Research on Process and Application of Environmental Activity Bade Costing Based On Life Cycle

Zhu Xiao-lin[1, a], Shang Fang-fang[2,b]

[1]*School of Business and Administration,University of Science and Technology Liaoning, Anshan, Liaoning, 114051*

[2]*School of Business and Administration,University of Science and Technology Liaoning, Anshan, Liaoning, 114051*

[a]*380768936@qq.com,* [b]*shangfangfang1988@126.com*

Abstract: Environmental cost accounting has great significance in the cost savings and the improvement of economic benefits, therefore it plays an important role in the overall environmental accounting. After introducing the basic theory of environmental cost and analyzing the defects existing in the traditional cost accounting model, this paper combines the life cycle costing and activity-based costing to research the environmental cost scientifically and comprehensively. It is advantageous to analyze environmental cost comprehensively, reduce the total cost of products, and improve the effectiveness of the enterprise's cost management decision.

Keywords: Environmental cost; Activity-based costing ; Life cycle costing

High speed development of economy brought a series of environmental problems, for example natural resources are exploited piratically, environmental pollution and ecological destruction, etc. In recent years, with the development of environmental protection has aroused the attention of the society, the voice for reducing environment pollution, reducing the energy consumption, improving resource efficiency and establishing the perfect environmental costs accounting system is becoming higher and higher. Manufacturing enterprises come to sense the importance of calculating system of the environment cost. Since the calculating system of the environment cost is not mature, there is much limitation in traditional cost accounting. So, it is essential to perfect cost accounting content and build up a new method of confirmation and measurement of environmental cost.

DEFINING BASIC CONCEPTIONS IN ENVIRONMENTAL COSTS

Environmental costs is the hot researching directions in the field of environment economy. The process of enterprises production, simultaneously also is a process which the resources being exhausted, the environment being polluted and the ecology being destroyed. The environmental cost means the price which pays for the behavior.

Product Life cycle consists concept and design phases , material manufacturing and processing phases ,product production phases ,product consume phases and recycling phases. To analyze every phase in the product life cycle can lead to a deeper understanding of environmental costs. Environmental costs can be divided into internal environmental costs and external environmental costs. Internal environmental costs is the cost for enterprises to take responsibility initiatively or is forced by the law. It includes pollution prevention and control cost and internal environment loss cost. Green fees, environment testing fees and environmental protection equipment operation costs are the ones which belong

to the pollution prevention and control cost. Emission fees, damage fees and any taxes and fees are the ones which belong to the internal environment loss cost. The external environmental costs is the governance cost which is produced by economic action of enterprise and is paid by the society ,that is so called environment loss cost. It includes resources depletion cost , forest value losses and ecological damage cost ,etc. Calculating environmental cost in the right way and making the exterior costs internalized can provide foundation for cost accounting, product pricing and performance measure.

ENVIRONMENT OPERATION COSTING BASED ON LIFE CYCLE

THE LIMITATIONS OF THE EXISTENCE IN CURRENT ENVIRONMENT COST ACCOUNT SYSTEM

Under the current accounting mode of environmental cost in China, processing method of environmental cost is like this: if an expenditure is related to the environment (such as environmental protection fees, green fees, sewage charges), it will be listed into period expense; if the amount is large, it will be used as the prepaid expenses; environmental cost is allocated during all products which is based on the production generally Therefore, under the current accounting mode of environmental cost, the natural resources consumption cost is not confirmed and measured, and all environmental cost is listed into period expense regardless of what the nature of environmental cost is. The way is very simple, but there are also some shortcomings in practical application:

Under the mode of current cost accounting enterprises only calculate internal production costs , but they don't calculate the natural resources cost and the the environment effects of natural resources exploitation, such as environmental resources depletion costs, ecological environmental damage cost, forest value loss and compensation cost, etc; Put environmental costs into account "Manufacturing Expenses "directly, use a single distribution standard to allocate environmental cost, but the drivers are not reflected clearly; The environmental cost is listed when it happens and potential environmental costs could not be reflected in advance. Therefore it is contrary to the principle of total cost and leads to inflated or virtual reduce profits. Taking the way of one-size-fits-all to the environmental cost will have adverse effects on the enterprise's healthy and sustainable development. Large deviation on product accounting will lead to unfair distribution of environmental cost inevitably, and then will appear a greater deviation on product pricing, finally affect managers decision-making correctly.

THE NECESSITY OF ENTERPRISE ENVIRONMENTAL COST BASED ON LIFE CYCLE

The target of environmental cost accounting is Confirmation, measurement and allocation on environment cost, it is more important for decision-making to provide useful information for enterprise managers. There are many methods of environmental cost accounting, therefore the choice of the appropriate method is very important according to their own actual situation. The paper combines the activity-based costing(ABC)with life cycle costing(LCC) to account environmental cost, this is environmental activity-based costing based on life cycle. Activity-based costing calculates the cost according to cost driver, it is a reasonable method for allocating environment cost, and its calculation results can provide the basis for the life cycle cost analysis. Life cycle costing expands the research scope of enterprise environment cost, including the enterprises' upstream and downstream environment cost and future cost. It is more conducive to analyze the environment cost comprehensively and reduce the total cost of products. So combining the two methods can research and collect environmental cost scientifically and comprehensively .

(1)The requirement to calculate the product cost correctly

Product cost should contain material cost, labor cost and environmental cost. In the new accounting method -- environmental activity-based costing based on life cycle, environmental cost is confirmed and collected comprehensively according to the life cycle stage,and its focus is from the traditional "product" to "activity". Distribute resource cost to activity according to resource drivers, then track products according to activity drivers, finally calculate the product cost. Standard of distribution changes from the single type to multiple standards according to cost drivers. These lead to rule out the irrationality of arbitrary standards on the calculation of the cost and improve the transparency and accuracy of the cost calculation. It is advantageous to get the correct calculation of the product cost.

(2)The requirement to realize the sustainable development of enterprise

Enterprises want to reflect the information correctly, such as corporate environmental responsibility, environment resources and performance on the prevention and controlling pollution. Enterprises have to use new cost accounting method to reflect the expenditure scientifically and comprehensively. The activity-based costing based on life cycle can help the enterprise to reflect and plan environmental cost, analyze and evaluate the performance of environmental protection, realize the best proportion between environmental cost and environmental protection effect and establish a good corporate image, so as to realize the sustainable development of enterprises.

(3)An important basis for decision-making scientifical

Environmental expenditure not only meets the needs of enterprise environmental management , but also is a factor to influence enterprise income.The ABC provides a reasonable allocation standard--activity drivers--for enterprises. And the

LCC makes the scope of activity cost extend to the future cost--contingent cost. It is helpful to provide more objective, actual and accurate cost information and basis for cost controlling and scientific decision-making .

THE ACCOUNTING PROCESS OF ENVIRONMENTAL ACTIVITY-BASED COSTING BASED ON LIFE CYCLE

The basic process of ABC of based on the life cycle can be described in below:

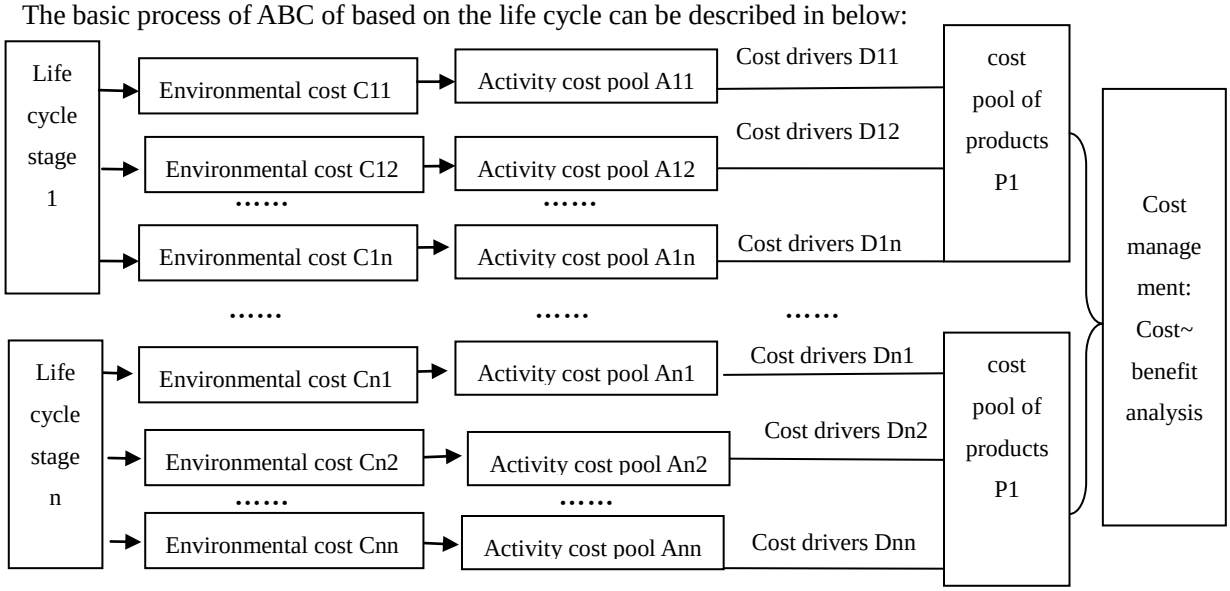


Fig 1. Accounting process of activity-based costing based on the life cycle

From above we can conclude the general steps of ABC based on the life cycle:

(1)Determine the life cycle stages according to the characteristics of the products, find out the influence to the environment, and then summarize environmental cost of these stages.

(2)Determine the activity cost pool. Activity cost pool is a bridge between product and cost, it is the minimum cost accumulation unit of the cost accounting model, activities' scope and the division basis of each activity center should be clear.

(3)Identify cost drivers. Put the cost to each activity and establish a causal relationship between output and input. Selection of Cost driver is very important.

(4)Calculate the cost of the product. Put costs in the activity center to the product cost.

(5)Cost - benefit analysis according to the calculation results.

Confirming and accounting environment cost based on the life cycle can broaden the accounting scope of environment cost. And at the same time ,the paper also uses the activity-based costing, which is based on the principle---"product consume activities, activities consume resources" and make activities as accounting object. Standard of distribution changes from the single type into multiple standards according to cost drivers, these lead to rule out the irrationality of arbitrary standards on the calculation of the cost and improve the transparency and accuracy of the cost calculation. It is helpful that enterprises analyze each stage's environmental cost and pay attention to disclosing cost information correct. And it can provide the basis for managers to control the production activities and performance evaluation. Thereby enterprises are encouraged to take measures such as improving technology and improving the utilization rate of resources to achieve the purpose of reducing total cost. Finally enterprises should consider the coordination between economic benefit and social benefit and establish a good corporate image to achieve sustainable development.

PRACTICE AND RESEARCH -- WITH BAOGANG AS AN EXAMPLE

Review the life cycle of iron and steel products, since there is little influence on the environment in the use and abandonment stages, so the two stages can not be considered. This paper focus on raw materials acquisition stage, the process of raw materials and production. The data is shown in table 1

Tab1. Related data on environmental cost measurement of Baogang in 2012

Units: ten thousand yuan

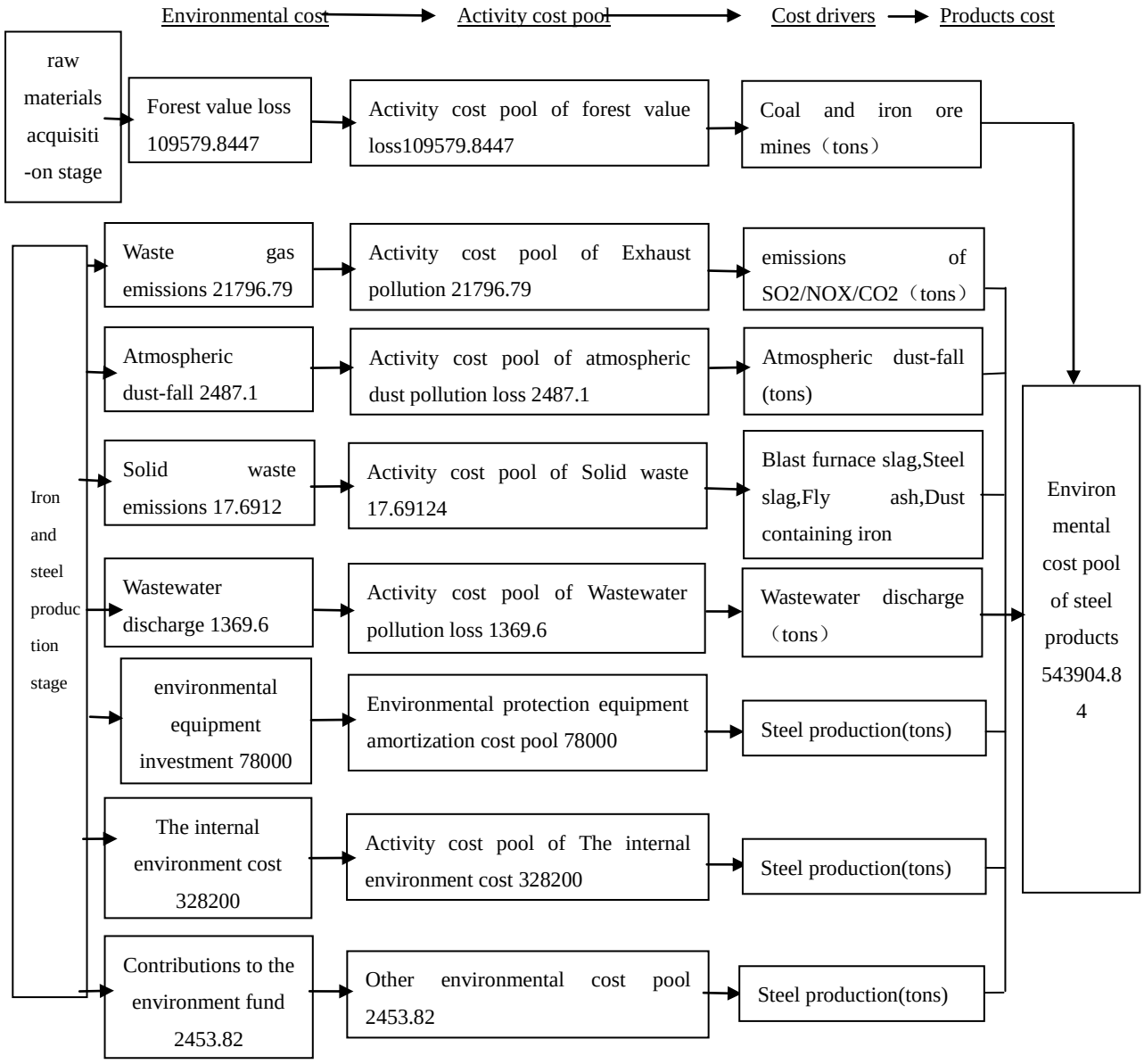
Stage	Content of environmental costs	Parametric/Emissions	Measurement	Results

				method	
raw materials acquisition stage	Forest value loss	Forest value loss of coal mining	Soil disturbance topsoil 1.1 tons of per ton of coal mining, and the average capacity is 1.7 t/m3; Soil layer thickness is 0.30 meters; Forest value 24900 yuan/ha. coal consumption is about 16.3857 million tons in 2012.	Market value method	8808.08
		Forest value compensation of iron ore mining	disturbance topsoil 6t of Per 1 ton ore mining and soil average density is 1.7t/m^3;the soil layer thickness is 0.3 meters; Consumption of iron ore is 34.4 million tons.in 2012.	Market value method	100771.7647
the process of raw materials and production	Waste gas emissions	NOX emission	1793.688tons, market value 8 yuan/kg	Market value method	14349.504
		SO_2 emission	11751 tons, environmental value 6 yuan/kg		7050.6
		CO_2 emission	17247tons, market value 0.023 yuan/kg		396.681
	Atmospheric dust-fall		11035tons, environmental value2.2yuan /kg	Market value method	2487.1
	Solid waste emissions	Blast furnace slag	5.8924millon tons	Market value method	17.69124
		Steel slag	3.7022millon tons		
		Fly ash	0.4506 million tons, environmental value 0.12 yuan/kg		
		Dust containing iron	1.9117million tons		
		Hazardous waste	27200 tons		
		Other production	2.7586 million tons		
	Wastewater discharge		17.12 million tons, environmental value 0.0008 yuan/kg	Market value method	1369.6
	Governance environment equipment investment			Market value method	78000
	The internal environment cost	Capital expenditures: pollution discharge fees	––	––	43300
		Capital expenditures: System audit fee	––	––	
		Capital expenditures: Environmental testing fees	––	––	
		Capital expenditures: Environmental protection facilities operating cost	––	––	
		Capital expenditures: Depreciation of environment protection facilities	––	––	
		Capital expenditures: Artificial cost of	––	––	

		The cost of exp-enses	environmental protection			
			Environmental research and development fee	––	––	284900
			Environmental protection publicity expenses	––	––	
			Afforestation fees	7326+10000㎡	––	
			Hazardous materials transportation fee	––	––	
			Solid waste disposal fee	––	––	
	Contributions to the environment fund			––	––	2453.82

Data sources: Baogang sustainable development report 2012

According to the data in Table 1, it merges into the activities cost cool, and thus find cost drivers, we can get the specific calculation process, as shown in the figure below(Units: ten thousand yuan):



2. Flow chart of Baogang environmental cost confirmation in 2012

Form the data of figure 2, the total environmental cost of baogang in the life cycle stages is 5.4390484 billion yuan. Contributions to the environment fund is 24.5382 million yuan. The production process of energy-saving and environmental protection equipment investment is 780 million yuan, and the internal environment cost is 3.282 billion yuan.

Environmental protection investment of Baogang is increasing year by year from environmental report during several years. And from the financial report shows that net profit rises ceaselessly in recent years. Therefore the achievements are inseparable with Baogang's efforts to environmental protection.

From the above calculation process can be seen that the external cost which is not be measured in Baogang has roughly equal proportion with the internal cost. And even it is the internal environment cost, we also have to distinguish the cost of expenses and capital expenditures according to different conditions. Forest value loss is 1.09580 billion yuan in the access to raw materials stage, which is accounting for 20.15% in the life cycle environmental cost; Environmental cost of various waste emissions in the Iron and steel production stage is 243.0158 million yuan, accounting for 4.46%. Although the proportion is not high, the amount can not be ignored. The part of the environmental cost should be included in the current profits and losses, and it should be allocated during products. Since number and kinds of steel products is various and the environmental impact of each product in the process is different, so enterprises should allocate the total environmental cost to products based on the rate of product cost drivers. It is aimed to guide enterprises to make decisions on production and management that is complied with the best environmental benefits.

REFERENCES

[1] Xu Yuqing, Wang Yanxiang, LiChao. The effective method on environmental cost activity-based costing[J] *Environmental protection*. 2003:35-37

[2] Liu Yinling. *Research and construction on enterprise environmental cost accounting system[J]*Northwest University,2009:29-31.

[3] Xiao Xu.Enterprise environment cost theory [M]. Beijing: China financial economic publishing house.2002.149.

[4] Xiao Xu, Hu Ke, Zhou Pengfei.Environmental activity costing base on life cycle[J]. *Journal of business research.*2006:49-51

[5] Zhang Tianwei, Zhen Guohong. Applying Activity-based costing to account enterprise environment cost [J]. *accounting monthly(theory*).2008(3):39

[6] Ma Zijun, Research on accounting and management environment costs[J].*Journal of north trade*,2012(1):45-48.

[7] Li Chun. Comparison on Several collation and environment cost allocation methods [J]. *Chinese management informationization*. 2008(3):37-40

[8] Yang Hongxin. The application on fair value in accounting professional judgment[J].*Chinese management informationization. 2008(19):42-45*