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Research Article

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Benefit analysis and soil and water conservation programs of the Zhezhuang coal mine

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ABSTRACT

The construction of Zhezhuang coal mine has some impacts on the surrounding environment. This article provides scientific basis for soil erosion preventing, which can effectively control soil erosion in the project area and improve the ecological environment, safeguard the safe operation of the main project at the meantime.

Key words: soil; water; conservation; erosion

INTRODUCTION

Zhezhuang coal mine is located in GuiZhou province, Haozhang county, Zhezhuang township. The resource's geological reserves is 7.78 million tons, and the design recoverable reserves is 2.6012 million tons. The mine is 0.15 million tons scale per year, and service life is 12.4a. Project construction area covers 6.32hm^2. The static investment of the project is 19.46 million yuan.

The project area is the key provincial soil erosion management area and supervision district, dominated by water erosion, and is a mild loss of area. The average soil erosion modulus is 2239.32t/km^2 • a, and the allowable soil erosion modulus 500t/ km^2 • a.

2. FORECAST

According to the construction and production features, the new erosion factor is mainly the impact and effect of the landscape, vegetation, soil, hydrology etc. Layout for the main project construction organizations and construction process design, the project produce waste soil and residue and soil erosion, combined with the natural geographical conditions and the analysis and soil erosion characteristics, forecast results are as follows:

The soil and water conservation facility area destructed the project is 4.64hm^2, ladder Ping 2.21hm^2, shrub 0.89hm^2, waste grassland 1.54hm^2.

The total excavation of earthwork of the construction is 11120m^3, the backfilling earthwork 12360m^3, the abandoned earthwork 810m^3, debiting earthwork 2050m^3 (all natural square.)

The total of soil erosion caused by the project is 9854.17tons, added soil erosion 9591.39tons.

Forecasting, soil erosion of this project is mainly concentrated in the construction period and production run. The erosion area of construction period is the main industrial market area, the wind well area, the refuse dumping area and the sub system area; the production run of the main field area is gangue field. The above project area is important and difficult of soil erosion prevention and control.

If it does not take appropriate measures to control soil erosion caused by the construction, the project may result in greater soil erosion area. When the large amount of excavation earthwork of the construction, site preparation and suffering rainfall erosion, it will flow directly into the land, If not taking appropriate water conservation measures, it lead to fertility decline, and affect the production and living of local residents.

3. MEASURES

3.1 The General Layout of Soil Erosion Control Measures

- *The main industrial area*

The main industrial area includes the main production region, auxiliary production areas, working and living area, and coal storage area. The project will be a comprehensive design for the plant measures and the interim measures of main industrial area.

①Plant measures

Increase plant area by 1.28hm2 for soil and water conservation

Including 0.59hm2 of turf, 120 arborvitaes, 60 Cinnamomum camphoras, 60 osmanthuses; 225 Ligustrum quihouis, 225 Buxus microphyllas , 0.09hm2 of street trees and 150 camphor trees.

②Temporary measures

Temporary protection engineering measures: the temporary cut-off drains is 198m long, the area of cross section is 0.4 × 0.4m; temporary soil bags is 95m3.

- *Wind well* area

①Plant measures

Increase grass area by 0.09hm2 for soil and water conservation.

②Temporary measures

Temporary protection engineering measures: the temporary cut-off drains is 30m long, the area of cross section is 0.3 × 0.4m; temporary soil bags is 20m3.

- *Refuse dumping site area*

Refuse dumping site area includes the narrow gauge area and the discharge refuse area, refuse dumping site is located southwest of the mine shaft, covering 1.01hm2. The project will be a comprehensive design for the plant measures and the interim measures.

1) Plant measures in refuse dumping site area

Increase tree area by 0.31hm2 for soil and water conservation and, plant 1600 locusts.

2) Narrow gauge area

① Plant measures

② Increase grass area by 0.01 hm2 for soil and water conservation.

③ Temporary measures

Temporary protection engineering measures: the temporary cut-off drains is 20m long, the area of cross section is 0.3 × 0.4m.

- *Sub-system*

Sub-system areas are made up of six sub-regions: high pool area, water pipelines area, district substations, transmission line area, industrial site access road area and Ground blasting material reservoir. The “project” will be added to the substation site section Ditch and the area of plant measures and interim measures to conduct a comprehensive design.

1） Engineering measures
This area needs a rectangular cross section which has a 43m long, 0.4m wide, 0.4m high drainage, volume of excavation is 33.1 m3, rock of excavation is 14.2m3 , M7.5 mortar rubble is 28.8m^3, M10 cement mortar surface is 101.9m^2.

2） The plant measures
① High pool area
Ryegrass will be planted 0.01 hm2 mainly in venues around the tank excavation backfill.

② water pipelines area
Water pipelines after backfilling is required to restore vegetation and plant ryegrass whose area is 0.01m2.

③ Ground blasting material reservoir
Ryegrass will be planted 0.02hm2 around ground blasting material reservoir.

④ Industrial site access road area
Industrial site access road is 0.5km long , 100 trees will be planted on both sides of it, equivalent to an area of 0.06hm2 and ryegrass will be planted 0.05hm2 in idle land.

⑤ Substation area
Ryegrass will be planted 0.03hm2 in idle land around substation area.

⑥ Transmission Line Area
Restoring vegetables and planting ryegrass 0.01m2 in idle land around transmission line area after backfilling.

3) Temporary measures
Temporary protective measures for sub-system area: temporary cut-off drains 395m, temporary soil bags 375m3.

4) Mine Subsidence
Protective measures: protective coal pillar will be reserved in the appropriate protective goal and the surface cracks caused by subsidence will be taken measures such as stuffing and land reclamation.

3.2 Design for Soil and Water Conservation
- *Engineering measures*

1) Drain
The “project” designed a 43m long drain which is rectangular and takes M7.5 mortar rubble drains. The drain connects with natural river . It is 0.4m wide and 0.4m high. Its volume of excavation is 33.1 m3, rock of excavation is 14.2m3, M7.5 mortar rubble is 28.8m3, M10 cement mortar surface is 101.9m2.

2) Land Remediation
Land Remediation is mainly done by covering soil after backfilling and greening. The covering soil uses surface soil of every region. In the construction, surface soil should be dug and put on free space temporarily.

- Plant measures designed

Design principles of Grass Measures
Local conditions and stress points. Analyze planting site conditions, layout suitable grass species;
Suitable tree principle. choose suitable tree species, grasses species, etc.;
Combine beautification and greening with water and soil conservation.

1) Tree species selection
According to the climate of mine site, soil, soil erosion and other characteristics, the species to be selected for greening projects are: Camphor, Laurel, Black locust, Orientalis, Buxus microphylla Lobular privet; grasses are ryegrass.

BENEFIT ANALYSIS
After the project implements the measures of soil and water conservation, the benefit analysis is as follows:The remediation rate of disturbed surface area of the project area

$$\textit{the}\ \text{remediation rate of disturbed surface area} = \frac{\textit{the}\ \text{area of soil and water conservation measure}}{\text{disturbed area}} + \frac{\text{permanent construction area} + \text{surface area}}{\text{disturbed area}}$$

$$\frac{5.59hm^2}{5.87hm^2} \times 100\% = 95.4\%$$

- The degree of soil erosion

$$\textit{the}\ \text{degree of soil erosion} = \frac{\text{soil and water conservation aera}}{\text{area caused by soil erosion}}$$

$$\frac{2.68hm^2}{2.95hm^2} \times 100\% = 91\%$$

- Soil erosion control ratio

- The rate of slag block

$$\text{the rate of slag block} = \frac{\textit{the}\ \text{actual amount of slag block}}{\text{the total amount of waste water}}$$

$$\frac{5900m^3}{60200m^3} \times 100\% = 98.3\%$$

- Vegetation recovery coefficient

$$\text{vegetation recovery coeffcient} = \frac{\text{the area of plant measure}}{\text{area can be greened}}$$

$$\frac{1.89hm^2}{1.92hm^2} \times 100\% = 98.5\%$$

- Vegetation cover rate

$$\textit{vegetation}\ \text{cover rate} = \frac{\text{the total area of forest and grass}}{\text{the control area of responsibility}}$$

$$\frac{1.04hm^2}{1.055hm^2} \times 100\% = 28.08\%$$

3.2.1 Soil and Water Conservation

Through the implementation of the program, the disturbed surface area of the project area be fully integrated managed, and soil erosion and waste slag is effectively controlled. The amount of soil erosion will reduce to 1666t, and intensity of soil erosion in the project area from the original 2239tons / (km^2 • a) reduced to 600t / (km^2 • a).

3.2.2 Eco-Efficiency

Since the implementation of the program, the soil erosion of project area is effectively managed, and grass area is 1.89 km^2. In the construction process, the project area pay attention to the protection of undisturbed ground vegetation, especially fight against the construction project of soil erosion. It not only conserve water sources, and curb soil erosion, reducing pollution, greening the environment, and to improve the ecological environment of the project area and form a virtuous circle.

3.2.3 Social Benefits

After the implementation of the program, first, the construction would reduce the breakage of the environment, and the project area are greening and embellishing, creating ecological priority, social and economic sustainable development of social economy development and construction project. Second, As the drainage capacity of the slope of the project construction area and the surrounding areas increased, the project improve ability to withstand natural

disasters, so that benefiting local people. Third, the project area has been effectively controlled soil erosion, ensuring the safe operation of the main project.

CONCLUSION

4.1 The Zone Layout of Soil and Water Conservation

Stacking and transporting the excavation of earthwork as much and reasonable use as possible, it decreased waste soil and residue, to effectively reduce soil erosion. That is the key to control soil erosion of the project.

The implementation of soil and water conservation programs coordinates with the local soil and water conservation planning and regional governance program. Soil conservation prevention division of the project area combine with regional soil erosion control, so that administering regional soil erosion.

The next stage, the main project design units should invest Soil and water conservation measures and programs into the design of the main project, conducting further soil and water conservation measures design work. It adjusted, review, and deepen the content of the program design. In particular, gangue field should be designed in accordance with the soil and water conservation requirements and the requirements of tailings reservoir to further prepare the design work to ensure the stability and safety of tailings reservoir.

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