

FLOW COST ACCOUNTING – SYSTEM FOR REDUCING MATERIAL COSTS

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Introduction

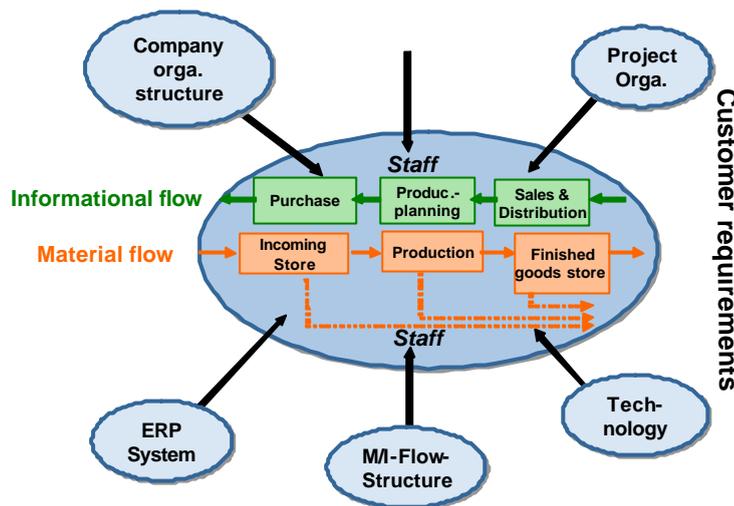
The leadership echelon from DaimlerChrysler wants to do this (*Stuttgarter Zeitung* [daily newspaper] from 09/12/2000), and the management from General Motors as well (Financial Times Germany from 10/1/2002). The reduction of material costs is increasingly recognised as a key factor for corporate success. The reason is quite simple. In production companies the material costs are the largest block of outgoings by far, and have a correspondingly high cost relevance. In the German average, the material costs of companies in the production trade lie at ca. 56%. In relation to the material costs of the chemical industry, the reduction of material input by 1 percentage point is linked with a cost-cutting potential of 586 million Euro. (Source: Federal Statistical Office: Statistical Yearbook 1999). In contrast to staff reductions this potential for cutting costs is linked with positive image effects. That is to say, efficient material input leads not only to considerable cost reductions, but at the same time improves the company's environmental efficiency.

Flow cost accounting performs an important function within flow management, namely that of quantifying the factors in the material flow system and by obtaining an improved in-house transparency also revealing points of departure for economic and ecological oriented modifications to the flows of materials. In quantifying the material flow system, the company creates a database containing quantities, values, and costs, consistent throughout. In the foreground are those quantities (in physical units like numbers, kg, m³, KWh etc.), values (= physical quantity x input price) and costs that refer directly to the material flows themselves (e.g. material costs, inventory values, and waste volumes) but the material flows also include all the other costs incurred by the company in maintaining the material flow system (e.g. personnel costs, write-downs and depreciation).

Flow cost accounting can thus be recommended as an improvement on existing accounting approaches - in two respects : economic and ecological.

Flow Cost Accounting as a part of Flow Management

The basic idea of Flow Management is the assumption that the fulcrum point for equally ecological, economic and social effectivity is efficient structuring of the material and information flows within a company. Therefore, it is necessary to create a complex control



system, which provides these three aspects within the sense of efficient organization and still allows easy handling.

The method, in which the material and information flows are structured, depends primarily on the employees, whose action

Figure 1: Flow management for production companies

itself can be structured within the scope of external marginal conditions. The prerequisite is knowledge of the material and information flows, process-oriented and modifiable organizational structure as well as transparent and reliable information from the ERP system.

Why is Focusing on Material Costs Alone Worthwhile?

In producing companies, the creation of physical products and therefore processing of various materials is of central importance for business success from an economic as well as ecologic point of view. In addition to being connected with considerable logistic expenses for the material flow structure, the material costs (quantity of materials used evaluated at purchase price) also represent by far the greatest cost block as mentioned in the introduction. The reduction of the use of materials can therefore contribute to significant cost reductions with simultaneous positive effects for the environment. Primary obstacles for systematic reduction of material costs are insufficient transparency in the inner company material flow structure and the associated costs. Frequently, the company accounting department is not capable of providing detailed and cogent information on the use and whereabouts of the material.

With the increasing use of Enterprise Resource Planning Systems (ERP systems) the prerequisites for detailed follow-up on material flows is improved considerably. Major producing companies create millions of data records on material flows annually. As a rule, however, the information is used only very unsystematically. With minimum efforts for adaptation, the ERP systems can be advanced to the point that employees are provided with material data relevant for handling within a very short time. This problem is the objective of flow cost accounting.

Flow Cost Accounting Makes Material Flows Transparent

First, flow cost accounting considers the quantities and values of material received by a company within a certain period. These quantities and values are associated with material flows within the company at the level of individual material numbers. In addition to considering the material flows going into the product, material flows resulting from material losses are also observed. Evaluation of the material quantities is accomplished at the purchasing prices regardless of whether the material is a raw material, an intermediate

Production costs (in \$ millions)	Material costs	System costs	Delivery and disposal costs	Total
Product	85	22	0	107
Packaging	27	18	2	47
Material losses	19	4	1	24
Total	131	44	3	

Material costs account for a considerable percentage!
(e.g. 67% of production costs)

A considerable share of costs is caused by material losses!
(e.g. > 12% of production costs)

product or a finished product. The value added within the company is therefore not taken into consideration in the first step. In this manner, the difference between input and output allows us to determine in detail the material losses resulting in storage and production. On the basis of this material flow transparency, the system costs (e.g.

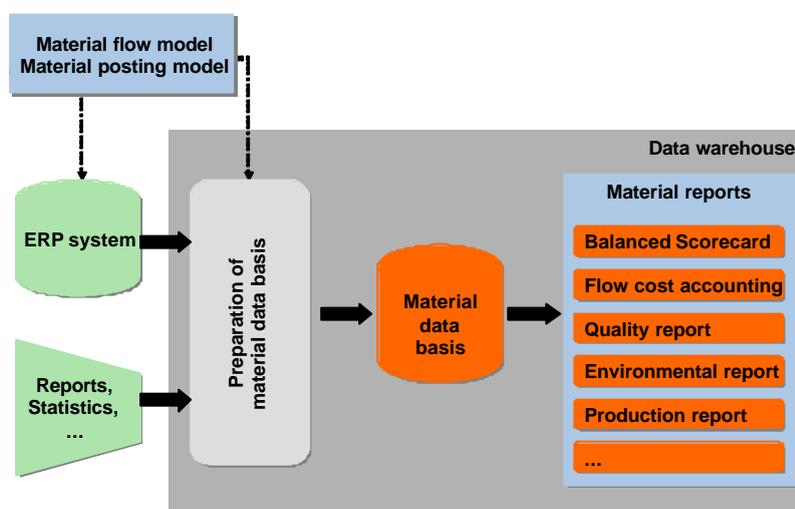
Figure 2: Example of flow costs for a pharmaceutical company

personnel costs, write-offs, etc.) and disposal costs can be associated in concrete terms with the individual material flows in the next step. However, the material flows represent a significant cost factor within the scope of flow cost accounting.

Flow cost accounting frequently shows that the structure of the ERP systems are not aligned clearly with real material flows. Moreover, numerous incongruencies (erroneous bookings, errors in parts lists etc.) become apparent in the existing database, which can be discovered and eliminated systematically within the course of flow cost accounting.

Material Flow Transparency in Company ERP Setting

A multiple-stage procedure is most practical for permanent integration of flow cost accounting into the company optimization process. First, existing ERP systems need to be checked in terms of their complete material flow transparency and upgraded as required. In addition to adaptations of master data, types of movements, etc. it is also necessary to revise the practice of material booking in this context. When the data quality in the ERP systems is improved accordingly, the question arises of how the data can be processed without major effort and evaluated by highly differing employees. Since ERP systems usually provide only



insufficient support here, it is most practical to edit the material data in a data warehouse. This uniformly edited material data can also be used for numerous other material-related reports such as production statistics and environmental reports in

Figure 3: Integration of flow cost accounting in an ERP environment

addition to its use in flow cost accounting. The data warehouse can be used for providing information to decision-making employees on an individual basis within minimum time.

Informed Employees Develop Manifold Measures

Only when employees are informed of material use and material efficiency at short cycles, is it possible to start a systematic learning process leading to continuous improvements. With the material reports, all associated staff members receive a highly detailed continuous summary of quantities and costs for materials used in the company's products and leaving the company as remaining materials. This knowledge is the basis for discovering improvement potentials and using them systematically:

- Development of products and packaging
e.g. thinner container walls, modification of mixtures and processes, dematerialization for new product generations, elimination of packaging components

- Organizational measures
e.g. increasing charge sizes, better machine adjustment, optimization of cutting, reduction of over-delivery, coordination between marketing and production planning, material procurement, coordination with suppliers
- Technical optimization of existing facilities
e.g. more precise track guidance, control using photocells, return of material losses to the system
- Investments in new equipment

Concrete Benefit for Companies

According to experience, flow management leads to the following benefits for companies:

- Reduction of material costs (and disposal costs)
- Overall optimization of stocks, throughput times and lot sizes
- Reduction of time required for ERP system (searching for errors, reprocessing and reporting)
- Increase in process reliability (procurement, production planning, marketing, etc.)
- Consolidation and simplification of management systems (Supply Chain Management, Customer Relationship Management, Quality Management (9001:2000, VDA) Environmental Management, etc.)

FLow cost accounting in companies: the example of Ciba

AT A GLANCE

- Ciba exposes material discrepancies in the amount of millions through material flow modelling and flow cost accounting
- Eco-efficiency becomes an object of the group-wide project “Fit for Growth”
- Eco-efficiency triggers internal developmental measures for reduction of material discrepancies
- Improvements do not have to be expensive: Employees from Ciba develop fast and simple approaches

Material flow controlling: systematic reduce of material costs

Ciba Spezialitätenchemie Pfersee GmbH

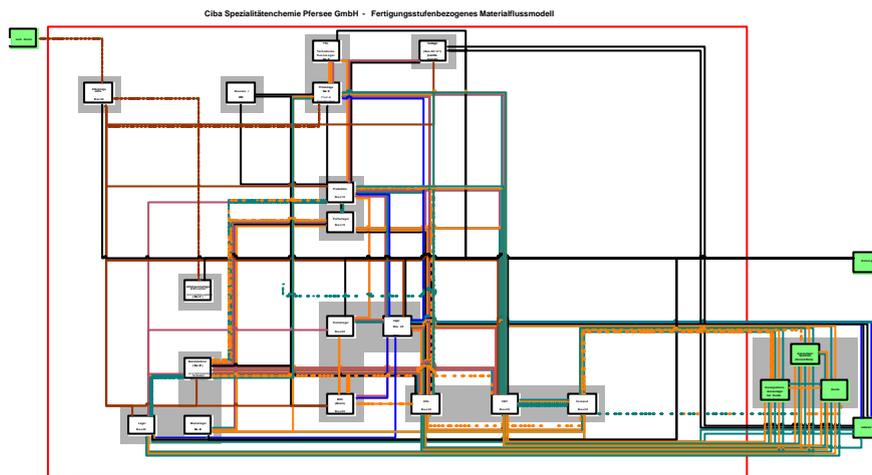
Die Ciba Spezialitätenchemie Pfersee GmbH [speciality chemicals] is a subsidiary of the Ciba Spezialitätenchemie AG group in Basel. As an international partner of the textile industry, Ciba develops, produces and markets products in Langweid for the processing of textiles. High-quality textile attributes such as protection against weathering, heat or moisture, longer durability as well as shape retention and colour resistance are especially important for the international clothing industry and for technical textiles (e.g. automobile industry). A staff of ca. 400 are employed at the Langweid premises near Augsburg.

From modelling to material savings

Corporate modelling

In order to establish the transparency concerning the structure of the **product material flows** as well as a uniform viewing method of those employed concerning the corporate structure, a material flow model was prepared in the first step. The product material flows at Ciba were modelled separately according to the following categories: raw and auxiliary materials, intermediate products, finished products, merchandise, goods returned to suppliers, goods returned from customers, non-value-adding product material flows in the form of residual wastes and effluent loads. This material flow model illustrates in detail the material flow from suppliers throughout all internal production stages up to customers or waste disposal operators, respectively.

Figure 4: Material flow model



The **material posting model** was prepared in a second step. In this model the structure is documented, in which the ERP system or the process computer illustrates material-relevant data such as movements or inventories. In addition to the posting-technical storage locations, the production orders and cost centres of the company were modelled. In view of a differentiated presentation of the production processes, six categories were defined for production orders (production order areas). Finally, it was a matter of balancing the physical and posting-technical product material flows against one another. Because the EDP system doesn't always consistently illustrate the actual material flows sufficiently and in enough detail to enable meaningful evaluations of the existing data. The balancing subsequently serves to recognise the variance between actual material flows and electronic data.

With the help of this balancing, the following measures for improvement of the material flow transparency in the ERP system were able to be prompted: Establishment of process-specific production order areas, revision of movement keys in order to ensure a clear division between storage location, production order, cost centre, reverse, correction and cancellation postings, etc., as well as a better backtracking capability vis-à-vis the "from-to" postings. Staff training with respect to a consistent utilisation of the revised movement key.

Flow cost accounting

For the development of more efficient measures for reduction of material input it is crucial for a company to have specific information regarding the nature and amount of material movements and material discrepancies which arise in the individual storage locations or orders. In order to be able to assign quantities and values to the material flows, the **flow cost accounting** was implemented in a third step. The flow cost accounting exclusively utilises data which are already available in the ERP system or in the process computer. Before the evaluation of the data was able to be started, the Ciba employees had to prepare the necessary tables (material master data, formulations, flow data, inventory data, etc.). In the framework of the flow cost accounting, the material flows and inventories have now been evaluated on the basis of an SQL-based databank by employees from the Institute for Management and Environment (imu). Based on the most varying calculation elements (production order, storage location and movement accounting), statements concerning posting and material discrepancies up to the raw material and product level were able to be deduced for every charge. Essential causes for discrepancies such as chemical by-products or recycling losses were reported in detail.

Findings

Ciba recognises immediate need for action

The overall result of the flow accounting showed material discrepancies in an amount of over 2 million Euro, and prompted Ciba to introduce numerous improvement measures — not merely in the technical field, but also in the organisational area. Beyond that, the material flow management shall be interlocked with the existing management systems (integrated management for environment and quality, supply chain management, etc.). Eco-efficiency has also attracted attention beyond the production premises, and will be integrated in the group-wide “Fit for Growth” project in order to continually and systematically work on the reduction of material and posting discrepancies.

These developments already show today that a shift in thinking has taken place in the companies. Many quantifiable improvements which are based on the knowledge of the location and the quantity of material discrepancies will be evident at the end of 2002. Then the measures implemented today will be manifested in specific cost savings.

eco-efficiency project

The eco-efficiency project, which is being promoted in the framework of the Bavarian high-tech offensive from the State Ministry for Education, cultural Affairs and Science, is located at the Institute for Management and Environment. The flow management will be implemented in numerous pilot companies by March 2003. You'll find up-to-date information on the status of the project under: www.eco-effizienz.de or contact: info@imu-augsburg.de .

Within the scope of the eco-efficiency company network, companies can obtain information on the status and development of the project at no cost at regular intervals (registration under: www.eco-effizienz.de). The material developed within the scope of this project has already received considerable interest internationally. For example, the Japanese Ministry of Economy (METI) has requested a research commission consisting of four pilot companies (e.g. Canon) to perform and evaluate flow cost accounting. In the USA, a close exchange of information was accomplished with the US Environmental Protection Agency and Harvard University.

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Abstract:

In many companies the systematic reduction of material costs is thwarted due to an insufficient transparency of in-house material flows. Although larger production companies annually generate millions of data records concerning material movements in the ERP systems (from manufacturers such as SAP, BAAN, Oracle, etc.) and process computers, the production as well as the controlling is frequently not able to make general statements concerning the utilisation and the whereabouts of purchased materials in quantities, values and costs. Ambiguous posting structures, fluctuating active substance percentages or posting and acquisition errors severely impede analyses. With a marginal adaptation effort the quality of data and detail can be improved to such an extent that a material data base is created, which presents flexible evaluation possibilities and provides decision-makers with equitable target group information. On the basis of consistent material data larger investment decisions are thus able to be made, products are able to be further developed and a continuous improvement process can be set in motion

The instrument of flow cost accounting shifts a company's in-house material flows into the center of the costs analysis and attempts to make these flows transparent beginning-to-end in terms of their effects on costs, in full and flow-specific. This transparency can make a meaningful contribution to clarifying the complex relationships of effects operating within the material flow system and thus create a comprehensive database for realizing potentials and evaluating appropriate measures for improvement. Flow cost accounting may reveal that a measure designed to raise efficiency on a production system leads not only to lower costs in the actual materials but also to lower costs in materials handling and waste disposal.

In the German average, the material costs of companies in the production trade lie at ca. 56%. In relation to the material costs of the chemical industry, the reduction of material input by 1 percentage point is linked with a cost-cutting potential of 586 million Euro. (Source: Federal Statistical Office: Statistical Yearbook 1999). In contrast to staff reductions this potential for cutting costs is linked with positive image effects. That is to say, efficient material input leads not only to considerable cost reductions, but at the same time improves the company's environmental efficiency.