

Study on the Environmental Remediation Mode of Marine Industries

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Abstract—In this study, the environmental remediation mode of marine industries was investigated by using utilization of sea water in combination with thermal power generation. As an ocean state owning a broad sea frontier, China has a very great potential in development and utilization of marine resources. It is necessary in development of environmental remediation to seek for some modes differing from that of traditional terrestrial economy.

Keywords-remediation; marine industries; environment; sewage treatment

1. Introduction

Such resource and environmental problems as shortage of resources, large energy consumption and serious pollutant discharge have already become the main bottlenecks of China's economic development(see Table 1). Both government and enterprises of China are actively seeking for a road of sustainable development for future. Developing circular economy is not only very effective for decreasing material consumption and alleviating environmental pollution but a necessary response to new trade protectionism, the fundamental way out for relieving the current resource constraints of China and a key measure to improve the economic efficiency [1]. Fundamentally, developing circular economy is the essential requirement of China's efforts in putting people first and realizing sustainable development..

2. Methods

2.1. The characteristics of the development of China's circle economy, it is a kind of government-guided new exploration about industrial development mode.

In a bid to handle the increasingly serious domestic resource and environmental problems, Chinese government, basing itself on transferring the extensive mode in economic growth, made the strategic choice of developing circular economy at the turn of the century, regarding circular economy as an important means to put into practice the Scientific Outlook on Development and to realize the harmonious development between human and nature[2]. Chinese government, which is the primary advocator and leader of circular economy, has played a key role in developing circular economy. Through the implementation at all levels from the central leaders, the ministries of State Council to the local governments, the development level and scale of

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China's circular economy have realized the efficiency and strength based on the industrial guidance by government. Meanwhile, it has also resulted in that China's circular economy still has a top-down natural mode of policy-related industries, and whether or not it is active and sustainable needs to be tested by practice.

2.2. The stage features of China's circle economy result in its incompleteness and selective learning from the experience of other countries and regions.

Differing from the developed countries, China is facing two practical problems when developing circular economy: firstly, the circular economy of China has the disadvantages of late start, weak foundation and immature theoretical and practical experience; and secondly, China's economic development is still in the early and middle period of industrialization and is characterized by imperfect market and very low productivity, thus making such practical problems as the methods to realize economic aggregate growth and quality improvement and the method to handle the relation between economic development and employment are still primary problems for China to solve. Therefore, it is determined by China's actual conditions that the circular economy of China cannot employ the existing modes of other countries thoroughly [3].

3. Results and discussion

As an ocean state owning a broad sea frontier, China has a very great potential in development and utilization of marine resources(see Table 2). It is necessary in development of marine economy to seek for some modes differing from that of traditional terrestrial economy. The quantitative reduction of resource consumption is on the basis of scale economy. If scale economy is not realized, it will be difficult to minimize the resource consumption of unit output. One of the important ideas of marine circular economy on the social level is that land is regarded as an integral part of marine circular economy. Marine ecological system is the biggest ecological system in earth's biosphere, affecting land directly. Marine industries and terrestrial industries supplement each other. Most of the pollution and threats to marine environment come from terrestrial economy and society, and the realization of marine circular economy depends on the support and cooperation of relevant terrestrial industries.

Marine circular economy has social and economic activities guided by ecological laws and sees the symbiosis of different terrestrial and marine industrial chains and enterprises. Marine circular economy is therefore a diffusive great economic circulation on the social level, and it involves in land and maritime space. When in development marine circular economy, it is a must to start from the strategic and overall consideration, make out overall planning and comprehensive decisions for coastal industrial enterprises, coastal fishing villages and the tertiary industry, take advantage of the location advantages of coastal regions and ensure the comprehensively coordinated and sustainable development of human, oceans and society.

4. Conclusion

The core of environmental remediation mode is to the boost the construction of marine eco-industrial parks on the meso level and to form the industrial chain of circular economy for major marine industries. On the meso level, marine circular economy has a great development potential. Construction of marine eco-industrial parks can solve the fund and resource regeneration bottlenecks of the small circulation in marine enterprises effectively. At present, there are several mature industrial chain modes of marine circular economy as follows:

A. The industrial chain of marine circular economy taking marine fishery product processing industry as core: the marine fishery product processing is an industry generating rather serious environmental pollution mainly caused by wastes like the waste water and leftovers generated in processing, as well as a great quantity of waste shells generated in shellfish processing. The waste water generated in processing may be drained when meeting the standard after being treated in the sewage treatment plants. Thus, the core of the circular economy mode for the marine fishery product processing industry is the cyclic utilization of wastes. Let's take the processing of scallops for example. Scallop skirts are processed to be frozen products and instant food; the scallop shells and viscera are processed to be feed or refined seafood soy sauce; and the scallop shells may also be made into shell strings or used as the attaching base for feeding oysters. Dried small shrimps and crab shells are used to produce various products such as chitin, chitosan, methyl chitosan, glucosamine

hydrochloride and so on. The “zero discharge” of the marine fishery product processing industry may be basically realized through comprehensive utilization of wastes of fishery products.

B. The marine circular economy mode taking comprehensive utilization of sea water in combination with thermal power generation: in this mode, the residual heat of generator sets is used for sea water desalination; and the concentrated sea water drained in sea water desalination and the condensed cooling sea water drained from the thermal power plants are all led to the salt fields to produce intermediate brine water so that bromine may be extracted through bromine blowing by air. The extracted brine water is sent to the evaporation tank for continual evaporation so as to get saturated brine water. The saturated brine water is sent respectively to the crystallizing tank and the vacuum salt making plant and made into crude salt and refined salt. The residual salt-making mother solution is sent to the salt chemical production process to have all inorganic salts in it separated and to produce such chemical products as KCl, MgCl₂ and MgSO₄. By this time, the sea water has been fully utilized and can be drained into the sea without waste liquor, thus realizing “zero discharge”.

5. Acknowledgment

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6. References

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TABLE 1 COMPARISON ON THE RESOURCE EFFICIENCY OF CHINA AND OTHER COUNTRIES

	China	Japan	Austria	Netherlands	Germany	America
Population (million)	1250	127	8	16	82	273
Area (thousand km ²)	9597	378	84	41	357	9364
Population density (person/ km ²)	134	336	98	466	235	30
GDP (billion USD)	980.2	4078.9	210	384.3	2079.2	8351
Per capita GDP	3291	24041	23808	23052	22404	30600
GDP per km ² (0.1 billion USD/1,000 km ²)	1.02	107.9	25	93.7	58.2	8.9
TMR (million tons)	50000	5461	560	1056	6150	21840
Per capita TMR(t/person)	40	43	70	66	75	80
NAS(t/person)	16	9.7	11.5	8.3	11.5	7.7
Material strength (kg/USD)	51.01	1.34	2.67	2.75	2.96	2.62
Resource productivity (USD/t)	19.6	746.3	374.5	363.6	337.8	381.7

TABLE 2 COMPARISON ON THE CIRCULARE ECONOMY OF CHINA AND THAT OF THE DEVELOPED COUNTRIES

	Developed country	China
Development stage	Late period of industrialization	Early and middle period of industrialization
Problem	The treatment and disposal of the wastes generated in late period of industrialization	The serious conflict between economic growth and resources and environment
Connotation	An environmental management mode concerning end-of-pipe control	A new mode of economic growth taking the effective utilization of resources as core
Practice mode	Dupont's Model (enterprise), Kalundborg eco-industrial park (industrial park), and Kitakyushu recycling-oriented society (region)	The comprehensive implementation at three levels, i.e. cleaner production, eco-industrial park, and regional circular economy construction