



Productivity methodologies, tools, and techniques

Material flow cost accounting and its relevance to SMEs—Yoshikuni Furukawa and Hiroshi Tachikawa

Focusing on nonproducts (waste) from the manufacturing process, material flow cost accounting (MFCA) can help organizations boost their economic performance and productivity as well as environmental management. In this article, the basic concept and application of MFCA to SMEs are explained.

Background

Environmental topics, such as climate change and environmental regulations, are in the headlines more than ever, indicating that environmental awareness is gaining momentum along with economic business performance. In response to this social trend, businesses are being placed under increasing pressure to achieve higher productivity with less environmental impact. MFCA helps organizations to meet such needs. Through MFCA, organizations can identify waste volume and their flows within production processes, in both monetary and physical terms. Such information acts as a strong motivator for organizations to enhance productivity and reduce waste for their overall benefit. More than 300 Japanese examples and examples in Malaysia prove that MFCA is a simple but powerful approach for further cost reductions and less environmental impact.

The concept of MFCA was originally developed in Germany and introduced in Japan around 2000. Since the Japanese Ministry of Economy, Trade and Industry has strongly supported the dissemination of this tool, many Japanese companies have introduced MFCA. MFCA has also attracted attention from other countries; currently MFCA projects in Malaysia are ongoing in five enterprises. In addition, MFCA is now undergoing the ISO standardization process. The MFCA standard (ISO14051) will be published this year.

Concept of MFCA

MFCA traces all input materials that flow throughout production processes and measures finished products and emission (waste) in physical units via the following equation:

$$\text{Input} = \text{Finished products} + \text{Nonproducts (waste)}$$

As an example, assuming that 100 kg of materials are used as input in a production process resulting in 70 kg of finished product, then the nonproducts (waste) are 30 kg. With this in mind, the equivalent cost evaluation of the finished product and nonproducts (waste) is made. In MFCA, finished products and emissions (waste) are called products and material losses, respectively. In other words, the essential point of MFCA is to recognize material losses as nonmarketable (second) products. This indicates that costs for both products and material losses are calculated in an equivalent manner; the production process manufactures both products and material losses. The concept is illustrated in the Figure.

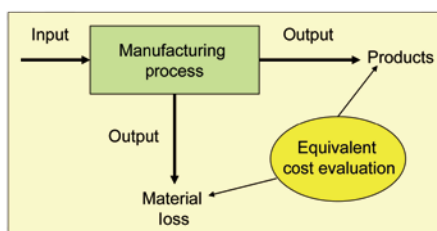


Figure. Concept of MFCA.

Difference between MFCA and other production management activities

The MFCA calculation differs from other production management activities. Even if material loss is visible onsite, the cost of material loss is usually overlooked. However, in MFCA, material losses are considered to be another product. Therefore, equivalent cost calculation is performed for material losses. This information provides a strong incentive to company management to minimize material losses, leading to cost reductions (higher profits).

MFCA application

MFCA can provide dual benefits, both internal and external. A typical example of internal benefits is higher corporate competitiveness through identification of material losses and implementation of quality control activities. An example of Nitto Denko, a major Japanese manufacturer and material and subparts supplier, is shown in Table 1. This provides a good example of how MFCA enabled the company to improve productivity.

Table 1. Improvement of material productivity through MFCA by Nitto Denko.

	2001	2004	2011 (target)
Products (%)	68	78	90
Material losses (%)	32	22	10
Total (%)	100	100	100

MFCA also brings external benefits for the environment. MFCA enables organizations to produce the same amount of finished products with fewer inputs, meaning that organizations can reduce environmental impacts such as material volume for production and energy use (resulting in lower CO₂ emissions). Table 2 shows an example from a Japanese SME (a supplier of automotive, commercial cooling, and heating products).

Table 2. Implementation of MFA in an SME

	Current	Target	Reduced volume	Rate of reduction
Input materials (tons)	119	109	10	-8%
Product (tons)	75	78	—	—
Material loss (tons)	41	31	10	-24%
CO ₂ emissions (tons)	1,234	1,151	83	-7%

By applying MFCA to its manufacturing process, the SME found an opportunity to reduce the volume of input materials and CO₂ emissions. Simultaneously, as mentioned above, MFCA revealed quality-related issues including avoidable and abnormal losses. As an example, those losses identified by MFCA included losses related to poor workmanship, spoilage, and defective units. MFCA helps an organization to identify and take countermeasures against those issues.

Conclusions


MFCA can bring both internal and external benefits, which means that organizations can make higher profit with less environmental impact. The balancing of the environment and the economy within organizational management is a vital issue to enterprises seeking to achieve sustainable development. MFCA is applicable to any organization, regardless of type, size, activity, and location.

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In summary, MFCA can lead to:

- Increased production efficiency through capital investment, based on the appropriate, accurate evaluation of investment projects;
- Cost reductions through changes in product design and raw material use based on precise evaluation of manufacturing cost; and
- Specific targets for onsite improvement activities (e.g., total quality control, ISO compliance), thereby revitalizing such activities.

In addition, MFCA implementation does not always require advanced computer-based information systems as an information base. Especially in organizations such as SMEs, simple spreadsheet calculations are sufficient for MFCA utilization. 



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