

# Empirical Study on MFCA Introduced in Sekisui Chemical Group and its Enlightenment

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**Abstract.** Environmental issue has always been the focus of world attention, actions of human being, business, and society must be based on environmental protection. From the perspective of enterprise, wastes in the production process has become an important object of environmental protection actions. Recycling wastes and reducing emissions are important measures to conserve resources and reduce environmental impacts. Material Flow Cost Accounting(MFCA), as an effective tool for environmental management, helps enterprises to reduce environmental loads by tracing the situation of material flow in the production process. At present, the MFCA practice of China is still not perfect. This article attempts to do empirical research on MFCA of Sekisui Chemical Group, and find the effective measures to guide our country enterprises to practice MFCA.

## Introduction

MFCA was originally developed by IMU in Germany in the late of 1990s, international studies have paid much attention to principal technique for environmental management accounting [1]. The Ministry of Economy, Trade and Industry (METI) has made efforts to develop MFCA since 2000 in Japan [2]. At present, MFCA, as a measure of cost management, has been utilized in many enterprises, for example, Nitto Denko corporation, Sekisui Chemical, Canon, Shimizu Printing, etc [3]. In the academic research of MFCA, foreign scholars have started earlier, Ohnishi (2006) [4], Enkawa (2007) [5] and Nakagima (2009) [6] studies on the theory's of MFCA, Numata (2006) [7], Funasaka (2008) [8] and Harada (2009) [9] do case studies by selecting different enterprises. However, our theoretical and empirical researches on MFCA have raised in recent years, Weidong Zhu (2010) [10], Xiyang Luo (2012) [11], Benyue Zhang (2015) [12] studies on MFCA and related theories. This article attempts to do empirical research on MFCA of Sekisui Chemical Group, and find effective measures to practice MFCA in China.

## MFCA Ideology

MFCA is a method which assesses the costs comprehensively by tracking material flow especially waste costs in the production process. This method visualizes enterprise's hidden waste costs, and achieves the goal of saving costs and reducing environmental loads by reducing and recycling the hidden wastes. The basic idea of MFCA is that any inputs (raw materials, energy, and so on) is equal to any outputs (product, wastes, emissions, and so on), as shown in Fig.1. In Fig.1, material costs is an important part of material flow costs, and it is also a major cost item of manufacturing enterprises; Energy costs are the control scope of MFCA; the system costs (personnel expenses, depreciation expenses, and so on) all allocated to products and material losses. Each substance, whether involving raw materials, semi-finished products, products or material damage, can be seen as the system costs. MFCA pays close attention to material flows that reflect which flow belongs to products and which flow belongs to material losses. The material losses are not only limited to raw materials, but also include all outputs that did not translate into final products or spare a waste of resources, for example raw materials, energies and other economic resources.

In addition, the relationship between MFCA and traditional cost accounting is that the later contained in the former, as shown in Fig. 2 [13]. Under the traditional cost accounting, there is no other output except products and work in process. However, MFCA is a method that records and evaluates the physical nature of things, the information given by MFCA is essential basis of accuracy and specificity of resources utilization.

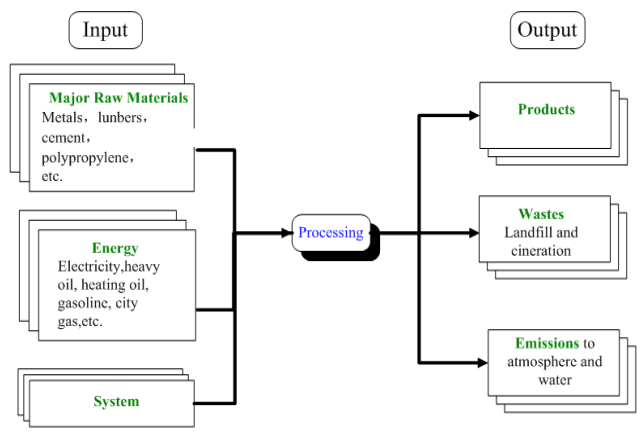


Fig. 1. Input—Output model

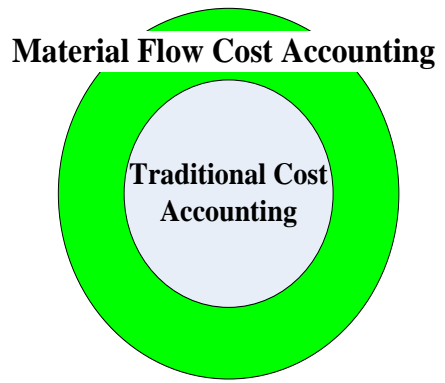


Fig. 2. Relation between Material Flow Cost Accounting and Traditional Cost Accounting

### Empirical Analysis

**Sekisui Chemical Group Introduces MFCA.** Sekisui Chemical Group was founded in 1947, including about 100 billion yen capital, number of employees 886 23 people, and its operating income up to 85.764 million yen. The company based on high performance plastics (electronics , automobiles and transportation, building and Infrastructure, and so on), urban infrastructure & environmental products (public and private infrastructure, functional materials and others) and housing company, launch the colorful career that creating social value in the worldwide [14].

Sekisui Chemical Group introduced MFCA in 2004, and in 2006 established “a center for Manufacturing Innovation ” to support the company-wide introduction of MFCA. As a result, it has successfully introduced MFCA into 35 production sites and 101 products production process [15].

The MFCA model of Sekisui Chemical Group introduced as shown in Fig. 3. Companies translate "no waste " ideology into practices, in depth to technology dept, operation dept, production dept and other. In particular, MFCA realize manufacturing innovation by strengthening technical. MFCA makes every cost in input-output visual and the value of products more exactly in Sekisui Chemical Group process, especially the material losses, as shown in Fig.4. Production innovations benefit production efficiency.

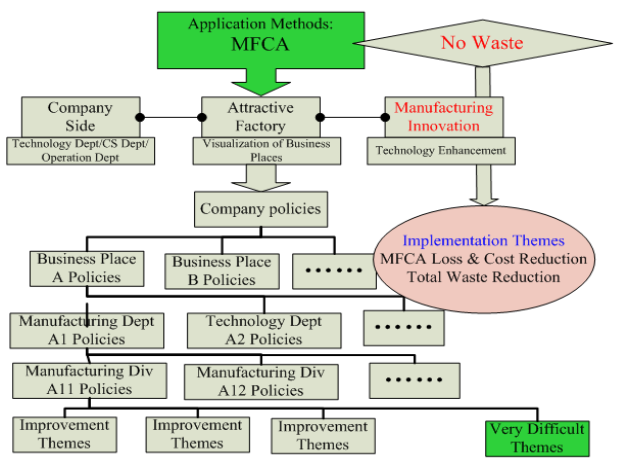


Fig.3. MFCA model of Sekisui Chemical Group

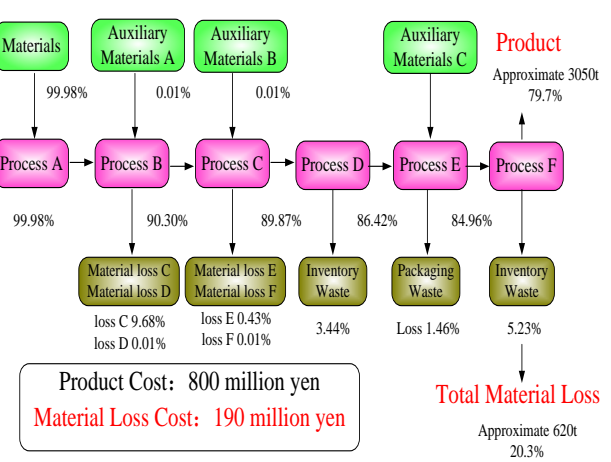


Fig. 4. Material losses in every material flow

## Implementation Details of MFCA

**Tools of Corporation Social Responsibility (CSR).** Sekisui Chemical Group put MFCA as an important measure for the realization of CSR. Effectiveness of reduction both waste costs and environmental impacts adopted MFCA earn good image of social responsibility. Although managers will set a goal of increasing sales relative to the reduction of input costs for enterprises, but waste costs as waste of output distinguish from input costs. Therefore, setting goal of reducing waste costs will become the driving force of enterprise practicing MFCA. From the perspective of social responsibility and environmental management, reduction of waste costs can improve the efficient use of resources and reduce environmental impacts. From a certain extent, increased input of environmental protection go against objective of profit maximization, but MFCA, as a bridge between environmental protection and the pursuit of profit, create win-win with business and society.

**No Waste Action.** There are three sites. At production site, Sekisui Chemical Group support "no waste" action by recycling wastes, including reduce and reuse wastes, it improve the effective utilization of health resources. The action of simplified packaging of raw materials and recycling wastes reduce the costs of wastes. The amount of waste costs in 2007 reduce 13% than 2004 and reduce 42% than 1998[15]. At the construction site, wastes produced in all kinds of each processes on the construction site take measures of internal finishing and other ways to reduce wastes. A thorough grasp of the condition of surplus materials in the construction site can contribute deciders to make appropriate adjustments to optimize product shipments. Compared to 2000, Sekisui Chemical Group achieve a 43% reduction of waste costs by each house in 2007[15]. At the office site, implementing "Green Office" by reducing paper use and realizing green purchasing in Sekisui Chemical Group. Waste produced not only one site of company, management, sales and other office will produce wastes during the use of office supplies, for example, a large number of files and other resources. Initiatives of reducing the use of copy paper by Sekisui Chemical Group expand influence of Green office.

**Effectiveness Analysis** .In the initial implementation of MFCA, Sekisui Chemical Group set a target that waste costs of cumulative losses total reduce 5 billion yen in a three-year (2006-2008). According to statistics, the target realized a year earlier than predicted (2007). Waste costs of losses reduce 5.3 billion yen and total amount of waste emissions reduced by 11% during two years (2006-2007). Thereafter, it has realized that the waste cost of cumulative losses total reduce 5 billion yen in a five-year (2009-2013). In 2009, Total loss costs reduce by 700 million yen and total waste emissions reduced by 9%. In 2010, it reduced costs by 1.3 billion yen through efforts of increasing the thickness precision of housing exterior wall panels and decreasing the volume of materials disposed of as defective [15].

## Enlightenment of MFCA Introduced

**MFCA is the Bridge between Enterprise and Society.** While, profit-Maximizing of business objective makes conflicts with environmental protection of social development purpose. The production idea of focusing on reducing wastes not only satisfy enterprises' business objectives of reducing cost and creating profits, and adapt to the concept of harmonious development of society. Therefore, MFCA eliminates the conflict between enterprises and social development, and promote harmonious between enterprises survival and environmental protection.

**MFCA is the Important Development Direction of Traditional Cost Accounting** .Traditional cost accounting method has been unable to meet the needs of today's enterprise development. The concept of harmonious society and scientific development, the initiative of social responsibility force enterprise to seek a sustainable way. Traditional cost accounting does not accurately reflect the cost of products, green input and cleaner production. on the contrary, MFCA can clearly and accurately account input-output costs and environmental impacts. Therefore, to comply with the requirements of social development, the development orientation of traditional cost accounting is MFCA.

**"No Waste" is the Key to Raising Enterprise Productivity.** With the development of economic and scientific and technological progress, most enterprises realize the purpose of reducing production

costs, increasing productivity, even enhancing the competitiveness by increasing their technical inputs and improve production equipments. Technological innovation is an important factor that affect enterprises' survival and development, but conditions of waste costs in production and efficiency of wastes instead of technological innovation become the key factor during enterprises which own higher skill levels, good development conditions even they are in the same platform. One generation makes effort, descendent get the benefit from it. After all, resources are limited. It is wise to turn wastes into treasure for enterprises.

## **Enlightenment to China**

**Regard MFCA as the Content of Accountants Continuing Education.** Accountants Continuing Education in China has the characteristics of universality, comprehensiveness and relevance. Each certified personnel must to complete the task every year. Regard MFCA as the content of Accountants Continuing Education can widely convey the concept of MFCA to all accountants, and even to enterprise manager, and into enterprise operation philosophy.

**Make of Production Cost in Enterprises "Visual".** Traditional cost accounting methods in the absence of necessary cost items, and Chinese enterprises have little known the details of inputs and outputs in production. Especially, outputs, such as varieties wastes, oxides, and so on, confused with the costs of finished products. Accounting System does not require enterprise to public the cost details of production, but it does not mean companies should ignore these costs. The right of enterprise decisions, including select investment partners or investment products, items, must be based on the accurate cost information. The development of times requires enterprises to improve management level and make the cost of production "visual" and "transparent".

**Put MFCA into Environmental Impact Assessment Standards of Enterprises.** With the rising status of environmental protection, enterprise's environmental impact assessments affect their development opportunities to a great extent. To this end, put MFCA into environmental impact assessment standards of enterprises not only make assessment accurate about environmental conditions of enterprises, but also make enterprises focus on MFCA in practice.

## **Conclusions**

MFCA of Sekisui Chemical Group's practices certify that MFCA is an effective tool to improve enterprises' productivity. The wastes generated in the process of enterprise production (wastes and hazardous substances) not only have negative impacts on environment, but also restrict the efficiency of enterprises. This paper draws three enlightenment by analyzing: firstly, MFCA is the bridge between enterprise and society; secondly, MFCA is the important development direction of traditional cost accounting; the end, "no waste" is the key to raising enterprise productivity. In addition, to promote MFCA in practice of Chinese enterprises, making points that China should take measures of regarding MFCA as the content of accountants continuing education, making of production cost of enterprises "visual" and put MFCA into environmental impact assessment standards of enterprises.

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