CHECKLIST FOR GETTING STARTED WITH MFCA:

1. Involve management to ensure a successful implementation.
2. Form a cross-departmental team from the production, accounting, environmental, quality control, R&D and other applicable groups and familiarize the team with MFCA.
3. List the main input materials (raw and auxiliary) and output materials (product and waste) including energy expended. Use this list to estimate an initial input-output-mass-balance for the plant.
4. Define the material flows to monitor (a production line, a specific product, or a specific material) along with a time period for taking measurements. Material flows are movements of material between various quantity centers, where the material is processed or stored.
5. Create a flow chart to depict the movement of material through the production process noting both the physical and monetary values of material and expended resources. The flow chart can be based on a plant or production line layout.
6. Define quantity centers as cost centers along the material flow (e.g. a machine, a unit of the production line, a department, or a storage area).
7. Identify the amount of material and energy going into and out of each process/quantity center.
8. Identify system costs for handling material including labor, depreciation, maintenance, and transportation for each quantity center and each transition between quantity centers.
9. Build a rough summary of the input and output volumes and costs. You can use a simple MFCA matrix. This will provide you with an overview of both product and non-product costs, providing a guide for the most promising ways to reduce costs.
10. Once MFCA is in place, integrate it within a Plan, Do, Check, Act (PDCA) management cycle and set measurable targets for increasing material efficiency, reducing costs and rewarding employees for successful implementation. The PDCA cycle should be repeated regularly in order to ensure constant improvement.

VISUALIZING MFCA

Note how both physical and monetary units are tracked throughout the production process (this is an illustrative example).

Material
200 tons $100,000

Process 1
Slaughter house

Process 2
Meat processing

Final product
125 tons $62,750

Material
175 tons $87,750

Energy
22 000 kWh $2,800
Labor
200 man hours $4,000

Process 1 — Resources Expended
Waste 25 tons $12,250
Energy 22 000 kWh $2,800
Labor 200 man hours $4,000

Process 2 — Resources Expended
Waste 50 tons $25,000
Energy 40 000 kWh $5,600
Labor 50 man hours $1,000

KEEP TRACK AND STAY IN THE BLACK

How manufacturers can improve profitability, make better business decisions, and reduce waste.

Did you know that the real cost of waste can be up to 100 times higher than you think?

Many manufacturers underestimate their waste costs by focusing on disposal expenses and recycling revenue, missing the high cost of raw materials that don’t end up in the final product. In fact, by tracking the cost of raw materials, energy and other resources throughout the production process, significant cost reductions can be identified and waste decreased. Tracking also provides actionable information about production processes empowering companies to make more effective business decisions.

IFC examined three manufacturers in different countries to discover the true cost of waste in their operations, identifying strategies for cutting costs, reducing waste and increasing efficiency. The results of the study and an approach for achieving improvements follow.

THE REAL COST OF WASTE

FACT

Many manufacturers underestimate the real cost of the waste they generate.

By focusing on waste disposal fees and misleading recycling revenue at the end of the manufacturing process, producers can overlook costs for managing waste like labor, energy, and most importantly, the expensive cost of wasted material purchased at the beginning of production.

PROFIT POTENTIAL REVEALED

FACT

Identifying and reducing the true cost of waste can set the stage for new profits.

The best way to identify and reduce the cost of waste is to examine the amount of material used to make your product. Since material costs are often the largest share of all production expenses, using less material can lead to significant savings. In fact, this is a sounder strategy for reducing overall costs than focusing on labor expenses which are usually a smaller portion of costs.

For the three companies involved in this study, material costs accounted for 70 — 80% of their production expenses. Thus, reducing material in product as well as in waste is a great way to decrease overall costs — a much more effective option than cutting labor expenditures.

A small increase in material efficiency can yield big savings. Specifically a 2.5% material efficiency increase can yield a yearly savings of $1,360,000 (real-world example of company in this study with $55,000,000 in annual production costs).

In partnership with

Material Costs as a Percentage of Production Costs

<table>
<thead>
<tr>
<th>Material / Other / Labor</th>
<th>Aluminum production</th>
<th>Meat processor</th>
<th>Tin can producer</th>
<th>German production industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>78%</td>
<td>70%</td>
<td>80%</td>
<td>56%</td>
</tr>
<tr>
<td>Other</td>
<td>12%</td>
<td>18%</td>
<td>9%</td>
<td>26%</td>
</tr>
<tr>
<td>Labor</td>
<td>7%</td>
<td>11%</td>
<td>18%</td>
<td>18%</td>
</tr>
</tbody>
</table>

Waste costs can be understated by as much as 100 times

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Tracking material, energy and other resources in the production process can identify the true cost of waste and provide useful information for making a factory more efficient.

Tracking pinpoints where the most expensive resources are wasted in the production process, providing a blueprint for corrective and useful information for adjusting manufacturing processes.

Using ISO 14051 guidelines for material flow cost accounting (MFCA), IFC assessed three factories in Europe and Central Asia to identify the cost of waste in their operations. IFC discovered that the manufacturers where vastly underestimating their waste costs. In particular, each factory demonstrated a significant potential for cutting costs by reducing the amount of physical material that was lost during the manufacturing process.

IFC discovered millions of dollars of hidden waste costs after assessing the three manufacturers in this study. The true cost of waste for each plant ranged from 4 — 103 times higher than the companies’ estimates. In fact, when considering recycling revenues, two out of the three companies considered waste disposal to actually bring in revenue, causing a major misperception about waste costs.

### Aluminum Products Producer
- CIS company
- 150 million meters of roll-formed profiles per year
- 25,000 tons of coated aluminum coils made per year
- 70,000 tons of coated steel coils made per year

**Reported costs**
- $161,000

**Hidden waste costs**
- 74x reported costs

**True cost of waste**
- $1,350,000

**Hidden costs ratio**
- 78%

**Waste: Material, Energy, Labor, Other**

**Cost of Wasted Resources**
- $19,300,000

### Meat Processor
- Serbian company
- 18,000 tons of meat products annually
- Exports to Western European market

**Reported costs**
- $187,000

**Hidden waste costs**
- 103x reported costs

**True cost of waste**
- $19,300,000

**Hidden costs ratio**
- 70%

### Tin Can Manufacturer
- Turkish company
- Makes tin food and aerosol cans
- 375 billion unit production capacity
- $450 million turnover
- 450 employees at a 17,000 m² facility

**Reported costs**
- $1,200,000

**Hidden waste costs**
- 4x reported costs

**True cost of waste**
- $5,550,000

**Hidden costs ratio**
- 80%

### Finding the Hidden Cost of Waste
ISO 14051 and Material Flow Cost Accounting

In order to identify the true cost of waste it is essential for manufacturers to closely track material as it flows through the production process and assign costs to discarded material and the resources expended to manage the discarded material. This can be accomplished using material flow cost accounting (MFCA) as described in ISO 14051.

Material flow cost accounting (MFCA) is based on the concept that all raw materials that enter a factory will exit as part of a final product or as some type of waste (otherwise known as non-product). MFCA is a system for tracing the amounts and costs of this material through the entire production process, as well as the resources used to process this material, such as energy, labor and transportation.

The end result of a proper MFCA implementation is a clear picture of the costs of these resources as they are deployed or lost in specific points of the production process, providing useful data for identifying opportunities to reduce costs and improve the production process.

For example, in this study, MFCA techniques revealed that the tin can producer which was reporting $200,000 in revenue from waste ($1,400,000 in recycling revenue less $1,200,000 in waste expenses was actually incurring $5,550,000 in waste costs. Thus, MFCA revealed that it is advantageous to cut the amount of waste generated instead of creating more recyclable waste which appeared to generate revenue.