp_block_2g0_05: Slope Angle: 34^0, Berm Width: 40,603 (41 M), Number of Benches 3. Number of overburden results from the nearest pit.

Keywords: Disposal,Overburden,Pit.

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INTRODUCTION

Indonesia has abundant mineral resources with significant economic value. These mineral resources have attracted many investors to open mining operations in various regions across the country. To obtain these minerals, excavation processes are carried out using either open-pit or underground mining methods. In open-pit mining, to extract the desired minerals, it is necessary to first remove the overburden or covering soil layer. The initial activity in the mining process is land clearing and overburden (OB) stripping. The main objective of this activity is to move the overburden layer using mechanical equipment so that the ore mining process can take place. The stripped overburden is then transported to a storage area commonly referred to as a disposal site.

Disposal is an area in an open-pit mining operation used for dumping low-grade material and/or non-ore material. This material must be excavated from the pit to obtain high-grade ore/material. The disposal site is typically in the form of a large pit, which is a former mining area (mine-out area) where mining activities have ceased. The overburden piled in the disposal area will eventually be revegetated or reforested by covering the top of the disposal with topsoil and planting vegetation. Mining activities at PT Vale Indonesia Tbk. are conducted on sites that are about to be mined, including land clearing and overburden stripping processes, which are then transported to the disposal area. These materials are the ones that need to be excavated from the pit in order to access the ore or high-grade material.

The design of disposal is crucial to support the smooth operation of mining activities, and from the disposal design, it is possible to determine the capacity of overburden that can be accommodated. The purpose of this research is to calculate the capacity of the planned disposal design, to assess whether the planned disposal storage can accommodate the overburden material from the nearest pit, and to analyze the geometry of each design that has been created.

METHODS

A. Data Collection

The data sources used in this research include both primary and secondary data. Primary data refers to data obtained directly from the field, including:

1. Topo Mine Out data (former mining area)
2. Disposal material data from the nearest pit, specifically from blocks 2b0_01 and 2h0_03.
   Secondary data consists of data collected and processed by others and is used as additional data sources, such as:
3. Regional geological structure data
4. Company profile
5. Mining location maps.

B. Data Processing

In this stage, data processing was carried out on the data that had been collected. The process steps involved are as follows:

1. To calculate the tonnage of a disposal area that has been created, the software **Vulcan 9.0** was used with the formula **Volume x Density OB**, where the density used is 1.82 (based on the testing conducted by the Geology Team of PT Vale Indonesia).
2. The tonnage obtained from the disposal plan is reduced by 30% (for some pits at PT Vale Indonesia that have already been mined out, only 70% of the capacity can be filled)..

RESULT AND DISCUSSION

In designing the disposal area at Bahadopi for PT Vale Indonesia Tbk.'s mining operations, the Vulcan 9.0 application is used. To calculate the disposal capacity, in this case, tonnage, the design ensures that the disposal created can accommodate non-economic materials and overburden materials. The researcher refers to the following data:

No	Material	Source (BM)	CoG	Sub-Area	Hill Name	Region	New Region	OBW (Wmt)	Waste (Wmt)	Ballast (Wmt)
1	RoM	t7222h01517_a6.bmf	1.6	Bahadopi Block 2	2b0_1	sp_bah160_6s_2b0_01.00t	2b0_1	6.774.984	25.025	1.156.001
2	RoM	t7222g01517_a6.bmf	1.6	Bahadopi Block 2	2g0_2	sp_bah160_6s_2g0_02.00t	2g0_2	3.140.804	-	533.937
3	RoM	t7222g01517_a6.bmf	1.6	Bahadopi Block 2	2g0_1	sp_bah160_6s_2g0_01.00t	2g0_1	2.193.252	-	372.053
4	RoM	t7142h01517_6s.bmf	1.6	Bahadopi Block 2	2h0_3	sp_bah160_6s_2h0_03.00t	2h0_3	3.578.982	59.925	618.614
								15.688.022	84.950	2.681.405
									TOTAL	18.454.377

1. **Disposal Storage Capacity**

   The reference for the waste material is 12,213,531 (wmt). The researcher created a disposal design and subsequently obtained the volume and tonnage, which are outlined as follows:

   The total capacity of the designed disposal is 26,844,403 (wmt), and this result has not yet been reduced by 30%. This is based on historical data and previous work in several pits that have already been mined out, where only 70% of the waste material can be accommodated. Therefore, the final result is as follows:

NO	NAME	VOLUME	DENSITY	KAPASITAS(Wmt)
1	s_disp_block_2g0_01	1.857.716	1,82	3.381.043
2	s_disp_block_2g0_02	1.619.134	1,82	2.946.824
3	s_disp_block_2g0_03	2.305.939	1,82	4.196.809
4	s_disp_block_2g0_04	6.981.637	1,82	12.706.579
5	s_disp_block_2g0_05	1.985.246	1,82	3.613.148
			TOTAL	26.844.403(Wmt)

NO	NAME	VOLUME	DENSITY	TONNAGE
1	s_disp_block_2g0_01	1.857.716	1,82	3.381.043
2	s_disp_block_2g0_02	1.619.134	1,82	2.946.824
3	s_disp_block_2g0_03	2.305.939	1,82	4.196.809
4	s_disp_block_2g0_04	6.981.637	1,82	12.706.579
5	s_disp_block_2g0_05	1.985.246	1,82	3.613.148
			Total -(30%)	**18.791.082 (Wmt)**

2. **Total Waste Material**

   a. **Total OBW, Waste, and Ballast 2B0 to Compartment 1**

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Region	OBW (Wmt)	Waste (Wmt)	Ballast (Wmt)	TOTAL
2b0_1	2.594.334	23.034	444.953	7.956.010
2b0_1H0	4.180.650	1.991	711.049	

b. Total OBW, Waste, and Ballast 2G0 to Compartment 2

Region	OBW (Wmt)	Waste (Wmt)	Ballast (Wmt)	TOTAL
2G0_02	705.441	-	119.925	3.674.741
2G0_02H0	2.435.363	-	414.012	

c. Total OBW, Waste, and Ballast 2G0 to Compartment 1

Region	OBW (Wmt)	Waste (Wmt)	Ballast (Wmt)	TOTAL
2G0_01	1.932.579	-	328.539	2.566.105
2G0_01H0	260.673	-	44.314	

d. Total OBW, Waste, and Ballast 2H0 to Compartment 3

Region	OBW (Wmt)	Waste (Wmt)	Ballast (Wmt)	TOTAL
2G0_03	3.521.972	59.925	608.922	4.257.521
2G0_03H0	57.010		9.692	

From the total data above, the formula used is OBW + WASTE + BALLAST from Blocks 2B0, 2H0, and 2G0, which is:

7,956,010 + 3,674,741 + 2,566,105 + 4,257,521 = 18,454,377 (wmt).

However, in this case, the researcher only focuses on the calculation results from Block 2B0 to Compartment 1 and 2H0 to Compartment 3, which are 7,956,010 + 4,257,521, totaling 12,213,531 (wmt). This is because the Topo Mine Out data provided by the Mining Department is only from one block, which is Block 2G0. This result serves as the basis for the disposal design based on the simulation plan, which will then be used to calculate the storage capacity (tonnage).

3. Geometry of Each Design that Has Been Made

a. s_disp_block_2g0_01

The height of this disposal is measured from the crest to the toe, which is 14 meters.

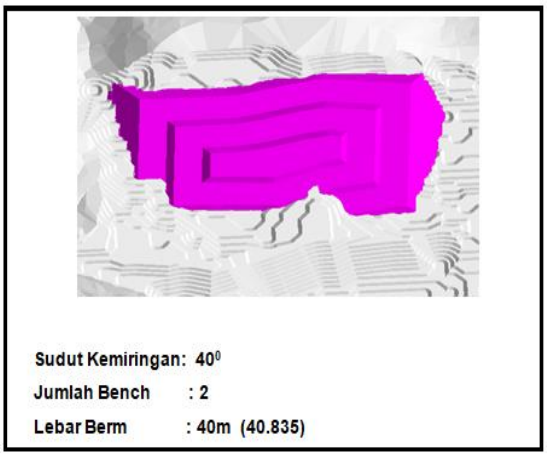

figure 1 a. s_disp_block_2g0_01

b. s_disp_block_2g0_02

The height of this disposal is measured from the crest to the toe, which is 26 meters.

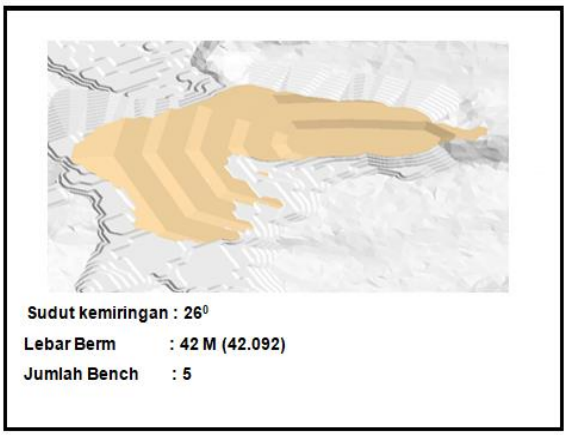

figure 2 b. s_disp_block_2g0_02

c. s_disp_block_2g0_03

The height of this disposal is measured from the crest to the toe, which is 12 meters.

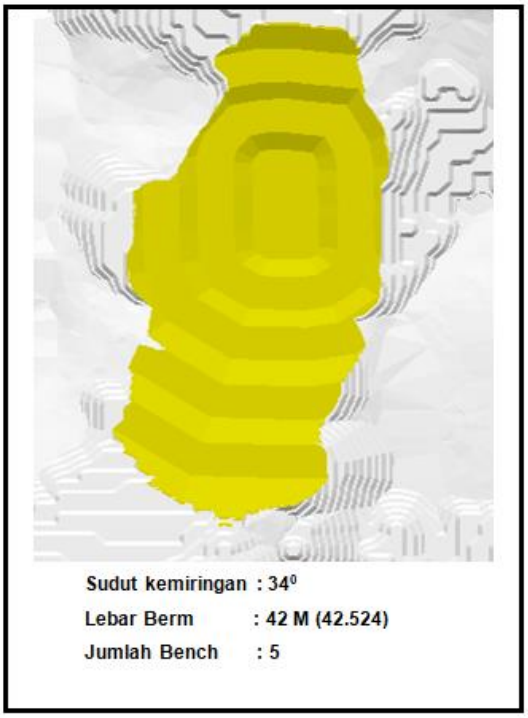

figure 3 c. s_disp_block_2g0_03

d. s_disp_block_2g0_04

The height of this disposal is measured from the crest to the toe, which is 29 meters.

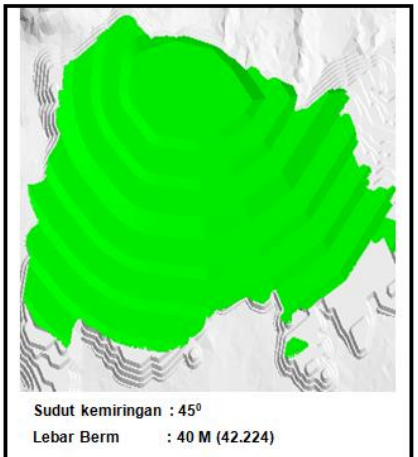

Figure 4 d. s_disp_block_2g0_04

e. s_disp_block_2g0_05

The height of this disposal is measured from the crest to the toe, which is 15 meters.

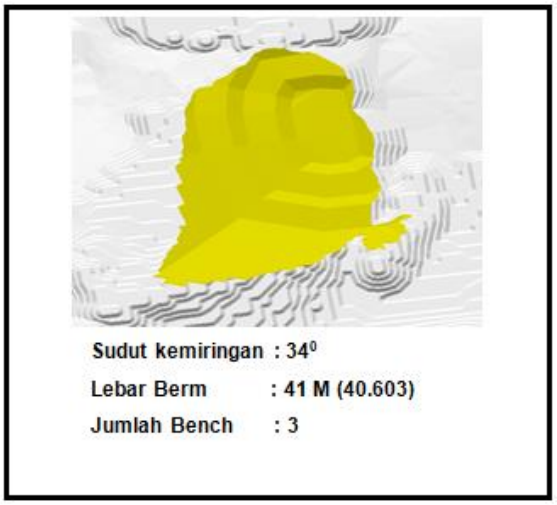

Figure 5 e. s_disp_block_2g0_05

In designing the disposal using Vulcan 9.0, several supporting data are used, such as Topo Mine Out (former mining area), which can be seen in Appendix I, and Resources data from several blocks in the Bahodopi area, which can be viewed in Appendix II.

The design of the disposal plan and the determination of the disposal storage capacity in the Bahodopi 2G0 block is carried out

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according to the steps outlined in the Standard Operating Procedure (SOP) from Geotech (Geotechnical Engineer), which has taken into account safety, environmental factors, distance, capacity, and several recommendations regarding the stability of the disposal slopes based on previous disposal cases at PT Vale Indonesia's mining operations.

To determine the height of the disposal, this can be viewed in Vulcan 9.0. In addition, the SOP created by PT Vale Indonesia's GeoTech Team includes several important considerations, such as:

a. Minimum berm width of 40 meters,
b. Bench height of 10 meters,
c. Slope angle of 26°.

These measures are implemented to prevent issues that have been encountered in previous disposal cases.

CONCLUSION

Based on the study conducted, the following conclusions were obtained by the author:

1. The tonnage in the disposal design is 18,791,082 (wmt), which is sufficient to accommodate the overburden according to the reference data of 12,213,531 (wmt).
2. The storage capacity of the five disposals created is 18,791,082 (wmt).
3. The geometry of each design is as follows:
   a. s_disp_block_2g0_01: Slope Angle: 40°, Number of Benches: 2, Berm Width: 40m (40.835)
   b. s_disp_block_2g0_02: Slope Angle: 26°, Berm Width: 42m (42.092), Number of Benches: 5
   c. s_disp_block_2g0_03: Slope Angle: 34°, Berm Width: 42.524m (42m), Number of Benches: 5
   d. s_disp_block_2g0_04: Berm Width: 40.224m (40m), Slope Angle: 45°, Number of Benches: 6
   e. s_disp_block_2g0_05: Slope Angle: 34°, Berm Width: 40.603m (41m), Number of Benches: 3

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