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Material Flow Cost Accounting extended to the Supply Chain – Challenges, Benefits and Links to Life Cycle Engineering

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Abstract

Since May 2014 a new ISO Standard on Guidance for the extension of Material Flow Cost Accounting (MFCA) into the Supply Chain is in preparation. The contribution will elaborate on the challenges and benefits of this extension for the participating supply chain partners. As Material Flow Cost Accounting and Life Cycle Engineering are based on a similar demand on information about Material and Energy Flows along the Supply Chain, respectively along the life Cycle, synergies and differences between the two approaches will be discussed. As far as available guidance for successful collaboration in the supply chain will be given.

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Keywords: Supply Chain, Material Flow Cost Accounting

1. Introduction to Material Flow Cost Accounting

First the paper will give an introduction to Material Flow Cost Accounting, its development as a method which is used internally by companies to identify improvement potentials and the related ISO standard ISO 14051. Than the reasons, challenges and benefits for extending MFCA to the supply Chain will be discussed. Finally possible links between MFCA and Life Cycle Engineering are described.

Nomenclature

MFCA	Material Flow Cost Accounting
LCA	Life Cycle Assessment
LCE	Life Cycle Engineering
ISO	International Standard Organisation
QC	Quantity Center

1.1. MFCA as an internal method

MFCA is a material and energy flow oriented accounting approach, which can be used within an environmental management accounting framework. Material and energy flow oriented cost accounting approaches focus on the corporate material and energy flows as cost objects. The reasons for this are that firstly environmental impacts of a corporation are directly related to material and energy use and secondly – at least that's true for producing industry – energy and especially material cause the highest portion of costs of a company. Therefore material and energy flows are of double importance, as their reduction is a joint ecological and economic target. The goal of implementing MFCA is to increase resource efficiency of production systems [4, 6, 8, 9, 10, 11].

The target for getting started with MFCA is a higher visibility for inefficiencies in a production system. Therefore losses and other inefficiencies are quantified and visualized regarding their physical units and their costs. Especially inefficiencies caused by production losses get more attention in

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decision making as such losses are identified with their true costs [1, 5]. The basic approach is visualized in fig. 1.

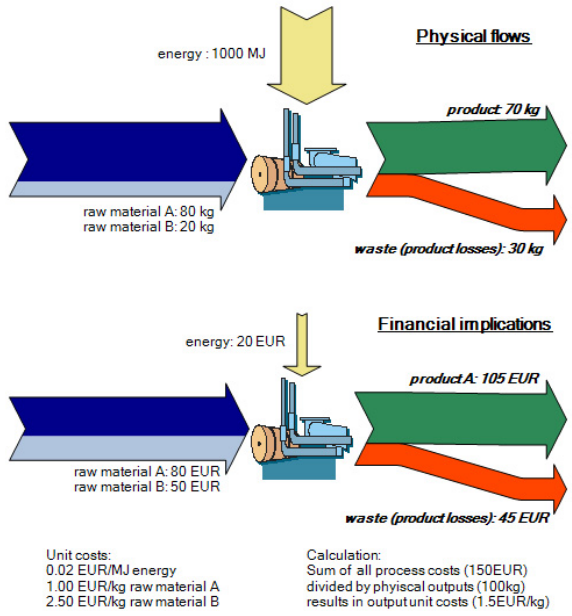

Fig. 1. Basic MFCA Approach [14]

What differentiates MFCA from other costing approaches is the attribution of costs to material and energy losses and not only to products as done in conventional cost accounting. In a simple case this cost allocation is done according to mass. MFCA practitioners assume in this ideal and simplified case that there is a linear relationship between inputs and outputs of a production process. This leads to a reduction of input flows if losses of outputs can be reduced as shown in figure 2.

Conventional cost accounting considers when assessing the reduction of losses only the reduction of disposal costs if applicable. So losses are not linked back for the assessment of improvements to material and energy flows caused throughout the production system.

The case of internal recycling without the application of MFCA may be considered as cost neutral. As a material is recycled internally this material is not accounted for as a loss in conventional cost accounting. In an assessment using MFCA the recycling often will be identified as an inefficiency. Cost for energy, labor and auxiliaries used for the recycling process become quantified and thus visible, as they are attributed to the loss (to be recycled material) [12]. As a consequence a measure reducing the amount of material that has to be recycled internally becomes more attractive. Also material losses sold as scrap are often seen as beneficial. Considering the purchase cost, the cost for energy, labor caused for "producing" that scrap, the small income generated by the sold scrap becomes clearly identified as a bad deal.

Applying MFCA therefore leads to a new assessment of efficiency potentials which can be identified for reducing losses that occur after several process steps. The true cost of a loss occurring after a series of processes is substantially underestimated without MFCA.

A reduction of waste by 10 kg would reduce the overall output of 100 kg in the upper Sankey diagram of figure 1 by 10%. Assuming a linear correlation between inputs and outputs this would lead to a reduction of 10% of all inputs and related cost respectively. In practice linear relations between inputs and outputs are rare and the potential of waste reduction to zero is only a theoretical optimum. Still having the information that waste induced cost are summing up to a total of 45 € - which represents 30% of the product costs in the example shown in figure 1 - supports the efforts of decision makers to reduce inefficiencies. This more complete perspective on losses helps to avoid that small reduction potentials are underestimated in their impact on the overall result and they can result in notable cost savings considering all of their upstream effects.

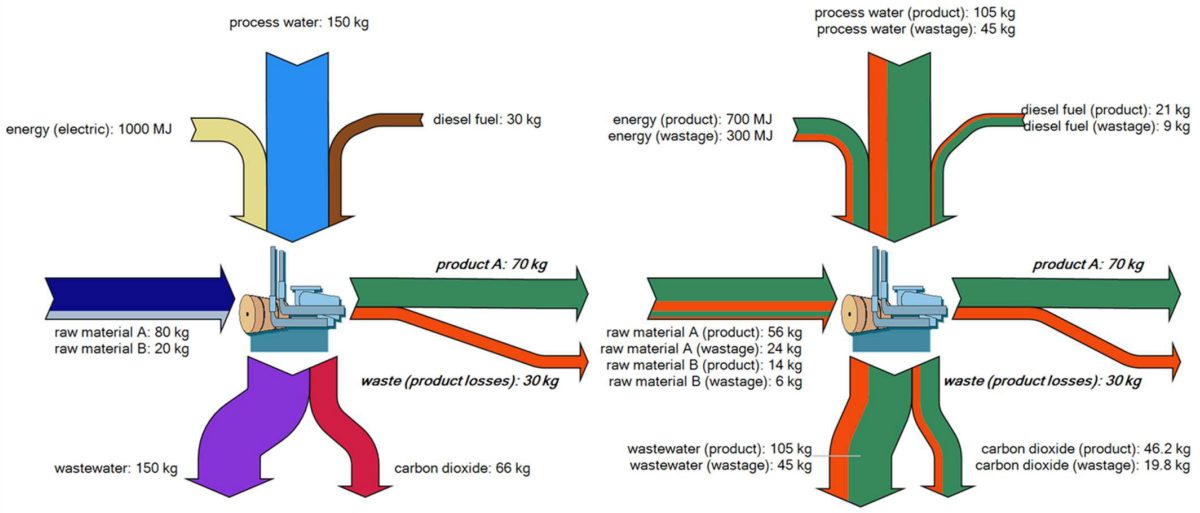

Fig. 2. Visualized reduction potential [14]