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Study on continuous improvement of enterprise cost based on the concept of resource productivity

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ABSTRACT

The productive consumption of resources like raw materials and energy is the key problem associating with the enterprise cost and competition. With the problems of cost confirmation of negative products (waste and un-graded products) and measurement in the enterprise manufacturing process as the starting points, this dissertation implements comparative analysis on the enterprise resource input of material, energy and labor with its output of manufactured products and services. Moreover, it breaks through the limitation of current product cost calculation which drowns the waste cost, overcomes the shortcomings of hysteretic nature and insufficient cause analysis in the current cost calculation and directly calculates the cost loss with the quantity and amount so as to reflect the consumption status of negative products and analyze the causes through the dynamics. Therefore, the maximum resource productivity can be achieved through proposing the improvement programs and the evaluations as well as implementing continuous cost improvement.

KEYWORDS

Resource productivity; MFCA; Cost improvement.

INTRODUCTION

With the rapid development of economy and people's unrestrained exploitation of resources for industrial activities, not only the exhaustion of non-renewable resources is caused but also severe waste pollution problem is generated. Consequently, the balance of metabolic system in natural ecology is seriously destroyed, the global-scale resources and environmental conditions are faced with unprecedented crisis, and the resources and environment problems have become the bottlenecks for the economic and social development. Accordingly, the UN and other international organizations have formulated a series of environmental conventions, and a lot of environmental management ideas and systems have emerged, which thus enhance the threshold of product market access. The formulation and implementation of environmental standards and legislations naturally increase the enterprise cost for qualified environment. Therefore, enterprises must consider the input of products and the influences on environment to adapt to the regulatory requirements, avoid environmental risks, lower environmental cost, improve the environmental adaptation and competition of products and achieve sustainable development.

At the end of the 1990s, the Germany scholar B. Wagner developed MFCA (short for Material Flow Cost Accounting), a kind of environmental management accounting approach, which has been applied and practiced in Germany enterprises. In 2000, MFCA was introduced to Japan, and it aroused the attention from the Japanese academic circle and business circle. The Japanese Ministry of Economy, Trade and Industry has listed the research of MFCA into agenda and built a specialized commission for MFCA research composed by university professors, relevant responsible personnel in governmental departments and business department directors in enterprises. In 2002, MFCA was incorporated into the Work Book of Environmental Management Accounting as an environmental management accounting approach, and upgraded into Guideline in 2007[1]. By the end of 2013, around 400 enterprises like Nitto Denko, Canon and Tanabe Seiyaku had successively implemented MFCA and obtained significant effects[2]. In the meantime, as for the theoretical research aspect, Kokubu and Nakajima (2002), expounds the theoretical framework and calculation method of Material Flow Cost Accounting from the perspective of environmental management accounting, and verifies the effectiveness of this approach through detailed examples[3].

In September, 2011, the international standards concerning with MFCA was promulgated as ISO14051. Hence, the awareness of MFCA is constantly improving, and researches on MFCA theory and practice are also carried out successively in different countries in the world. In March, 2013, Dresden University of Technology held EMAN (Environmental Management Accounting Network), among the 31 conference papers published and communicated in it, 25 are MFCA-related papers[4]. It is obvious that the study of MFCA has become the mainstream in environmental management accounting.

In contrast, the China started late in researches on Material Flow Cost Accounting, but it has obtained fruitful results in recent years. For instance, based on the relevant literature researches, Feng Qiaogen (2008) introduces the operational mechanism of MFCA[5]. Deng Mingjun et al. (2009) present the research and practice status of MFCA in foreign countries and their inspirations on China[6]. Zhen Guohong puts forward the suggestion of information disclosure for the enterprise environmental cost in material flow[7]. Scholars like Xiao Xu develop MFCA into the resource flow cost accounting[8]. However, they just conduct calculation, analysis and evaluation of cost and value flow on the resource flow situation in enterprise system, but do not study it by effectively integrating factors like company core competition, cost, environment and resources together. Moreover, they do not take the continuous improvement of resource productivity into account nor fully consider the actual situation and implementation feasibility of Chinese enterprises. Therefore, the continuous improvement and evaluation of enterprise cost based on resource productive concept has become the major issue faced in current accounting circle.

CONNOTATION OF RESOURCE PRODUCTIVE COST

Concept of resource productive cost

Resource productive cost means the subject of labor consumed during the production process of enterprise (raw material and auxiliary material, fuels and energy, including depreciation of fixed assets) and labor cost paid by employees (wage, salary, and their addition), as well as input of subsidiary producing departments (labor, material and fee), which are regarded as resource productive cost.

The classification of resource productive cost

Positive products are qualified products and services in line with quality standard, while negative products are waste during the production process of enterprises, including all production losses such as scraps and waste gas of raw materials and auxiliary material, as well as inventory loss. The data of negative products in the process of production will be collected according to their practical input (consumption) condition and the accounting of resource productive cost will be divided into four kinds of costs to measure separately as shown in TABLE 1, including material cost (MC), system cost (EC, including direct cost and indirect cost), energy cost (EC, including energy cost and cost related to assistance) and waste treatment cost (WTC), as shown in TABLE 1.

Evaluation content of resource productive cost

Through quantification of resource productive index during the process of production, resource productive cost accounting proceeds with analysis on the cause formation of negative cost and undertakes cost control tracing back to the origin of occurrence. Its evaluation procedures and contents are as following.

(A) Confirm the formation status of positive products and negative products in enterprises and calculate cost of negative products according to weight ratio of waste loss such as negative products.

(B) According to the features of product technique, take negative products as subject of cost control to undertake cost distribution based on currency and amount calculation. Generally speaking, the method of weight ratio can be adopted to proceed with cost distribution. Input products which can not be calculated by weight could be distributed by other methods.

(C) Through calculating negative products, analyze the formation cause of negative products. The Sketch cost improvement plan, discuss and evaluate the improvement plan, as well as organize plan implementation.

(D) Trace and confirm the improvement effects of cost improvement plan to proceed with re-evaluation. Summarize evaluation results to complete technique and work standard continuously.

TABLE 1: Main costs of resource productive cost accounting

*MC Material cost/ Accessory material cost/Auxiliary material cost	*Material cost/ Re-added material of products and semi-finished products/Abstergent, water, solvent and catalyst
*SC (Direct cost) System Cost	*Direct labour, Outsourcing and processing cost, Expenses such as costs of tools and moulds
*SC (Indirect cost) System Cost	*Equipment amortization, Indirect material cost, Indirect labor cost
*EC (Energy Cost) Energy Cost	*Electric power, Heavy oil, Light oil, Natural gas and LPG
*EC (cost related to assistance) Energy Cost	*Vapor, Compressed air, Water, Mild water and purified water
*WTC：Waste Treatment Cost	*Storage cost, Carriage cost and treatment cost

IMPORT AND CALCULATION OF RESOURCE PRODUCTIVE COST

The popularization of resource productive concept

Continuous improvement of enterprise cost based on the concept of resource productivity is not a kind of one-off investigation activity on waste and defective products. Contrarily, it is a kind of continuous improvement activity to reduce cost constantly and pursue the minimum of cost and maximum of resource productivity. Hence, the continuous improvement of resource productivity needs operators, managers and on-site administrators to improve the understanding of resource productivity, define own responsibility, play own function and face the problem shoulder to shoulder.

In order to improve resource productivity of enterprise and unfold improvement activity continuously, universal education of resource productivity aiming at staff at different levels should be unfolded. General seminar should be conducted to understand and cultivate the interest of resource productive cost accounting, as well as to improve cognition degree of resource productive cost accounting. Specialized seminars should be opened to deep understand accounting of resource productive cost.

Determine objects, including products, processes and technical process

(A) Through investigation in pilot enterprises to determine data source of investigation objects (products and processes).

(B) Revise the model according to investigation and analysis.

(C) Analyze product life cycle and undertake model experiment.

(D) Establish the Quantity Center of all projects.

(E) Determine the sorts and period of analytic objects.

(F) Determine the data collection method of analytic object.

(G) Establish evaluation index system.

Calculation and analysis of resource productive cost

(A) Data collection and arrangement. Collect and arrange the data of input sorts, amounts and cost of materials in various projects, including MC, SC, EC and WTC..

(B) Determine the distribution standard of SC and EC.

(C) Utilize existing managerial resource of ERP and TPM to expand the information of negative products and resource loss of enterprises into ERP system. Integrate management information system gradually, so as to collect and arrange the date of equipment operation status in various projects.

(D) Confirm and analyze calculation results of resource productive cost.

CONTINUOUS INPROVEMENT AND EVALUATION OF RESOURCE PRODUCTIVITY

It mainly centers on the improvement of resource productivity. In other words, the dissertation proposes improvement plan according to the improvement subjects of material loss reduction and cost decrement, as shown in TABLE 2.

(A) Analyze the feasibility of reducing cost.
(B) Utilize calculation of resource productive cost and checks cost improvement plan.
(C) Stipulate improvement plan according to priority.
(D) Investigation on the amount of material input and discharge amount of waste after the implementation of improvement plan.
(E) Retake accounting calculation of resource productive cost.
(F) Track and evaluate the improvement effects.

TABLE 2: Check procedure of resource productive cost

NO	Research stage	*Work emphasis
Plan	Preparation	*Investigation on enterprise current situation, including enterprise products, production-line, and flow chart of processing and assembling.
	Determine the target products and process	*Determine target product, production-line and process range *Determine production cycle of target process and cost control centre *Determine the sorts and period of analytic subject *Determine the analytic subject and data collection method
Do	Data collection and arrangement	*Data collection and arrangement of input material sorts, input amount and the amount of waste and defective products according to different processes *Data collection and arrangement of system cost (processing fee) and energy cost *Determine distribution methods of system cost and energy cost *Data collection and arrangement in different conditions of process operation
	Accounting calculation of resource productive cost	*Construction of accounting calculation model of resource productive cost and data input *Determine and analyze accounting calculation results of resource productive cost (negative products of different processes and their causes of formation *Study the improvement plan based on calculation results
	Summarize the improvement subject	*Propose improvement subject such as reducing loss and decreasing cost
Check	Provide improvement plan	*Study reduction room of material loss and discuss the possibility *Calculate and check association degree between material loss reduction and cost decrement *Propose the sequencing of improvement and improvement plan
	Implement the improvement	*Organize and implement
Action	Evaluate improvement effects	*Re-calculate the material input amount and amount of waste and defective products after improvement *Evaluate improvement effects, structure extended model, summarize and popularize the experience

CONCLUSION

The dissertation proposes the standpoint of resource productivity and manages to structure accounting theory of resource productive cost creatively. The dissertation compares resource inputs such as material, energy and labor of enterprise with its outputs such as products and services, as well as changes pure enterprise cost calculation into resource productivity calculation of social organization which bears environmental responsibility. Taking negative products as starting point, the dissertation provides accounting index system of resource productive cost including amount of added value, resource cost productivity and system cost productivity, as well as resource consumption cost rate and raw material loss rate. Besides, the dissertation calculates corresponding cost of waste and defective products, so as to truly reflect resource productivity condition of enterprises. Moreover, the dissertation breaks through the limitation of current product cost calculation which drowns the cost of defective product and overcomes the shortcomings such as that it is difficult for current cost calculation to reflect the value of salvaged material definitely, the hysteretic nature of costing, as well as cost formation analysis is lacking. By utilizing quantity and amount to calculate cost allowance directly and through dynamics to reflect consumption condition of negative products, the dissertation visualizes resource loss of enterprise. Meanwhile, the dissertation merges cost information of waste and defective products into operation management system of enterprise to establish complete operation information system. By applying PDCA circulation as shown in TABLE 2, the dissertation manages to maximize resource productivity through analyzing its cause of formation, providing improvement program and program evaluation, as well as undertaking cost improvement constantly.

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