

# **Environmental Management Accounting (Material Flow Cost Accounting : MFCA)**

September, 2007

Environmental Industries Office  
Industrial Science and Technology Policy  
and Environment Bureau  
Ministry of Economy, Trade and Industry of JAPAN

# Environmental Accounting:

Combining Environmental and Economic Activities  
as a Basic Tool for Environmental Management

## Environmental Management Accounting:

**Specialized in internal management of a company**

For reports to executives and managers  
Used for internal management of a company  
(e.g. Material Flow Cost Accounting)

See “Environmental Management  
Accounting Method Workbook,” by the  
Ministry of Economy, Trade and Industry

## External Environmental Accounting:

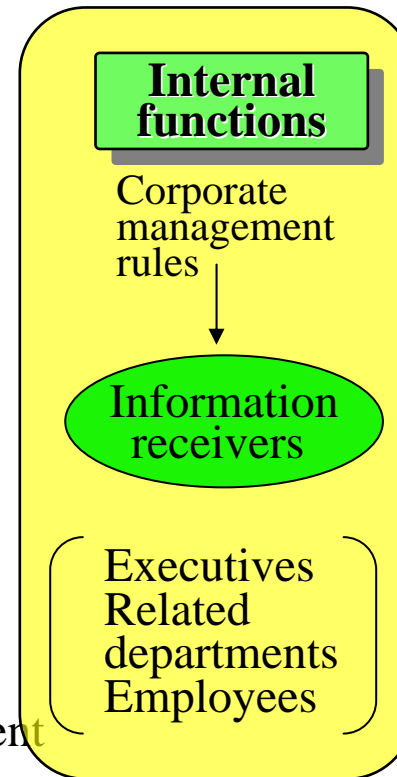
**Specialized in external reporting**

For reports to external stakeholders  
(corporate evaluation, etc.)

(e.g. Environmental Reporting,  
Financial Accounting)

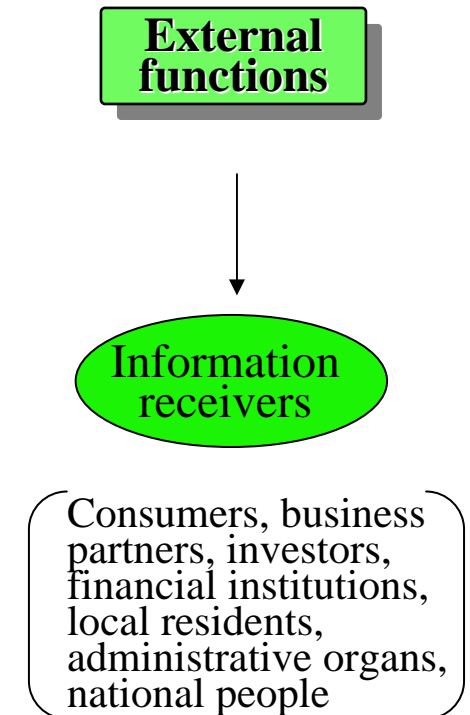
See “Environmental Accounting  
Guidelines,” by the Ministry of the Environment

【Company, etc.】



【Society】

Social communication



# Environmental Management Accounting Workbook (2002)

- The Ministry of Economy, Trade and Industry promotes the utilization of “environmental management accounting”, which contributes to the decision making process of a company and the improved efficiency of management costs.

	Major targets	Methods and outline of management accounting
<b>Environmental &amp; Management Accounting</b>  Environmental factors are added to the existing systems	<b>Companies</b>	<b>Environmentally-conscious performance evaluation</b> Incorporating environmental performance into departmental performance evaluation at companies
	<b>Production (equipment)</b>	<b>Decision-making method for environmentally-conscious investment</b> Incorporating environmental consideration into decision making for production capital investment
	<b>Production (environment)</b>	<b>Environmental budget matrix</b> Comprehensive planning of environmentally-conscious budget (Optimizing environmental conservation costs and environmental losses)
	<b>Products</b>	<b>Environmentally conscious cost management</b> Incorporating environmental consideration into the design and development stages of products
<b>Environmental (Management) Accounting</b>  Comprehensive methods supported by proprietary information systems	<b>Production</b>	<b>Material Flow Cost Accounting</b> Detailed analysis of losses from production processes (e.g. material loss, energy loss) in terms of quantities and values
	<b>Products</b>	<b>Life cycle costing</b> Calculating external environmental cost throughout a product life cycle; Supports product development at low environmental cost throughout a product life cycle

# Material Flow Cost Accounting (MFCA)

- A system to measure the flows and stocks of materials in the manufacturing process (raw materials and energies), in terms of physical and monetary units → Identifies accurate costs of **wastes and emissions**
- The prototype of MFCA was developed in Germany. Japanese versions of MFCA are modified for increased facility of use, by segmenting materials into raw materials and energy sources, as well as measuring them by process for easier improvement plans. The Ministry of Economy, Trade and Industry initiated MFCA-related measures in FY1999, followed by a series of model projects. The ministry has bolstered the promotion measures since FY 2006.
- MFCA focuses on environmental aspects, aiming at substantial cost reduction. Materials generating the output of wastes and emissions should not be input.
- MFCA pursues reduction and dramatic improvement in productivity through innovations of production process.

# MFCA Project of the Ministry of Economy, Trade and Industry

For details, visit the website of the Environmental Industries Office at:  
[http://www.meti.go.jp/policy/eco\\_business/](http://www.meti.go.jp/policy/eco_business/) (in Japanese)

FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006
Research of environmental management accounting			Promotion studies of environmental management accounting				
	Basic studies of MFCA			Studies of MFCA promotion and utilization methods			
			Environmental Management Accounting Workbook (2002)		Model MFCA Introduction targeted at large enterprises and small and medium-sized enterprises		Guide for MFCA, MFCA simplified calculation tool, seminar, workshop

## MFCA Project for FY2007

### 1. Implementation of measures to spread MFCA to all areas

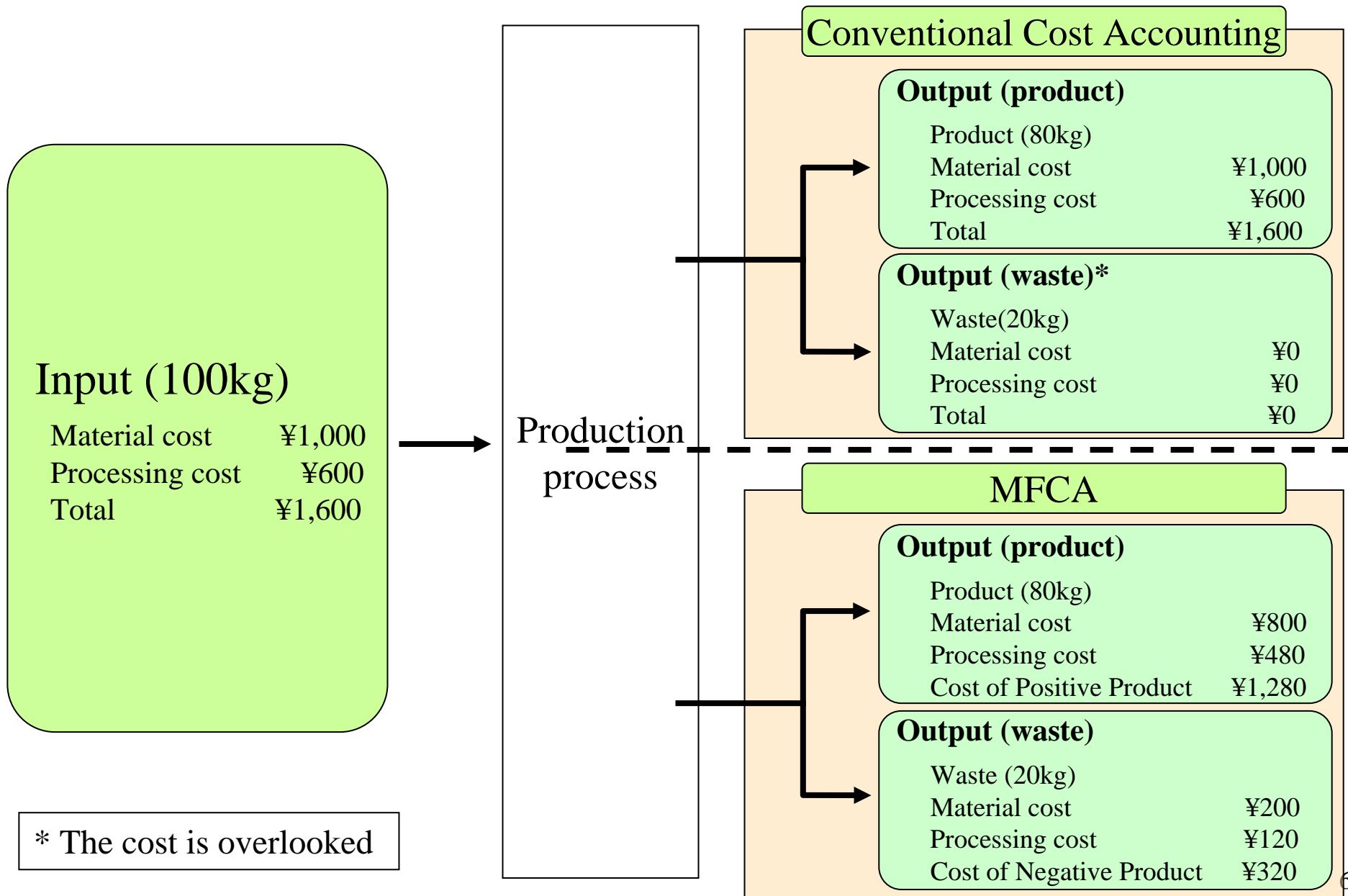
- ①Seminar holding by the enterprise group (Lecturer dispatch, etc)
- ②Workshop for practitioners held by the enterprise group
- ③Model MFCA Introduction project for affiliated company in the enterprise group
- ④Personnel training (Internship in ③)

### 2.Reporting Project

- ①Making of the casebook : Making and the distribution of the casebook which is compiled Model MFCA Introduction project until now intelligibly.
- ②Review of Guide for MFCA : Review and expansion of the following contents that was developed by last year.
  - a. Guide for MFCA    b. MFCA simplified calculation tool (Excel base)    c. manual for MFCA simplified calculation tool
- ③Promotion and publicity work on WEB

### 3.Setting up e advisory support

# Calculation of Material Flow Cost Accounting (MFCA)



# Comparing Profit and Loss Statements (P/L) based on Conventional Cost Accounting and Material Flow Cost Accounting (MFCA)

Conventional P/L and the relevant cost accounting are unable to identify cost losses.

Cost losses are automatically identified as “negative product cost” in P/L based on MFCA, enabling clearer planning of cost reduction measures and improvement effects.

**P/L based on conventional cost accounting  
(unit: thousand yen)**

Sales	<b>2,500</b>
Cost of conforming products	<b>1,600</b>
	<b>(Unknown)</b>
	<b>(Unknown)</b>
Sales profit	<b>900</b>
Sales and general administrative expenses	<b>400</b>
Operating profit	<b>500</b>

**P/L based on MFCA (unit: thousand yen)**

<b>2,500</b>	Sales
<b>1,600</b>	Product cost total
<b>1,280</b>	<b>Positive product cost</b>
<b>320</b>	<b>Negative product cost (loss cost)</b>
<b>900</b>	Sales profit
<b>400</b>	Sales and general administrative expenses
<b>500</b>	Operating profit

# Possibilities of Improvement by Material Flow Cost Accounting

- Increased production efficiency through capital investment  
→ Appropriate and accurate evaluation of investment items
- Cost reduction through changes to product design and raw materials  
→ Precise evaluation of manufacturing cost
- Providing specific targets for on-site improvement activities (e.g. TQC, ISO) → Revitalization of activities
- Extensibility to supply chain and social costs

# Examples of MFCA Utilization

<b>Type of manufacturing process</b>	<b>Processing type:</b> Manufacturing process that usually produces scrape, listing and similar wastes from machine processing, resin molding or other types of processing
	<b>Material type:</b> Material production process with unfavorable yield rate or heat balance; MFCA is also effective for cost simulation in changing material contents of ores, etc.
<b>Processes generating wastes</b>	<b>Individual processes:</b> There are input materials, listing from work-in-process and defective products in each process, generating wastes.
	<b>Latter part of manufacturing process:</b> MFCA is particularly effective where listing, defective products and other wastes are generated.
	<b>Post-manufacturing:</b> If a product has a very short shelf life, stock of expired products is generated and wasted.
	<b>Set-up:</b> Refers to product set-ups requiring detergents and adjusting materials; Loss grows larger in multi-model production.
<b>Complexity in process</b>	<b>Complex processes:</b> Refers to processing involving multiple processes (MFCA is particularly effective in identifying financial responsibilities for losses generated in processes shared by multiple departments.)
<b>Recycling of waste</b>	<b>Recycling treatment:</b> If wastes are sold as recycling materials, the selling prices are lower than the original purchase prices. All the relevant processing costs become loss, which is effectively made visible by MFCA.
	<b>In-process recycling:</b> MFCA is effective in making loss on processing cost visible, even if there is no loss on material cost.
<b>Management standards</b>	<b>Unclear waste data:</b> Refers to the cases where waste quantity data are not identified by process, such as listing, set-up loss, defective loss, yield of byproducts, etc.
<b>Wasted raw materials, work-in-process and products</b>	If a product is discontinued, the relevant raw materials, work-in-process and products are discarded. (This requires particular notice for a product with a short life cycle or frequent model changes.)

# 1. Example of Nitto Denko (Toyohashi Plant)

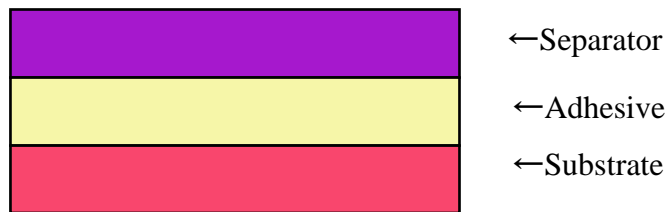
- ◆ Environmental response cost (industrial waste cost, etc.) took up almost the same percentage as operating profit in sales. Introduced MFCA into the production process of adhesive tape for electronics (with negative product rate 32%) → Determined on improvement plans and capital investment.

## [Causes]

Material loss was particularly large in (i) the coating process and (ii) the cutting process. Major causes for the loss were (i) subtle unevenness on the surfaces of adhesive and substrate, and (ii) wasted parts of tape such as cutting margins, etc.

## [Countermeasures]

- (1) Improving the cleaning method for substrate,
- (2) Adjusting the tape width to product specifications,
- and (3) Introducing production equipment based on (1) and (2) as a fundamental solution (Cost: 700 million yen).



Three-layered adhesive tape for electronics

## Improvement targets and achievements (Adhesive tape for electronics, Toyohashi Plant)

	2001	2003	2007 (Targets)
Positive product	68%	78%	90%
Negative product	32%	22%	10%
Total	100%	100%	100%

## 2. Example of Tanabe Seiyaku (Onoda Factory)

◆ Introduced MFCA into a pharmaceutical production process → Realized substantial reduction in environment cost (waste disposal cost) and environmental impact

### [Causes]

The incineration treatment cost of waste liquid containing solvent chloroform, generated from the composition process of pharmaceuticals, was large at 80% of all waste disposal cost.

### [Countermeasures]

In addition to the promotion of recycling chlorine-based solvents, the company switched from incineration to active sludge treatment using microbes. At the same times, removed the incinerator.

### [Effects]

Reduced costs for raw materials, waste disposal cost, incinerator maintenance, etc. (approx. 55 million yen/year)

The cost of capital investment (approx. 66 million yen) was mostly recovered in a year.

Also achieved the energy-saving cost of approx. 33 million yen/year (2,328 tons/year in CO<sub>2</sub> emissions)



▲ Removed the incineration plant in 2004

■ Won the Special Prize (MFCA Section) for the Environmental Efficiency Award  
2006 (December 2006)

### 3. Example of Canon (Utsunomiya Plant)

- ◆ Introduced MFCA into the lens processing process → Realized a breakthrough by near-shape technology

#### [Causes]

Treatment cost for sludge, waste fluid, etc. generated from the lens grinding process took up two-thirds of all material loss.

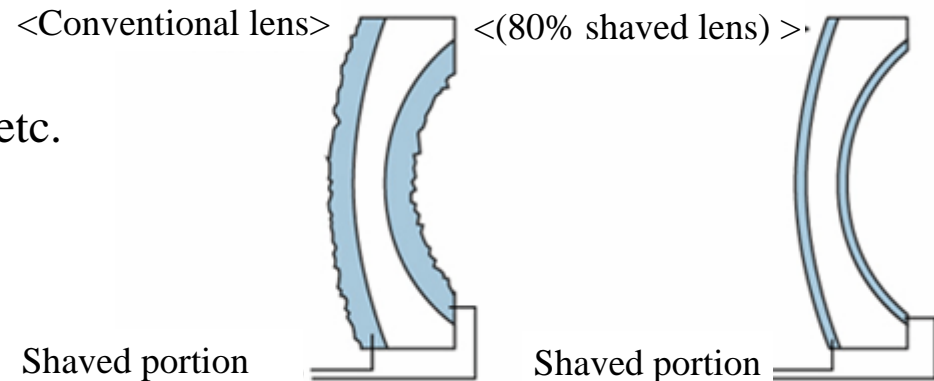
#### [Countermeasures]

Reducing sludge by near-shape technology

#### [Effects]

Reduced the grinding quantity →  
Reduced sludge treatment,  
processing man-hours,  
energy consumption, waste fluid treatment, etc.

Image of near-shape technology for lenses (Canon)



■ Won the Special Prize (MFCA Section) for the Environmental Efficiency Award  
2006 (December 2006)

## 4. Example: DMC Corporation (small-to mid-size company)

- ◆ Reduction of film loss in touch panel manufacturing through tie-ins with materials suppliers

### <Causes and Incentives>

The cut-out film discarded from the production line amounts to a substantial amount of waste. An attempt was made to evaluate this waste production as an MFCA loss cost rather than simply as a loss cost, so as to take it into consideration at the product design stage.

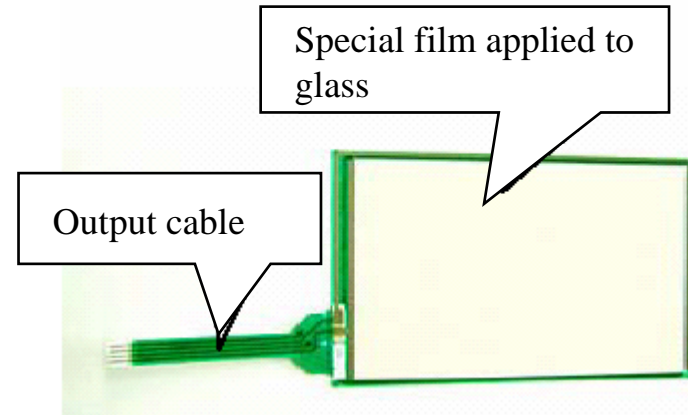
### <Strategy>

Cut losses by improving (replacing) equipment to gain greater cutting process efficiency. Make sure that both on-site supervisors and materials suppliers are aware of waste loss cost derived using MFCA, and request cooperation in supplying film materials that will result in less waste.

### <Results>

The Design and Production units worked together to look into film application, and came with the best specifications for it. Using those results, they negotiated with the suppliers to make it possible to purchase film meeting the optimal width specifications. Materials waste was also achieved by eliminating the need for preliminary cutting by achieving stock amount stability.

→ Waste reduction of 10% or greater



<Touch Panel (input device attached to the front of a liquid crystal display monitor)>

## 5. Example: Nippon Film Co, Ltd. (small-to mid-size company)

### ◆ Reduction of defects occurring in trash bag manufacturing, and evaluation through LCA

#### <Causes and Incentives>

Defective products were being produced in the trash bag production line, which spans the entire process of fusing, shaping, printing, and packaging polyethylene and is automated online. It was thought that MFCA could be used to improve the roll-type trash bags manufactured on an efficient automated production line. Furthermore, the company sought to use MFCA data to make an environmental evaluation based on LCA.

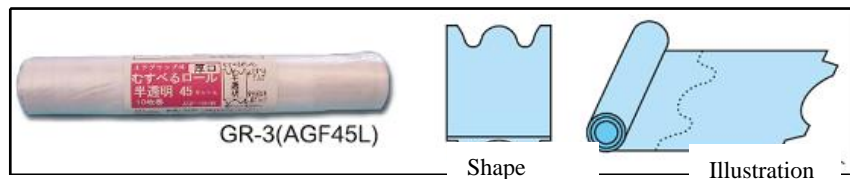
#### <Strategy>

Create a specific strategy for reducing the defect causes and volume through precise measurement of MFCA point data. Conduct LCA environmental evaluation of the company's patented roll-type trash bags based on the MFCA data.

#### <Results>

The defect volume was reduced (loss rate of 4.62%), because specifying the timing of the emergence of the defects (which occurred especially at start-up and temporary stoppage) and their volume made it possible to provide the operators with a list of items to look out for around the time that the defects occur.

The use of the MFCA data made it easy to execute an LCA environmental evaluation, so the company was able to provide consumers with an accurate environmental assessment of its products. (According to LIME, this showed a ¥0.006/sheet reduction in external costs for roll-type trash bags in comparison with flat-type trash bags.)



#### <Roll-Type Trash Bags>

#### <Flat-type trash bags>

Trash bags dispensed one-by-one independently.

#### <Roll-type trash bags>

Trash bags that are connected and are easily separated for use.

## 6. Example: IBEX Co, Ltd. (small-to mid-size company)

- ◆ Reducing production costs for various circuit boards used in FA (Factory Automation) equipment

### <Causes and Incentives>

While the defect rate is low, problems such as high (intangible) loss costs were recognized to exist in process re-jigging and testing.

### <Strategy>

Data measurement and analysis based on MFCA were conducted, and as anticipated high system loss costs were found. A strategy was formed for investigating the causes of their occurrence in re-jigging. Testing tools that would enable the reduction of testing costs through testing optimization and streamlining, as well as the immediate identification of test items, were developed.

### <Results>

The overall loss cost rate in overall system costs was broadly reduced, from 13% before improvements to 0.51% after, by executing a strategy in line with the investigation of the occurrence of system loss costs according to MFCA and the actual situation.



<Circuit boards for FA equipment>