GREEN MINE OPTIMIZATION STRATEGY OF ACID MINE DRAINAGE PROTECTION: FUNDAMENTALLY SCENARIO OF SUSTAINABLE WATER CONTAMINANT MANAGEMENT IN COAL MINING PROJECT, CASE STUDY; SOUTH BLOCK AREA LAMIN SITE PT. MEGA ALAM SEJAHTERA EAST BORNEO INDONESIA

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Mining activity has been a huge contributor of human environmental disaster mostly in one decades in earth. The consequences of technology approach and natural resources to complete people daily need showed the implication about the effect of mining area which contacting to human directly that would be created unbalance system among mining and human life which the source problem was Acid Mine Drainage (AMD). AMD has been the ultimate cases in mining production in the world that effects to environmental pollution and prior catalyst caused the flawed of production target in number of mining companies. Green Mine Optimization Strategy was developed sustainable system to protect water contaminant existence who will be occurred in the source of mining excavation area. South Block Area Lamin Site PT. Mega Alam Sejahtera has been conducted by number of scenario methods were Vadoze zone coal water contaminant, Run off water encapsulation, Water Monitoring Point management which all methods used MINESCAPE 4.119 to support sustainable water contaminant of management modeling system so that could be described the pattern of water management scenario from pre mining, mining and mining closure in simultaneous water indications from inlet flow forming until outlet flow forming by optimum condition. Therefore, as fundamentally resulted it would be got the best AMD protection formula for entire of coal mining project in the world to resolve a discourse among mining and human life so that both of cases will be running together.

Keywords: Acid Mine Drainage, Green Mine Optimization Strategy, Scenario, Sustainable Water Contaminant; MINESCAPE 4.119.

1. INTRODUCTION

Successful of sustainable water contaminant does not necessarily end with the aesthetic restoration of local landscape (Gentile et al, 1997). A key component today as mine planning should be predicted a feasibility determination post-mining, post-reclamation, water quality and designing mitigation plan for defining a life of mine process from rainfall water inlet to outlet flow systems area on mine operation (Harter, 2014). Those are using sophisticated equipment to mining process but as the result of those technology also increase of potential chemical process caused the exposed of mining surface excavation (ford, 2003) which the implication would be created unbalanced integration system among water VS mining area discourses into increasing of mining sustainable plan. The largest Mining companies nowadays have a similar problem namely how to protect...
sulfide minerals contamination on run off water and oxygen absence in one package system that called Acid Mine Drainage (AMD) (Dharmappa et al., 1999). There are number of innovation research and technology from geology and mining innovation recently but they have not been already done to break this case. In hence, geology and mining focus to describe about mineral resources and mineral reserves without thinking about environmental so that the assessment of AMD always could not existed as a main problem in long term optimization plan but would be a dilemmatic decision among mining business and environmental human life (Kuyucak, 2006).

Mega Alam Sejahtera coal mining company has been determined number of scenarios to represent interaction process of green mine optimization strategy identification on this project.

South Block Area located in young labanan formation in Berau East Kalimantan which showed number of challenges for hydro geochemistry and mining modelling engineering characterizes. Based on data it place has number of parameters namely coal reserve separation in Strike 170° and Dip 5° was explained that coal modelling occurs is flat coal sequences, lithology structure consist of sand 49%, clay 31%, soil 8% and mud 12% (soil laboratory, 2015) which explained the implication of drift coal process that it has been made this area so wet and geological structure is unstable for mining architect plan so that engineering management design to handle of material movement should be obstruction, and also high of rainfall water volume in 4323199.02 m³/year per two reply period in year which it was indicated that this area has already done to prepare water monitoring point strategy for long term planning in early to start this project. All parameters would be integrated in one system to achieved green mining practice for taking water contaminant flow system problem plan (Engineering Department, 2015).

Therefore, this project should be established by systematically with mainly purposed could be represent mining technically overview and effect analysis to human beneficially would be run together in one mining optimization projects.

2. RESEARCH METHODOLOGY

Research methods of Green Mine Optimization Strategy to Protection Acid Mine Drainage has showed number of methods were Vadoze zone coal water contaminant identification which it explained the hierarchy of geological model to coal refuse area which it place water from surface zone would be mixed with coal exposed so that water, O², and sulfide met in one point that could be caused the generation forming of Acid Mine Drainage (AMD). Run off water encapsulation of material balancing was indicated the determination of material layer with Potential Acid Forming (PAF) and Non Acid Forming (NAF) toward the correlation of volume, porosity and hydraulic conductivity factors into precipitate water infiltration on water contaminant schematic and Water monitoring point management was presented schema of scenario water transportation from sump through drainage to catchment area and social environmental which all methods used MINESCAPE 4.119 to support modeling AMD protection simulation which it could be elaborated the mainly concept plan from pre mine, mining, and post mining in interacting between human life and mining operation.
3. RESULT AND DISCUSSION

3.1. Hydro Geochemistry Scenario

Material balance composition from south Block area was indicated by performing bore hole DP6RD1 to show of layer characteristics in research area which it would be presented in figure 3.1 namely:

![Figure 3.1 Bore Hole Lithology layer of AMD (Engineering Dept, 2014)](image)

Based on figure 3.1 could be developed waste management AMD of Disposal by dividing of layer material composition within backfilling area of mine out boundary so that minimize water in water table (coal expose) would be disappeared from pit front by encapsulation mine out area layer by layer until the end of mining sequences.

Acid water on pit front has not been fully completed over. In hence, water monitoring point (WMP) should be existed from pit front throughout catchment area and also until society environmental lived by transport acid water. It case could be schemed on figure 3.2 namely:

![Figure 3.2 Water Monitoring Point plan in south block area (Mine plan, 2015)](image)
Based on figure 3.2 described that Green mine optimization strategy to protect Acid Mine Drainage in south Block area could be occurred by interaction among mining operation and environmental plan in one package system sustainable mining optimization.

### 3.2. Vadoze Zone Water Contaminant Identification

Vadoze zone area would be designed in section plan area on south block area which it could be showed in figure 3.3 and 3.4 namely:

![Figure 3.3 Mapping layout Vadoze zone area](image1)

![Figure 3.4 Vadoze Zone Area section plan](image2)

Based on figure 3.3 and figure 3.4 indicated the modelling area of mining operation plan which it was occurred in south block area.

### 3.3. AMD Waste Management Protection Strategy

Encapsulation modelling by MINESCAPE software 4.119 which it show schematic of material balance from developing sequences plan to disposal plan that must composite and balance between cut volume in development area and fill volume in disposal area. It could be described in figure 3.5 and table 3.1 namely:
Based on figure 3.5 and table 3.1 there are 3 parameters to explain the correlation among water contaminant concentration, mining operational and waste management run off scenario of south block area namely material composition volume of disposal who consist of two parts which PAF material has high number of value against NAF material, porosity that indicated the ability of water to precipitate on number of materials by different particles and hydraulic conductivity was an ability of geologic materials to move ground (Johnson & Hallberg, 2004) which those parameters could be illustrated that the three parameters should be observed on the same time for creating an encapsulate of run off on mining front caused mining activity and rainfall. Those problems could be analyzed in figure 3.6 and 3.7 namely:

Based on Figure 3.6 and 3.7 could be explained that PAF material is 69% and NAF material is 41% show indicated that material composition has been achieved the percentage disposal design to encapsulate this area and also the correlation of porosity and hydraulic conductivity into achieved the precipitation gab could be controlled by PAF layer on above 0.001 - 100 m/s hydraulic conductivity and 50 – 65 % porosity by higher precipitated and NAF layer on bellow 0.001 m/s.
hydraulic conductivity and 25 – 40% porosity by lower precipitated which both of cases NAF on top layer than PAF layer on down layer so that could be arrange the modeling of encapsulation run off disposal eventually there are a rest of water on pond to transport on water monitoring point to continue this area always running without water content on pit. Modeling of encapsulation method would be described on figure 3.8:

Figure 3.8 Waste Management Green Mine optimization

Based on figure 3.8 has been indicated that cut volume on mine development area and disposal was applicable balance so that it can be run together into mining operation activity and AMD protection system so that water on pit would be minimize so that would be occurred an sustainable interaction among material balance and water mine strategic.

3.4. Water Monitoring Point Management Modelling

Water monitoring point (WMP) management was a scenario that focus to reduce water from in pit area would be gone to catchment area so that pit condition always dry and water will be caught to recycle area to treat water be normally and will consume again to the society and environmental friendly (Ramli, 2013)

WMP strategies consist of three steps namely design parameter would be fulfilled acid water volume in pit area and out of mining area, pumping ability to calculate of pump duration of water acid and treatment area to secure water acid be normally and friendly to society and environmental. Design parameter start from rainfall plan target, forecast Sump and catchment area volume location in south block area. It will be showed from figure 3.9 for explaining water contaminant sustainable plan namely:
Based both of figure above have been got the resulted of water flow pumping system and Water Monitoring Point management namely:

**Table 3.2 Multi flow ability from in pit area toward WMP area**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before WMP scenario</th>
<th>After WMP Scenario</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>4.36</td>
<td>7.09</td>
<td>pH was Saline</td>
</tr>
<tr>
<td>TDS (Mg/l)</td>
<td>78</td>
<td>50</td>
<td>TDS was Decreased</td>
</tr>
</tbody>
</table>

**Table 3.3 Water monitoring point (WMP) management resulted**
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4. CONCLUSION

Based on the integration Acid Mine Drainage protection to sustainable water contaminant methods which consist of Vadoze zone coal water contaminant identification, AMD Waste management protection strategy, Water monitoring point (WMP) management could be founded AMD Protection Formula modelling which will bring a schematic design for water resource management in all mining in the world and especially on ASEAN Countries. It initially come from basic regional countries maritime conception of ASEAN which almost 65% water region including river, lake and ocean and the rest of 45 % was a land (WHO/UNICEF, 2008). The fact was brought the correlation of this research it would be brainstorm the important of sustainable water contaminant for human life in maritime countries so the implication if the research would be applicable thus the percentage of water contaminant from mining activity especially on coal mining project could be calculated and protected so the government as regulation power decision, Mining company as technically decision maker, and Academic as water contaminant modelling researcher could be determination a new concept for keeping our water sustainable plan and work together for finishing what the theme of this research talk about.

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REFERENCES


