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THE EFFECT OF MATERIAL FLOW COST ACCOUNTING ON COST REDUCTION AND COMPETITIVE ADVANTAGE SUPPORT

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Abstract:

This research mainly aims to show the effect of using material flow accounting on costs reduction and competitive advantage support in industrial companies, by costs reduction through the optimal use of resources, and showing the effect of this reduction in competitive advantage support, to achieve the objective of this research, the study followed the inductive and deductive approach through a case study in Basra Asphalt Plant. The laboratory data was adopted to clarify the research problem and to achieve its objective and hypothesis to determine the effect of material flow costs accounting in the competitive advantage support of the plant.

- Among the most important conclusions reached by the research: The application of material flow cost accounting has a positive effect on costs reduction and rationalizing administrative decisions, as this method identifies positive product costs and separates them from negative costs, which prompts the plant administrative to make management decisions regarding costs reduction by negative costs elimination, and this leads to remain in the market and continue competing**, he researcher then reached a set of recommendations, the most important of which are:**

- Companies should always adopt the proposed framework study of the material flow cost accounting approach in order to enhance their strengths and address their weaknesses to competitive advantage achieve in the modern manufacturing environment, by determine the costs of good products and negative costs for each process in industrial companies, including the research sample laboratory, without charging those negative costs and waste costs to the final product or considering them as general expenses.

Keywords: Material Flow Cost Accounting, Cost Reduction, Competitive Advantage Support

INTRODUCTION

Material flow accounting is one of the most important and beneficial management accounting methods, especially in the past two decades, to achieve advanced levels of productivity by following the principle of reduction the use of resources and reduction the damage to the environment at the same time, as it is one of the environmental accounting tools that care about the environment. It is concerned with costs administrative and how to measure it. It is distinguished by its precise focus on costs and dealing with the company's available resources. It is an accounting tool for environmental costs analyze, in addition to being a method that works to manage costs accurately and reduce those costs through optimal sustainability of resources accompanied by the production of products at the lowest costs and with high quality. However, this enables the company to face the ongoing competition between similar and competing companies. It is considered a modern method or technology that has a positive and significant impact in

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supporting the competitive advantage of companies as it focuses on product costs reduction by dealing with the resources available to the company as a result of distinguishing between resources that add value to the product and resources exclude that do not add value.

1- The first section: Research methodology

1-1 Research problem

- Cost and quality are the most important factors for the success of the company and the continuity of its activity, failure in quality burdens the company with additional costs, wasted time, loss of customers, etc. Therefore, the focus at the present time is on production of products at the lowest costs and with high quality by producing products free of defects and meeting the customer's desires, by adopting the method of accounting for material flow costs. Through this, the research problem can be formulated as follows: -

Does accounting for material flow costs have an effect on costs reduction and competitive advantage support?

1-2 Research importance

he importance of the research is evident in determine the most important strategic methods used to improve product quality and costs reduction and the extent of their effect and interaction with the business environment, which is one of the most important researches that attract the attention of companies whose objective is to continue their activity and competitive advantage achieve.

1-3 Research objectives

The main objective is to determine the effect of using the material flow cost accounting method on costs reduction and competitive advantage support in industrial companies, and sub-objectives are derived from it, which are as follows:

A- Determine modern strategic methods for costs reduction and giving a general idea about them and how to apply them.

B- The effect of the optimal use of available resources in costs reduction

C- Costs reduction has an effect on competitive advantage achieve.

1-4 Research Hypotheses

A- Accounting for material flow costs has an effect on costs reduction.

B- The companies' use of optimal resources reduces costs and improves quality..

C- Accounting for material flow costs has an effect on reduction for competitive advantage support.

1-5 Research Limits

- Spatial Limits: Data from the Oxidized Asphalt Plant/Basra were adopted as a sample for the research.
- Temporal Limits: Data from August - 2023 were adopted, as the plant relies on the batch system.

1-6 Data collection methods

Data were collected by following two aspects:

- The data were collected by following two aspects:
  - Theoretical aspect: The data related to the research topic were obtained by reviewing scientific sources in reputable journals, represented by letters and dissertations, as well as books and periodicals to benefit from them in covering the theoretical aspect of the research topic.
  - Field aspect: The data were obtained by relying on the company's accounting records, in addition to personal interviews conducted by the researcher in the research sample company in the relevant departments.

2- The second section: The theoretical framework

2-1 material flow cost accounting

2-1-1 Concept of material flow cost accounting

Material flow cost accounting is also called material and energy accounting or flow cost accounting or flow cost accounting, it aims primarily to determine the flow of materials and energy through the value creation system for a specific period of time, and to evaluate the potential for sound production at the company level, since the emergence of this concept in the late nineties of the last century, it has been applied in many companies, especially industrial ones, due to the scarcity of natural resources, the rise in prices of materials and energy, the increase in the volume of waste and gas emissions into the air, and the lack of information related to environmental impacts that negatively affect the environment and society (Warren & other, 2009: 12)

2-1-2 Objectives of Material Flow Cost Accounting

The main objective of material flow cost accounting is to stimulate and support companies' efforts to enhance their financial and environmental performance by improving the use of materials and energy. The sub-objectives are as follows: (Gotze et al., 2013: 232)

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A- The process Improve of material flow, energy consumption and its costs, as well as improving aspects related to the environment.
B- Decisions Support within the company regarding the field of process technology.
C- Quality administrative, supply chain and production planning.
D- Providing information to the quantities reduction of materials and energy consumed in the production process.
C- Reducing or limiting damage and loss in products and eliminating costs that do not add value.
H- Improving the communication and coordination process for materials and energy consumed.
- From the perspective of material flow cost accounting, costs are classified into four types: (APO, 2014: 5), (Zhao et al., 2013: 198)
A- Material cost: includes all costs of main and subsidiary materials involved in the production process.
B- Energy cost: includes all costs of energy sources used within the quantity centers that the company uses to process materials, such as fuel and electricity costs...etc.
C- System cost: all costs incurred by the company as a result of internal dealing with material flows, whether raw materials, service provision or materials under operation, with the exception of waste management costs, energy and material costs.
D- Damage administrative cost: costs that occur as a result of dealing with material flows within quantity centers, they are allocated to material losses only.

2-1-3 Steps to implement material flow cost accounting

- Material flow cost accounting is applied in two stages, which are: (Chompu-inwai et al., 2014:4)

The first stage: Applying MFCA concepts to determine the efficiency of the operating process and analyze it in terms of resource use. This stage consists of a set of steps, which are:

A- Planning: This is the participation of administrative and determining the expertise necessary for the study and draw its boundaries and determining the time period in which material flow cost accounting data will be collected and determining the appropriate quantity centers.

B- Implementation: In which the inputs and outputs of each quantity center are determined physically and financially.

C- Verification: In this journey, material flow cost accounting data are interpreted and summarized and the final results are transferred to administrative.

D- Correction: This step focuses on analyze the second step (implementation) by determine and evaluation improvement opportunities, as a result of this analysis, the causes, effect and size of the motives that caused these losses can be determined.

The second stage: includes the application of the necessary methods and techniques in order to improve financial and environmental performance, where engineering concepts were introduced to be used in creating and products improve such as production tools, distribution, human resources... and others in order to improve the performance of operations and reduce losses.

2-2 Costs reduction

2-1-1 Definition of costs reduction

- The process of costs reduction is one of the most important processes and goals that companies seek to achieve without compromising product specifications and remaining within the level of quality required by customer, the reduction philosophy is also the best method adopted by companies to improve profitability and strengthen the competitive position (Horngren,c& et al, 2011: 219). It is known as one of the easy ways to increase profits in the short term, the reason for the ease of this method was determined because determining the areas of cost reduction is completely within the company's control. It can also be the main driver of growth in the long term if dealt with correctly (Bragg, 2010: 7). It is defined as the procedures and strategies taken in the early stages of the product life cycle that can lead to the costs reduction of production stages and subsequent consumption costs (Walker et.al, 2016: 292).

2-1-2 Cost Reduction Methods

- Cost reduction is one of the important processes carried out by companies due to its impact on the company's revenues and the possibility of the company's continued success or failure. The cost reduction process must be within an integrated system of policies and procedures specific to the company and must be viewed from a positive perspective with the involvement of all stakeholders and all those in a position of responsibility in the company, the following are among the methods of cost reduction: (Goetsch & others, 2006: 2-4)
A- Continuous improvement method.
B- Material flow accounting method.

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2-1-3 General principles of cost reduction strategy

- There are a set of general principles for implementing the reduction strategy, which are as follows: (Reaning, 2002: 165)

A- Start producing products or services that meet the required customer needs, as products made of poor materials provide low-quality service to the customer that does not meet his desires, and this constitutes an obstacle to the company's growth or its failure to remain in the market in the long term, so the company must address this by costs reduction by producing products or providing services that meet the customer's desires required in the market.

B- Understanding and the ability to control cost drivers in the industrial sector in which the company operates.

C- Studying competing companies, some companies have designers and accountants who work together to compare the cost of manufacturing parts of the product to be produced with the cost of parts of products manufactured by competing companies in order to observe how competitors manage their business.

D- Drawing the advantage of costs reduction from many sources, including sources of financing, the sales method followed, following new approaches, and not just focusing on the mechanism of manufacturing products or operational efficiency.

2-3 The effect of material flow cost accounting in costs reduction

The costs reduction is the primary objective that competitive companies seek, especially those that compete on the basis of the cost dimension. They try to achieve low costs for their products in order not to allow their profit margins to decrease due to the high costs of their products. Therefore, the researcher believes that to achieve the advantage of costs reduction, companies must use... Material flow cost accounting tool because it is considered a tool designed to reduce environmental effects and costs. It tracks waste, non-value adding products and emissions and works to reduce them to product costs reduction and thus produce products. Sound and free of defects, so its implementation improves the company's financial performance and environmental performance when the results of the production process are processed into positive and sound products (Kazim et al., 2013: 62). It provides more accurate information about the production process as a whole, starting from the entry of the raw material into production until its exit. In the form of products or waste, the company's administrative then approves this information in order to take the necessary action to the cost reduction of products by reducing of materials, energy and improving their effectiveness so that It can use less amount of resources to produce the same quantity and quality compared to competing companies, as well as working to reduce or limit the quantity of damaged and defective products in the product and exclude resources that do not add value to it
(Al-Jabala and others, 2023: 382).

The effect of cost reduction in competitive advantage support

- Accounting for material flow costs plays an important role in supporting and improving quality and cost reduction by providing information on material and energy flows, limiting damaged and lost products, and decisions making by administrative to reduce them, as the cost reduction advantage is one of the main dimensions in supporting and achieving competitive advantage. Competitive advantage is defined as the technology or distinguished human resource that helps the company produce benefits and values for customers in a way that exceeds what competing companies offer (Madani, 2018: 19), as achieving the cost leadership strategy (cost reduction) has many benefits in supporting the company's competitive advantage through the following: (Mansour, 2012: 48)

1- In terms of old competitors: The Company that is characterized by lower costs is in the best position during price competition.

2- In terms of clients: Companies that are characterized by lower costs have immunity against strong customers as they cannot risk reducing their prices.

3- In terms of customers: The Company that is characterized by lower costs has a high attraction force for old and new customers.

4- In terms of new competitors: The Company that is distinguished by its lower cost has an excellent competitive position that enables it to the price reduction to confront any attack by new competing companies.

3- The third section: The practical aspect

3-1 Definition of the research sample

- The oxidized asphalt plant is one of the most important industrial plants in Basra Governorate within the manufacturing industries sector. This plant was established in 1919 on an area of (30 acres) under an investment license. It started its production work in 2023, as it includes (71 employees). The plant objective is to use black oil as a raw material and as operation energy the plant, which is received from the Oil Products Distribution Company. This

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material also enters into the production of oxidized asphalt and four oil wastes, which are considered the final products of that plant.

3-2 Determining the effect of material flow cost accounting in costs reduction and competitive advantage support

- This research was keen to study the research sample for the month of August -2023, since the plant operates on a batch system, each batch is filtered during the month in which it was received, and in this study the material flow cost accounting method is applied since there are large quantities of materials and energy wasted during the production process, as the idea of this method is based on the fact that the collection of material inputs must be converted into outputs and the difference between them is called negative products, as the focus is on the factory's main product, which is oxidized asphalt, so the flow of materials and energy is tracked and analyzed materially and financially, as follows:-

3-2-1 Determining the quantity of material inputs and outputs

- The quantity of the material used in the production process and the quantity of the final product of that process are determined. The following is a summary table showing the quantity of inputs and outputs:

Table No. (1) Quantity of inputs and outputs in liters for the Basra Asphalt Plant

Quantity of inputs (liters)		**(Quantity of outputs (liters**	
Material	Quantity	Final product	Quantity
Black oil	21,000,000	Oxidized asphalt	**20,370,000**
Operating fuel	630,000		

Source: prepared by the researcher

- Table (1) shows the quantitative inputs of the raw material in the production of oxidized asphalt, amounting to (21,000,000 liters), of which 3% is consumed as fuel, amounting to (630,000 liters), so that the net raw material as inputs is (30,370,000 liters), while the outputs represent oxidized asphalt in an amount of (20,370,000 liters).

3-2-2 Determining the costs of inputs and outputs for the oxidized asphalt product

After determining the quantitative inputs and outputs of the plant product and in order to make a decision regarding cost reduction, the costs of those quantitative units are calculated by adopting the material flow cost accounting technique by determining its four elements, which are material costs, energy costs, system costs and loss or waste costs, and are calculated as follows:

3-2-2-1 Material costs

It is one of the elements of (MFCA) and represents the cost of the raw material entering the production process for a quantity of (21,000,000 liters) of black oil, as shown in Table (2) and the following:

Table (2) Raw material costs entering the production of oxidized asphalt

Raw material	**Quantity**	**Cost per unit**	**Total cost**
Oxidized asphalt	21,000,000	196	**4,116,000,000**

Source: Prepared by the researcher

3-2-2-2 Energy costs

It is one of the elements of material flow cost accounting and includes the fuel costs consumed as energy to operate the plant for a quantity of (630,000 liters), as shown in Table (3) as follows:

Table (3) Energy costs for oxidized asphalt product

Statement	**Production costs**	**Natural spoilage costs**	**Total cost**
Operating fuel	123,480,000	123,480,000	**246,960,000**

Source: Prepared by the researcher

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In the above table, it is clear that the actual amount of fuel for operating the plant is 3% of the amount of raw material, which is 123,480,000 dinars, but due to malfunctions and stoppages during this period, an additional amount of fuel was consumed at a rate of 3%, which led to a waste in fuel costs of 123,480,000 dinars.

3-3-2-3 System costs

-which include salaries, maintenance, machinery, equipment, depreciation, administrative and marketing costs, as shown in Table (4) and the following:

Table (4) System costs for the production of oxidized asphalt

Statement	**Total costs**
Salaries	28,800,000
Maintenance	19,000,000
New equipment	44,000,000
Depreciation	600,000
Other uses	300,000,000
Total system costs	402,400,000

Source: Prepared by the researcher The above table shows the system costs incurred by the plant to produce oxidized asphalt, amounting to 402,400,000 dinars.

3-2-2-4 Damage management costs

The costs of disposing of the damaged items are included as in Table (5) and the following:

Table 5 Damage Management Costs

Statement	**Total costs**
Damage treatment costs	10,000,000

Source: Prepared by the researcher

-The above table shows the costs incurred by the factory in order to dispose of the damage, treat it and control it during the production process, amounting to 10,000,000 dinars.

After determining the costs of the material flow cost accounting an element, this technology is applied specifically to produce oxidized asphalt in Table (6) as follows:

- Table (6) Application of MFCA technology for oxidized asphalt product.

Statement	**Total Quantity**	**Unit of Measure**	**Total Cost of Inputs**	**Positive Outputs**	**Negative Outputs**
Inputs:					
Material Cost:					
Black Oil	**21,000,000**	**Liters**	**4,116,000,000**		
Energy Cost:					

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Operating fuel	**%6**	**Liters**	**246,960,000**		
System Cost:					
Salaries			**28,800,000**		
Maintenance			**19,000,000**		
New equipment			**44,000,000**		
Depreciation			**600,000**		
Other uses			**300,000,000**		
Damage Management Costs:					
Damage Management Costs			**10,000,000**		
Total Inputs			**4,765,360,000**		
Outputs:					
Oxidized Asphalt Product	**20,370,000**	**Liters**		**3,992,520,000**	
Material costs					**113,480,000**
Energy Cost	**%6**			**123,480,000**	**123,480,000**
Energy Cost	**%0,5**			**388,150,000**	**14,250,000**
Energy Cost					**10,000,000**
Total output				**4,504,150,000**	**261,210,000**

Source: Prepared by the researcher

The table above shows the total costs of the final product consisting of the costs of materials, energy, system and damage administrative during the life cycle of the product (oxidized asphalt), and determining the amounts of waste and damage during the production process. The quantitative balance between inputs and outputs was achieved according to this technology. The results of applying this technology showed that the total costs of the product amounted to (4,765,360,000) dinars, and this cost is distributed between the positive and negative product. The cost of the positive product was (4,504,150,000) dinars, while the cost of the negative product was (261,210,000), representing 5% of the total costs of the product. This percentage is considered to exceed the approved standards in costs, and the laboratory can conduct a deviation analysis to determine the aspects of shortcomings in performance.

It is clear by comparing the results between the current cost system of the plant, which amounts to (4,765,360,000) dinars, and the application of the material flow cost accounting technique, the costs amount to (4,504,150,000) dinars, with a difference of (261,210,000) dinars as a result of excluding negative costs from the final product when calculating the cost of one unit. Below is the income

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statement for the month of August-2023 prepared to show the difference between the two systems, as follows:

Table (7) Income statement for the production of oxidized asphalt

Statement	Current Costing System of the Plant	Material Flow Costing Technology
Total Sales	**5,969,985,250**	**5,969,985,250**
Total Cost of Production	**(4,765,360,000)**	**(4,504,150,000)**
Gross Profit	**1,204,625,250**	**1,465,835,250**
Negative Product Cost	**0**	**(261,210,000)**
Net Product Income	**1,204,625,250**	**1,204,625,250**

4- FOURTH SECTION: CONCLUSIONS AND RECOMMENDATIONS

4-1 Conclusions

1- There is a great need for modern administrative accounting approaches in order to keep pace with the tremendous developments in the modern industrial environment characterized by intense competition.
2- The failure of traditional systems to provide information on negative costs and waste at all stages of the product life cycle gives limited opportunities to make appropriate decisions to reduce costs.
3- Companies adopting the material flow cost accounting method play a major role in achieving the company's competitive advantage by reaching the highest degree of quality as a result of reducing the percentage of negative products, and thus cost reduction, which requires the factory to focus on ensuring quality.
4- The application of material flow cost accounting has a positive effect on cost reduction and rationalizing administrative decisions, as this method identifies the costs of the positive product and separates them from the costs of the negative, which prompts the plant administrative to make management decisions regarding cost reduction by eliminating negative costs.
5- The company's reliance on the raw material itself as fuel to operate equipment by consuming the equivalent of 3% of the raw material.
6- The application of the material flow cost accounting method reduced the final product cost by 5% by eliminating the negative costs that this method determined, which leads to remaining in the market and continuing to compete.
7- The application of material flow cost accounting helps in damage reduction, the production cycle time reduction and costs reduction, which leads to increasing profits.

4-2 Recommendations

1- Companies should provide the appropriate conditions for the continuous application of the material flow cost accounting method in order to competitive advantage achieve and maintain their market position.
2- Companies should always adopt the study of the proposed framework for the material flow cost accounting approach in order to enhance their strengths and address their weaknesses to competitive advantage achieve in the modern manufacturing environment.
3- Companies, including the research sample, should focus on the quality of the required products to ensure their continuity in the business market by getting rid of defective products and addressing that waste.
4- The necessity of determining the costs of good products and negative costs for each process in industrial companies, including the research sample laboratory, without charging those negative costs and waste costs to the final product or considering them general expenses.
5- The company should always rely on the same raw material as fuel to operate equipment by consuming the equivalent of 3% of the raw material, which contributes to saving time and reducing cost waste, as it is the same material that is produced and burned.
6- The necessity of benefiting from the quantitative and financial information provided by this method about damaged products and waste to reduce or eliminate them.

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