



Research on the Coal Energy of Coal Enterprise and Environmental Problem Under Circular Economy

LIU Meiyue^{1,*}; LI Hongyu¹; SONG Xiuchao¹

¹Assistant, Senior Staff Member, mainly engaged in Resource Economy and Management. Shandong University of Science and Technology Jinan Campus Shandong Jinan, 250023, China

*Corresponding author.

Address: Shandong University of Science and Technology, Shenglizhuang Road 17, Tianqiao District Jinan Shandong, 250023, China

Email: liumeiyuemm@163.com

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Abstract

Coal as a pillar of energy, which contributes a lot in our social economy. The coal enterprises are the representatives of our energy enterprises. In the long course of development, the traditional economic development model, such as overexploitation, over waste, insufficient utilization, has not only created serious wasting of resources and environmental destruction, but also hardly satisfy the need of economic development, and restrict the sustainable development process of the coal enterprises. The coal enterprises must transform from the traditional extensive coal industry to the circular economy multipurpose use sustainable industry to achieve sustainable development. Circular economy which can urge energy, environment and economy to coordinated development is an advanced development pattern. It is the inevitable choice when the coal enterprises research the new industrialization. This paper sets out from the coal enterprise develops circular economy, to illustrate strategic importance of circular economy to coal industry, to demonstrate the coal enterprises coal energy's effects to the environment, and propose related policies and measures, to realized a win-win situation of energy conservation and environmental conservation.

Key words: Coal enterprise; Circular economy; Coal; Environment

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INTRODUCTION

Our coal industry as a pillar of energy industry is very important in the national economy. Ever since a long time ago, coal has played an important role in the energy production and consumption, and for a fairly long time, coal will continue to be important in the energy mix. Nowadays coal energy produces 60% electric power of the world. China is a coal-fired power country. 76% of Pnmary energy consumption is coal in China. Increased coal consumption will cause significant environmental damage. The stive, SO₂ and NO_x discharged by coal represented 79%, 89% and 67% of total release in China. Our coal enterprises have played an important role in growth of the national economic, meanwhile the coal enterprises have also created serious wasting of resources, environmental pollution and ecological damage, great affected sustainable economic growth of the national economy and more difficultly realized their self sustainable development. In the stages of development, all of the coal enterprise should make the sustainable development as the important development plan. Developing circular economy pattern is the available track to radically solve the conflict of economic development, energy conservation and environmental conservation, and is also the important track to realize the coal enterprise sustainable development.

1. CONNOTATION OF CIRCULAR ECONOMY

Circular economy is short for hylic closed loop economy.

According to the direction of substance flowing, economy of traditional industry is a kind of unflow lineareconomy, namely resource-production-waste. The increase of linear economy relies on high strength mining and consuming resource, at the same time deeply destroying environment. Circular economy is an economic development model of promoting coordination and harmonious between human being and environment. It requires “Reducing, Reusing, Recycling” (3R) as standard of behavior of socio-economic activity. Organizing economic activity to a “Resource-Production-Renewable resource” reaction flow by deep ecology law, to realize “less mining, advance utilizing, less exhausting”, to maximally utilize import substance and energy, to enhance availability of resources and maximally reduce pollutant discharge and increase quality and benefit of economic operation. Figure 1 is flow chart of traditional linear economy and circular economy.

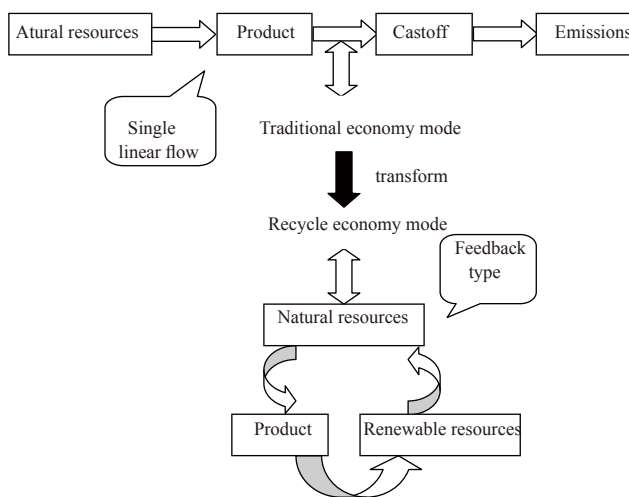


Figure 1
Recycle Economy and the Linear Economic Flow Chart

2. THE STRATEGIC SIGNIFICANCE OF COAL ENTERPRISES' DEVELOPMENT IN CIRCULAR ECONOMY

According to the 16th Party Congress of implementing scientific thought of development, forming harmonious society, and achieving sustainable development. The awareness of protecting environment and economizing on resources is continuously increasing among all Chinese citizens. The environmental problems of mining area are taking place at the centre stage. The government has published several good policies to encourage the coal enterprises to develop circular economy. The fifteenth regulation of the state council's comments about accelerate the development of circular economy determining that during 10th five years development plan of China, the government will continue to support the development of circular economy. All investment departments at all

levels need to increase their support to develop circular economy while issuing and implementing investment plans. Government needs to give support to projects, which related to developing circular economy and technology and industrialization demonstration, by giving direct investment, financial subsidy and discount loan; and also lead the non-governmental investments with the governmental investments. All financial institutions should also be supportive to projects related circular economy on financial aspect. Therefore, under the government policies which encourage on developing circular economy it has great strategic means for the coal enterprises to develop circular economy and sustainable mining area.

2.1 Increase Efficient Supply Ability of Coal Resource and Secure National Resources' Safety

During 10th five strategic developing years the output of coal resource increased around 1 billion tons, the average annual increase is around 200 million tons. In 2005 the total output reached 2.19 billion tons, the rapidly increase of coal resource output strongly support the national economy development. It is expected that China's need for coal resource will increase to 3 billion tons at 2020. In the future, coal resource will still be our primary national resource and has directly impact on national resources safety. However, the coal resource is still not fit with the higher requirements on steady and fast developing national economy, the supply of coal resource has many conflicts. For example, our recoverable reserves of coal resource per capita is low, but our consumption of coal resource per capita is rapidly increasing, our recoverable reserves of coal resource per capita is only half of the world average level. Coal resource is not renewable resource, the long-term efficient supply ability of coal resource in our country has dragged highly attention. In 2005, the output of coal resource was 2.19 billion tons which is more than one third of the world total output, the coal resource consumption intensity is continuously increasing. Therefore, it is vital to keep the scientific thought of development, to develop circular economy of coal resource, to focus and enhance coal resource recycle rate and utilization efficiency, and to increase the efficiency of resources supply by using fewer resources.

2.2 Transformation of the Traditional Development Mode of Coal Industry and Enhancement of Comprehensive Utility Efficiency of Resources

It is well known that most of the solid and liquid mineral compositions are usable resources, but they have been treated as rubbish and throw away. The reserves of associated ore of coal resource in China are huge, varied and high quality. One of the important ways to ease the issue among supply and needs of coal resource and help our national economy increase is to develop reserves of associated ore of coal resource, especially for coal resource-depleting mines. Through developing circular

economy, overall planning, systematic developing and efficiently extract associated ore of coal resource is vital to achieve comprehensive utility efficiency of resources.

2.3 Protecting Environment of Mining Area to Achieve Coordinated Development of Economy, Resources and Environment

In our country, 90% environment of coal mining areas is very weak, the damage of coal mining area's eco-system is transforming from structure damage to functional damage. The ecological service functions keep decreasing and the environment carrying capacity appears shortage. The reasons cause these are, firstly, during the extract process people damaged the original path of aquifer which cause the shortage of drinking water at certain regions, the damage to water conservancy projects and serious effect on agricultural industry. Secondly, the extract of coal has caused the surface subsidence, water loss and soil erosion, desertification and earth damage which caused by solid rubbish. Thirdly, the level of cleaner production and use of coal is low. Most of coal and gas has been directly exhausted to air which make the air pollution worse. In order to solve the problems between economy and environment and to achieve coordinated development of economy, society, environment and the extract of coal resource, it is necessary to develop circular economy, to imitate the way how eco-system operates and to reverse the end treatment and control the whole process.

2.4 Promote the Coordinated Development of Coal Resource, Relative Industry and Regional Economy and Achieve the Transformation of Economy Arise Style.

The circular economy in which its main character is developing resources – coal production – resources renewing stands for cyclic utilization of resources. It means not only expand the use of coal resource, for example generating electricity, and enhance economic performance but also reduces the waste maximally. Minimizing the cost of resources and environment to achieve the maximum economical and social benefit is helpful to transform coal resources based cities' economy and sustainable development, furthermore, it also promotes the coordinated development of coal resource, relative industry and regional economy and achieve the transformation of coal resource based economy arise style.

3. ANALYSIS OF THE RELEVANT EFFECT BETWEEN COAL ENERGY AND ENVIRONMENTAL PROBLEMS IN CIRCULAR ECONOMY

3.1 Coal Energy Coal Business Affect on the Environment

3.1.1 Coal Mining Affect on Land Resources

There are three aspects of coal mining affecting on land resources: Firstly, surface subsidence caused by underground mining, land utilization decreased, and increased soil erosion and desertification. The second is the effect of land surface mining, including the open excavation field of land destructive digging, and dump the pressure on the share of land. The third is pollution of solid coal waste.

3.1.2 Coal Mining affect on Water Resources

Including: (1) Mine water. Along with coal mining, large amounts of mine waste water impact that water table continue to drop. (2) Coal washing water. Another major pollution in coal mining is the coal washing water. "Wet washing coal" is widely used at present. However, this method produces a large number of coal washing water. (3) Coal dissolved watering. Accumulation of more and more gangue will not only using a large number of land resources, and also a large number of coal waste hazardous substances (especially heavy metal ions) penetrates through the ground water system by leaching and erosion of rainfall. Then, it causes water pollution of surrounding environment.

3.1.3 Coal Mining and Consumption affect on Atmospheric

Air pollution issues include: (1) Coal mine gas affect on the atmosphere environment. The release of coal mining in the coal mine gas is not only a major disaster in our country, and because of its greenhouse effect is 21 times greater than CO_2 , it is also the main cause global warming of the atmosphere gases.

(2) The spontaneous combustion of coal gangue affect on the atmosphere environment. In the spontaneous combustion of coal gangue, a large number of SO_2 , CO_2 , CO and other toxic and harmful gases are released.

(3) Combustion of coal affects on the environment. In china, a large number of coal combust directly and Inefficient combustion. Not only cause significant economic losses, but also the environment has caused serious damage in China. Coal combustion flue gas consisting mainly of CO_2 , CO , H_2O , SO_2 , SO_3 , NO_x , etc, and an excess amount of O_2 and N_2 and air into the smoke, in addition to a small amount of hydrocarbons and aldehydes, etc, which generate volume and coal, combustion and operating conditions and other factors. The sulfur pollution and dust pollution are serious.

① Sulfur pollution. With the higher sulfur content coal, SO_2 formation amount more. In addition to sulfate, the coal accounted for most of the sulfur, organic sulfur and pyrite sulfur in the combustion will produce SO_2 , and 80% of the SO_2 into the atmosphere. Sulfur pollution is serious acid rain pollution. Acid rain mainly due to fossil fuel consumption generated in the process of sulfur and nitrogen oxides into the atmosphere. It would have serious damage to forests, soil, water, crops, buildings, etc.

② Smoke pollution. Non-combustible coal minerals

contained impurities. Some of them are slag discharge. Others are the flue gas dust. When the smoke is greater than the atmospheric environment pollution is generated when the self-purification capacity. China's annual coal burning industrial boilers will be more than 600 million tons of soot emitted into the atmosphere. And it has become a serious urban air pollution particles the main reason.

3.1.4 The Storage and Transportation of Coal affect on the Environment

On coal transportation, the larger coal would be loss and it causes serious air pollution.

3.2 Under the Circular Economy the Means of Control the Coal Energy Impact on the Environment

As already mentioned above, the process of coal energy mining and the using generates many environmental problems. In order to sustainable healthy development for coal enterprises, we must straighten out the ideas, and coordinate the relationship of various elements of the development of circular economy process. According to the concept of eco-efficiency, to promote clean production, improve resource and energy use efficiency and reduce the amount of pollutants and emissions volume. By improving the technical level of utilizing the mineral resources, the limited mineral resources to be taken maximum good use and to accelerate the integration of the idea of circular and the enterprises practices and take the path of development of circular economy. Therefore, the following aspects should be focused on:

3.2.1 Production Intensification, Improve the Rate of Resource Recovery

To implement the strategy of big companies and large groups, to build high yield and efficiency intensification mine, relying on the resources, to rationally determine the scale of new mines, to encourage building the large and medium-sized mines and to limit the number of small mines, to reduce the coal coefficient from the source, to reduce waste. To materially change the production statement of the small coal mines from the technics, technology, equipment, etc, to improve the productive capacity and the recovery rate of small coal mines, and to maximally develop the utilized resources. According to the stipulation of the second part of Article VIII of < Opinions on promoting the coal industry to healthy development of State Department >: "Protection and rational utilization of coal resources. Revised standards and management methods of the recovery rate of production coal mine, the coal developmental item which designs the recovery rate is less than the te-specified standard shall not be approved and shall not be issued a mining license. Establishing a strict monitoring system of coal resources, implementing annual inspection and dynamic viscosity on the recovery rate of coal resources, if the recovery rate of the coal less than the standard,

should be ordered to make correction within a time limit; If the recovery rate still less than the standard over the time limit, should be punished according to law, until the mining permits and coal production license are revoked." Clearly, the coal enterprises is imperative to seek the mining method adapt to the condition of our country and the coal resource, enhance the mining area of the coal resources, make a new standard of the recovery rate of coal resources and management system, restrict using backward mode production and the low resource recovery mine.

3.2.2 Clean Coal Mining

Clean coal mining, based on the research and development of coal mining techniques, ground controlling and relevant experimental platform, is a producing process of coal mining which offers a solution to the eco-environmental problems caused by the traditional coal mining techniques. It involves the reduction of discharged refuse, earth surface subsidence, gas emissions, water resources deterioration and Material consumption. Clean coal mining is a part of clean producing that includes clean production and exploitation. According to he Chapter 4 Article 32 of China's Cleaner Production Promotion Law, "The Nation establishes a system of commendation and reward for cleaner production. The people's governments shall give commendations and rewards to those units and individuals that have made conspicuous achievements in the work of realizing cleaner production." Coal enterprises should make the most of the nation's provisional regulations on clean production and apply the advanced techniques and facilities, so as to reduce the pollution at source and improve the efficiency of resource utilization. Clean production, a producing process contrary to the traditional extensive industrial manufacturing, is the demand of the times, the trend of the world industrial development.

3.2.3 Research on the Pollution Control Techniques, Enhancing Harmless Disposal of Waste and Improving the Ecological Environment in Mining Areas

Coal mine water, coal gangue, coal slime, coal-bed gas, coal tar, coal ash and subsided land can be used as resources of producing so as to make the most of the waste and gain benefits in terms of economy, society and environment. According to The Administrative Measures for the Determination of Resources Comprehensive Utilization Encouraged by the State, enterprises that produce goods based on resources or techniques comprehensive utilization, after approved, can benefit from provisional regulations involving such as tax return. Under the provisional policies the government offers to enterprises about projects of resources utilization, coal mining enterprises should relate the short term to the long term as well as developing both traditional techniques and high technology.

(1) Making the most of coal gangue. Firstly, coal

gangue and coal slime can be used to generate electricity. Using coal gangue and coal slime as fuel to generate electricity can reduce the room gangue takes up and also environmental pollution. Secondly, coal gangue can be used to produce bricks. Coal gangue can be used as resources of producing perforated bearing-load brick with the help of vacuum-forming techniques and one setting-firing tunnel kiln. Thirdly, coal gangue can be used to produce cement. Using coal gangue instead of clay to produce cement can save the farmland as well as reduce cost.

(2) Exploitation of resources of coal-bed gas. Coal-bed gas is the most practical and reliable alternative energy among all the conventional gas in China. Exploiting the coal-bed gas before coal mining can prevent the coal gas accident from the root and improve the safety in production as well as reduce the construction fee of coal mines, which therefore increases the efficiency of production and economic benefits.

(3) Popularizing the application of coal mine water purification techniques and recycling the coal mine water. In a time of running short of water resources, coal mine water should be made full use of; and after advanced treatment, it can be used for production under coal mines,

power plant recycling water, ground dustproof greening, sanitary flushing, etc. Meanwhile, it can satisfy the demands of domestic water using most and make the most of the coal mine water resources.

(4) Comprehensive treatment of land subsidence. Firstly, using practices of fully mechanized caving mining to reduce the problem of surface subsidence. Secondly, making use of the coal gangue reclamation techniques, filling the subsidence area with coal gangue and coal ash, proceeding land reclamation and plant crops. Thirdly, constructing lakes and fishponds in the subsidence area, domestic sewage can be used as makeup water after primary purification, which not only improves the environment but also generate economic benefits.

(5) Enhancing exhaust gas control. Coal enterprises cause air pollution mainly due to the use of Coal-fired heating boiler and gas pumping-exhaust. While the efficiency of energy utilization is being increased, make the most of the waste according to the density of the gas and discharge so as to turn the harmful into the beneficial, which not only reduce the environmental pollution and cost but also increase enterprises' economic benefits. Figure 2 is the application of recycle economy in coal enterprise.

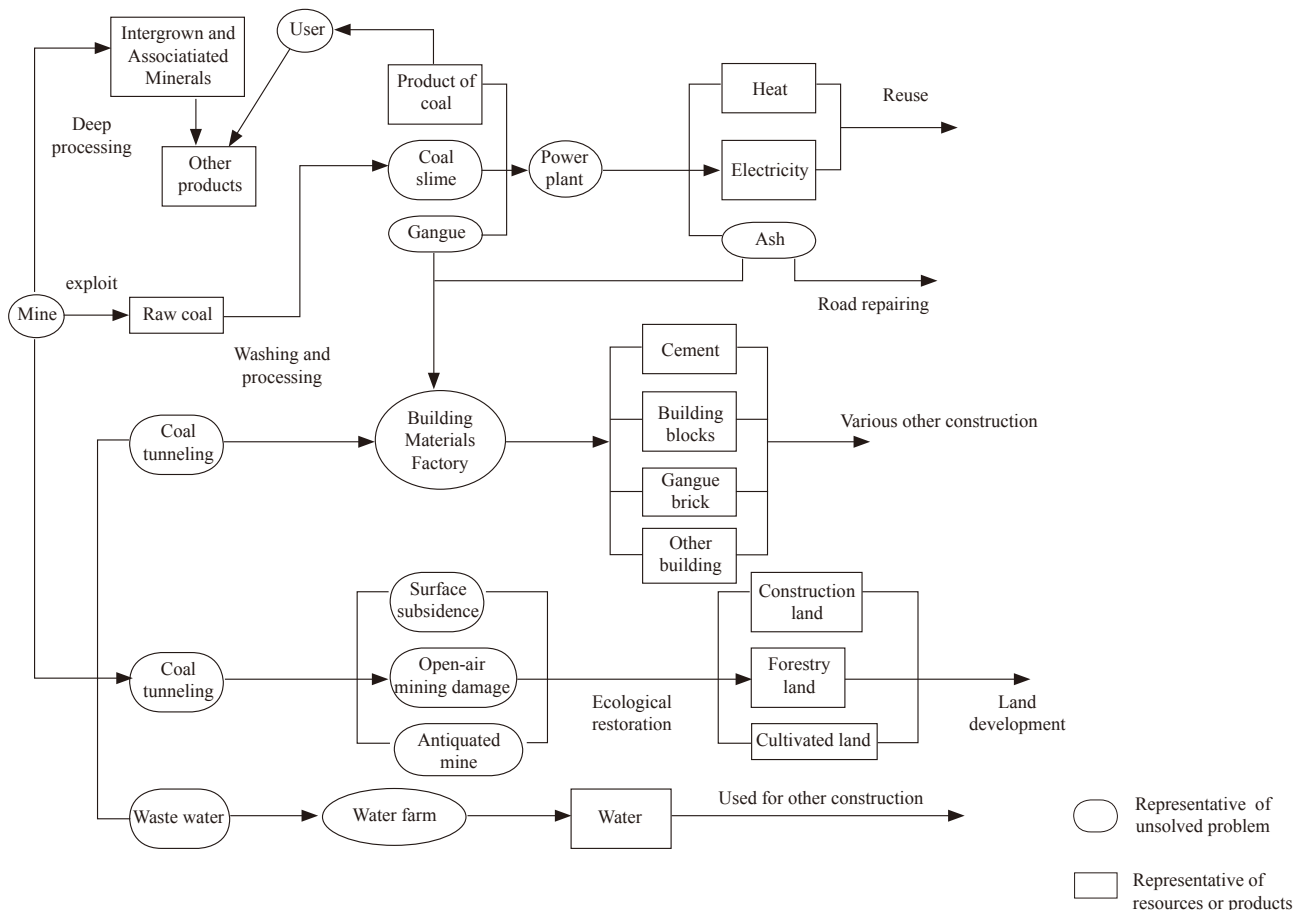


Figure 2
The Application of Recycle Economy in Coal Enterprise

CONCLUSIONS

Coal field as a leading industry of coal mining community, at the present time, must be directed by circular economy, must closely around the core of comprehensive cyclic resources utilization, develop circular economy of coal field. By building the cyclic utilization industry chain based on coal, associated resources with coal and the secondary resources in the development process, Its possible the briefly on the development threads, the guiding ideology and the realization approach of circular economy will be ultimately grasped and understand, more effectively make the policies, measures and programming to promote circular economy development, to drive mine clean producing, to promote the coal yield circular economy eco-industrial park to be formed, to step by step to circular economy, to achieve harmonious and sustainable development between energy and environment.

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