The Effectiveness of Employing Environmental Management Accounting Information for Implement Cleaner Production Strategy/ Applied Study in AL Kufa Cement Plant

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Abstract

Most studies and researches are concentrated to study the problems of environmental impacts Resulting from the exercise of industrial activity Given their importance in preserving the environment and supporting sustainable development, Although the role of accounting studies as one of the problem of environmental pollution, But the use of their information in making strategic decisions related to environmental issues Substandard. So In this search we will highlight the following:

1. Modern approach to accounting, especially with regard to the use of administrative accounting in the management of environmental issues Which is known as (Environmental Management Accounting) Which provide environmental information both financially and physically to make appropriate environmental decisions.
2. Study and analysis of how cleaner production strategy contributes to the preservation of the environment.
3. Study and analysis of the level of awareness of Iraqi economic units of the importance of environmental management accounting.
4. Trying to apply environmental management accounting in the Iraqi economic environment and to indicate the impact of implementing the cleaner production strategy.

To achieve the objective of the research and test hypotheses, the Kufa Cement Plant was chosen as a research facility, The extent of their application to environmental management accounting, A number of conclusions were reached: Environmental management accounting An environmental information management approach to support internal decisions related to environmental issues, Also The possibility of developing a proposed model for environmental management accounting in the economic unit in question For use in the implementation of cleaner production.

Introduction

Under the current industrial progress, the world is witnessing a serious phenomenon, environmental pollution, Should be taken into account as a result of the diversity and diversity of sources and forms of pollution. So the environmental effects of social and economic development of the economic units' practice of economic activities led to the need for an information system that provides information on environmental impacts and costs With a view to

measuring and evaluating environmental performance and the implementation of environmental strategies In particular the implementation of the cleaner production strategy. From this point Environmental management accounting has emerged as a system that provides environmental information (physical and financial) to assist management in implementing its environmental strategies, in particular the implementation of the cleaner production strategy.

According to that this research is a specialized scientific endeavor to evaluate the use of environmental management accounting information in implementing the cleaner production strategy in the Iraqi economic unit Which still apply traditional systems are difficult to identify for environmental impacts and costs And distorting decisions that would improve the environmental and economic performance of the economic unit.

The first topic: Methodology of research and previous studies

First: Research problem

Environmental problems arising from the exercise of economic activities by the economic units, including industrial activities and the negative effects resulting from environmental pollution caused by these units in various forms of problems that led to the emergence of a new and strong approach to the implementation of environmental laws designed to protect them. This leads to an increase in the interest of economic units in the search for environmental strategies, especially cleaner production strategy, as they represent the commitment of these units to environmental laws and their social responsibility towards customers and society . his interest led to the emergence of new accounting and management techniques. This interest led to the emergence of new accounting and management techniques . It is used to provide appropriate information to decision makers within economic units and to assist them in implementing their strategy to protect the environmentTherefore, the problem of research is the lack of interest of the Iraqi economic units in modern techniques of environmental management accounting and omission of the importance of the information that provides appropriate assistance to decision makers in the implementation of environmental strategies, especially the implementation of cleaner production strategy

Second: Research questions

Based on the advanced research problem .There are questions that can be raised in this context. The researchers seek to answer them through this research, which is as follows:

1. What is the nature of administrative accounting information? How to contribute to cleaner production in the preservation of the environment of the units?
2. What is the nature of environmental management accounting information?
3. How Cleaner Production Strategy contributes to environmental conservation of the economic units?
4. The possibility of presenting a proposed model for environmental management accounting in the Iraqi economic units?
5. The extent to which environmental management accounting information can be used in the implementation of cleaner production strategy?

Third: Aims

In light of research problem and questions, the research aims at the basic level to determine the extent of application of the Iraqi economic units of modern techniques of accounting management with environmental trends and benefit from the provision of information appropriate to the implementation of cleaner production strategy and the pursuit of the following goals:

1- Study and analyze the nature of environmental management accounting information.
2 - Study and analyze of how the cleaner production strategy contributes to the preservation of the environment of the economic units.
3 - Study and analyze of the level of awareness of the Iraqi economic units of the importance of environmental management accounting.
4- Studying the possibility of presenting a proposed model for environmental management accounting in the Iraqi economic units.
5- Study the possibility of using the environmental management accounting information in the implementation of cleaner production strategy.

Fourth : Hypotheses

The research hypothesizes the following:

1- The Iraqi economic units shall not use environmental management accounting in providing the necessary information for the implementation of the cleaner production strategy.
2- The possibility of presenting a proposed model for environmental management accounting in the Iraqi economic units.
3- The possibility of employing environmental management accounting information in the implementation of cleaner production strategy for the Iraqi economic units.

Fifth : Importance of Research

The importance of the research stems from the modernity of the subject of environmental management accounting and the interest in providing products that are not harmful to the environment in order to protect and preserve them from the negative effects that result from the practice of economic units for their work incorrectly, through the identification of the most important theoretical aspects of environmental management accounting and recognition (Physical and financial), as well as recognizing the extent to which Iraqi economic units understand the importance of using environmental management accounting information in making appropriate decisions related to Environmental issues, for example, the implementation of cleaner production strategy.

Sixth : Research Plan

To achieve the aims of the research , the inductive approach will be based on reviewing the theoretical side of the research by extrapolating sources and literature related to the subject in order to arrive at theoretical conclusions that support the ideas of research and rely also on the analytical descriptive method for describing and processing the data which will be obtained from the field study on economic unity Iraqi Environmental Management Accounting, as well as relying on the experimental approach to try to provide a proposed model for the application of environmental management accounting in the Iraqi economic environment.

Seventh : Previous Studies

From the studies the accounting literature that dealt with the subject of the use of environmental management accounting, so we will suffice in this paragraph to present the results of the studies closest to the current study as follows:

1- (Stasiškinė & Staniskis, 2003) Study

“ Environmental Management Accounting for CP Investment Project Development ”.

The aim of this study is to demonstrate the importance of flow information and associated costs in decision making for sustainable development. The success of the EMS depends on the methods of determining environmental costs, for example the integration of environmental costs in the capital budget for the evaluation of

environmental efficient projects or the use of costs. The study focused on a case study of some of the economic units that used cleaner production in their operations. One of the main conclusions of the study is that environmental management accounting is flexible enough and can be integrated into different cost accounting systems that can serve environmental management. Using environmental management accounting information, environmental costs can be tracked (usually are hidden in the general expense account) and can therefore be managed. Therefore, environmental management accounting is an essential method for measuring environmental impacts and costs that are important in evaluating environmental efficient projects such as cleaner production investment.

2- (Al Taimi and Al Zaidi , 2012) "Activate the role of strategic cost management in support of clean production technology ".

The study aimed to demonstrate the importance of strategic cost management tools in supporting clean production technology, with the most important shortcomings, and the determinants in strategic management tools in support of clean production technology. In addition, a proposed model was developed for the use of strategic cost management tools in cleaner production technology. The main strategy study on cleaner production and its implications for the role that strategic cost management is expected to play in supporting the proposed model. One of the most important concluding points of the study is that the adoption of the strategy of co-efficiency economic introduction to the application of clean production will be reflected in the philosophy of cost-cutting techniques and tools in supporting the environmental dimension as a key competitive advantage.

1. **(Doorasamy, 2014) "Using environmental management accounting to investigate benefits of cleaner production "**.

This study aimed to demonstrate the importance of using environmental management accounting in generating potential environmental and economic benefits due to its ability to provide environmental information used in the implementation of technologies and technology for the clean production of steam production in the South African boiler plant. The method of assessment of clean production

reveals the efficiency of the operational process and the constraints of implementing cleaner production techniques for current production. The study focused on the use of the questionnaire questionnaire , interviews and documentary review in quantitative data evaluation. The study concluded that the process of producing steam is not effective, which has a negative effect on the environmental and economic performance of the economic unit. Also, minimizing the importance of accounting practices in determining the economic costs of the economic unit does not help in managing and tracking these costs correctly. Moreover, The cost of material flow has a positive effect on the management in determining the quantities and monetary valuation of waste material, and this provides an opportunity to provide information for the implementation of strategic decisions on the implementation of clean production techniques in the future. Steam boilers are based on the coal.

4. **Tamimi (2016) "Use of Environmental Management Accounting Information in Supporting Environmental Programs and Strategies for Economic Argument "**.

The study aimed to explain the recent trends in the methods and techniques of environmental management accounting, the factors that helped in their emergence, and the study and analysis of the role of administrative accountant in light of the modern environmental trends of administrative accounting in supporting of strategic decisions with the environmental effects of economic units. Environmental management accounting techniques and techniques in providing the necessary information to support programs and strategic decisions with environmental impacts and try to present a proposed model for the application of environmental management accounting in the Iraqi industrial economic environment , The study focused on the selection of Factory as a place of research, and evaluated the extent of its application of environmental management accounting (both financial and physical), as well as evaluating the reality of the program and the environmental strategies followed and presenting a proposed environmental management accounting model for application in the plant. Environmental Management Accounting is an important and necessary part of the environmental management system because it provides financial and material information that helps managers to make decisions whether

related to short-term or strategic operational programs. The study also emphasized the possibility of using the proposed model of environmental management accounting (financial and material) in support of environmental programs and strategies for providing environmental information (material and financial) that effectively assists in the selection of programs and strategies. the Preservation of the environment.

After reviewing the previous studies, the present study is characterized by the following:

1. The lack of local Arab studies that dealt with the issue of environmental management accounting as a modern approach in the implementation of cleaner production strategy for economic units.

2. The researcher was unable to find any local or Arab theoretical or practical study that deals directly with the use of environmental management accounting information in the implementation of cleaner production strategy in the Iraqi economic units.

3. The majority of foreign studies were conducted in countries whose economic, social and political environment differs from the Iraqi environment. It is not possible to rely on absolute results without the actual conduct of local reality.

The second topic: The nature of environmental management accounting information.

First: the concept and definition of environmental management accounting

The economic units of different types and trends face a number of problems and difficulties. The most prominent of these problems and difficulties are the lack of awareness of these units of the large costs generated by the impact of their activities on the environment, which are difficult to follow when using traditional management accounting techniques because these costs are usually hidden in the public accounts . From this point of view , the Environmental Management Accounting (EMA) came which provides physical and financial information on environmental impacts and costs for managing them in a manner that results in environmental and economic benefits (Doorasamy, 2014.36-37).

Based on the concept of environmental management accounting, a number of researchers, professionals, academics and professional organizations

have presented different views and definitions regarding EMA. **(Graff)** introduced a definition of environmental management accounting as***" a method used by enterprises to account for material flows and accounting for environmental costs in order to assess the efficiency of their resources and opportunities for their environmental improvement"*** **(Jinadu)** considers environmental management accounting as ***"environmental performance management through the use of environmental information to increase the efficiency of materials use and reduce environmental impacts and costs"***. In addition, the United Nations Development Program **(UNDSD)** has further defined ***"The process of identifying, collecting, assessing and analyzing two types of information As they produce physical environmental information (quantity) for the flow of materials, energy and water, as well as the production of environmental and financial information that are used to make decisions that relate to the economic issues within the economic unit"***. The **(IFAC)** also introduced a definition of ***"Environmental and economic performance management through the development and improvement of accounting systems and procedures related to environmental issues. It typically includes life cycle costs, total cost accounting and strategic planning"*** (Graff et al., 1988; 3-4) (UNDSD, 2001, 12) ; (IFAC, 2005; 19) ; (Jinadu et al., 2015: 587).

Based on the above, it can be said that environmental management accounting is an environmental accounting system and procedures that are usually used in the physical and financial measurement of environmental impacts and costs in order to assist economic unit managers in implementing environmental strategies and thereby reducing environmental impacts and costs. In view of this, EMA can be defined as ***"part of environmental accounting that identifies and analyzes environmental information, such as financial information relating to environmental costs and revenues, and physical information (quantity) Water and energy flows to support internal decisions with environmental impacts that benefit managers in the implementation of environmental strategies aimed at achieving environmental protection and achieving sustainable development"***

Second: Environmental Management Accounting Information

Accounting Information (EMA) The EMA can be classified into two parts: the first is called the Environmental Management Accounting (MEMA), which produces environmental financial information for the activities of the

economic unit, reported in monetary units, for example, the costs of fines resulting from violations of environmental laws or investment Capital and other projects, using MEMA information in strategic and operational planning, serves as a tool for monitoring and accountability. IFAC has developed four types of environmental costs related to MEMA. (Categories, wages), environmental categories (air, water and soil), categories that reflect the length of visibility and clarity of data in accounting records (obvious costs and hidden costs)). The second part of the EMA is called the Environmental Management Accounting (PEMA), which produces physical environmental information related to the flow of materials, energy and water, i.e, its use and ultimate fate. It provides information to all parties concerned with the environment, properly and internal decision-making and the preparation of reports on environmental performance. (Burritt et al., 2004: 30) ; (IFAC, 2005: 15) ; (Alchisher, 2013; 32) ; Schalteggger, & Burrit, 2000: 15) ; (Jasch, 2009: 13).

Table No (1)

shows physical inputs and outputs across economic units

Physical input	Physical Output
Raw and Auxiliary Materials	**Products (including Packaging)**
Packaging Materials	**By-products (including Packaging)**
Merchandise	**Solid Waste**
Operating Materials	**Hazardous Waste**
Water	**Wastewater**
Energy	**Air Emissions**

Source: International Federation of Accounting, 2005, **"Environmental Management Accounting – International Guidance Document"**, P.33.

Thirdly: Environmental and Material Flow Cost Accounting

Economic units are looking for modern methods of measurement and control in order to improve the process of measuring the performance and control of their systems. Therefore, the techniques of environmental management accounting help to provide physical measurement (environmental effects) and monetary measurement (environmental costs). So in order to take. Appropriate administrative decisions. Therefore, the cost accounting of the flow of materials is considered one of the most important techniques of environmental management accounting. It has received wide attention because of its ability to provide information on waste and emissions, which are used to support the decision to implement environmental economic efficiency (Jasch, 2004: 37) (Tajelawi & Gabharran 2015.3641). Accounting for the cost of material flow helps measure material flows in physical and financial units in order to provide important information to economic impeller managers to help them make

decisions On the reduction of environmental effects and costs. It determines the source of waste generation and then determines the quantities and costs of waste generated by the processes. Therefore, it is considered an administrative tool used to improve material productivity and reduce costs. O in economic units to adopt cleaner production techniques because they provide information on waste and emissions in terms of quantities and costs of a (Doorasamy, 2014,58-61)

It is worth mentioning that the use of cost-accounting technology generates many benefits, most importantly (Fakoya, 2014: 70 - 71) ; (Doorasamy, 2014: 60) ; (UNDSD, 2001: 88):

a- Accounting for the flow of materials helps to understand the hidden economic losses in the traditional cost accounting system by identifying waste and emissions in the physical and financial units of the activities of the economic unit ...
b- Assist in determining the procedures for improvement by renewing and tracking the amount of waste and emissions of material flows ...
c- It helps to find environmental benefits through the ability of its information to guide decisions on reducing environmental impacts and costs ...
d- Use its information in the development of products or evaluation of investment projects ...
e- Help to increase the productivity of materials instead of laying off labor. ..
f- Improve the competitiveness of the economic unit by increasing the efficiency of materials and profits.
g- Helping to achieve cooperation between the supplier and the buyer to reduce the environmental impacts and social costs through improvements in the processing chain.
h- Identify the responsibilities of the different departments and sections on Waste generation and emissions. From the above it can be said that the technique of cost accounting for the flow of materials is necessary in providing information on material flows in terms of material and financial. It helps in determining the waste and emissions in terms of their quantities and costs. A low environmental impacts and costs and improve environmental and economic performance.

From the above it can be said that the technique (MFCA) is necessary in providing information on material flows in terms of material and financial, It helps to identify waste and emissions in terms of their quantities and costs, so their information is used by economic unit managers to reduce environmental impacts and costs and thereby improve environmental and economic performance.

The Third Topic: Cleaner production strategy and its relation to environmental management accounting

First : Concept and definition of cleaner production

In the late 1980s and early 1990s the concept of cleaner production was introduced by the United Nations / Environmental Division In order to support preventive strategies, use of raw materials and energy efficiently, Protect the environment from waste and emissions and Increasing the environmental and economic benefits of economic units. A comparison of cleaner production with end-of-pipe technology was introduced at the University of Rotterdam, This comparison shows the difference between cleaner production targets and end-of-pipe technical objectives, which ultimately leads to the importance of adopting cleaner production (Lindhqvist, 2000: 17) ; (Schnitze & Nubbaumer, 1994: 15-16). Based on the cleaner production concept, a number of researchers and organizations have put forward different perspectives and definitions on cleaner production, **(Mulholland)** introduced a definition of cleaner production ***"Cleaner production technology is provided with preventive methods that help to address the negative impacts on the environment and waste treatment through investment in other fields"***, **(Mugwindiri)** introduced another definition ***"Cleaner production is an initiative to protect the environment from pollution, It helps to increase output from production, and generates minimum residues and emissions Through the efficient use of materials and energy"***, In addition, the United Nations / Environment Program Division has provided a definition of cleaner production ***"Continuing application of an integrated strategy for environmental protection, applied to processes, products and services In order to increase efficiency and reduce risks to humans and the environment"*** (UNEP, 1998: 3) ; (Mulholland, 2006: 3) ; (Mugwindiri et al., 2013: 1).

Second: Cleaner production strategy and its relation to environmental management accounting

There are three basic strategies in the application of cleaner production techniques within the processes and products of the economic unit (Schaltegger et al., 2008: 8); (Zaidi and Tamimi, 2012, 221):

1. **Efficiency strategy:** We should distinguish between the strategy of environmental efficiency and economic efficiency strategy, since the environmental efficiency strategy aims to reduce the environmental effects of products, and the strategy of economic efficiency of the environment focuses on determining the relationship between economic performance and environmental impacts, which aims to achieve the best Economically feasible results with minimal environmental impacts.
2**. Consistency Strategy:** A strategy similar to EEC strategy, often of a technical nature. The strategy of consistency focuses on the structure of flow paths of materials and forms of energy through the development of innovations and the differentiation of technologies based on environmental compatibility, Economic environment by replacing environmentally friendly materials and energy with environmentally friendly ones.
3. **Competency strategy:** It is a behavioral strategy. It is oriented towards the environmental responsibility approach. This strategy is linked to the personal philosophy of individuals rather than to the strategy of economic unity, as it represents an environmental awareness of individuals. Cleaner.

It is worth mentioning that environmental management accounting reports are an important and reliable tool in business management, The United Nations / Division of Environmental Programs has begun to sensitize and encourage economic units to use environmental management accounting techniques because they contribute positively to improving cleaner production assessment and improving environmental management, (EMA) reports on environmental impacts and costs and provide systematic methods to control these costs in the short and long term (Doorasamy, 2015: 237-238) . Therefore, in order to implement cleaner production strategies, in particular the implementation of the environmental efficiency strategy, they need information on the physical flow of materials, Environmental management accounting techniques provide such information (physical Environmental management accounting) According to the following equation: **Environmental efficiency = Required outputs (quantity of production) / Environmental impacts (quantity of waste and emissions)**

Or when implementing the eco-efficiency strategy requires environmental and economic information. Environmental management accounting techniques contribute to the provision of material and financial information, The relationship can be explained according to the following equation: Environmental economic efficiency = **economic values (sales revenue or total**

profit) / environmental effects added (environmental costs or quantity of waste and emissions).

The Fourth Topic: Practical application

The aim of this research is to evaluate the accounting system used for the research sample represented by the Kufa Cement Plant in Najaf. In addition, a proposed model for the economic unit mentioned above is provided for the use of environmental management accounting information in implementing the cleaner production strategy as follows:

First : The accounting system in Kufa Cement Factory

The Kufa cement plant relies on the unified accounting system in recording daily entries. The system relies on the accounting manual, which gives a numeric mark for each account. The accounts are divided into the unified accounting system manual to:

1 - Assets accounts and symbolits number (1).
2 - Accounts payable and symbolits number (2).
3 - The expense account and its symbol number (3).
4 -Revenue accounts and symbolits number(4).

In addition, the economic unit under consideration is based on the classification of its costs to the consolidated accounting system. These costs are analyzed into a number of sub-accounts, whether at the trilateral or quadrilateral level: salaries and wages, (31) commodity inputs, (32) and other expenses(33) , as the above cost calculations are monitored (5) within a special control account for cost centers (6) for the production services centers. The economic unit under consideration does not include the above calculations in account No. (7) and (8) for the allocation of the costs of marketing services and administrative services costs.

The economic unit under consideration does not separate environmental costs from the rest of the costs due to its reliance on a unified accounting system that does not provide the potential for tracking and accounting for environmental costs, which negatively affects decisions related to environmental issues, This confirms the hypothesis that **“Iraqi economic units do not use environmental management accounting to provide the necessary information to implement cleaner production strategy”.**

Second: A proposed model for environmental management accounting

Due to the weak environmental concerns and weak implementation of environmental strategies, especially the implementation of cleaner production strategy in Kufa Cement Factory, One reason for this weakness is the lack of an environmental management accounting system that provides the economic unit with environmental and financial information to make decisions on environmental impacts and costs, The researchers will attempt to present a proposed a proposed model for environmental management accounting and then use a model in implementing the cleaner production strategy as follows:

1- Environmental Management Accounting Model Material

Physical environmental management accounting produces physical (quantitative) environmental information for the activities of the economic unit. Through the use of physical environmental management accounting, all material inputs and outputs associated with manufacturing processes can be entered into the Kufa Cement Plant to ensure accountability and use in implementing the cleaner production strategy In their application to ensure accountability and use in the implementation of the cleaner production strategy that the laboratory wishes to apply so it is necessary to know the inputs and the physical output of the process of manufacturing in the cement factory Kufa. These inputs and physical outputs which consist of a set of elements can be explained in table No.(2) as following :

Table No (2)

Inputs and physical outputs through Kufa Cement Plant

Physical Input	Physical output
Limestone (raw materials)	Production of ordinary cement and resistor
Clay clay (raw materials)	Clinker production (casual product)
Iron ore (raw material) \	Outputs are non-commodity
Sand (raw materials)	Sediments (solid waste)
Gypsum (raw materials)	the dust
Packing and packaging materials	Carbon dioxide
Black oil energy	Sulfur dioxide
electrical power	First carbon monoxide
Water	Lead

Source: Preparation of the two researchers based on personal interviews with specialists in the Kufa Cement Plant.

After determining the input and the physical output of the Kufa cement plant, the process flow manufacturing process is determined. The process flow consists

of a set of inputs and outputs. It also consists of major processes and secondary operations as shown in Table No. (3)

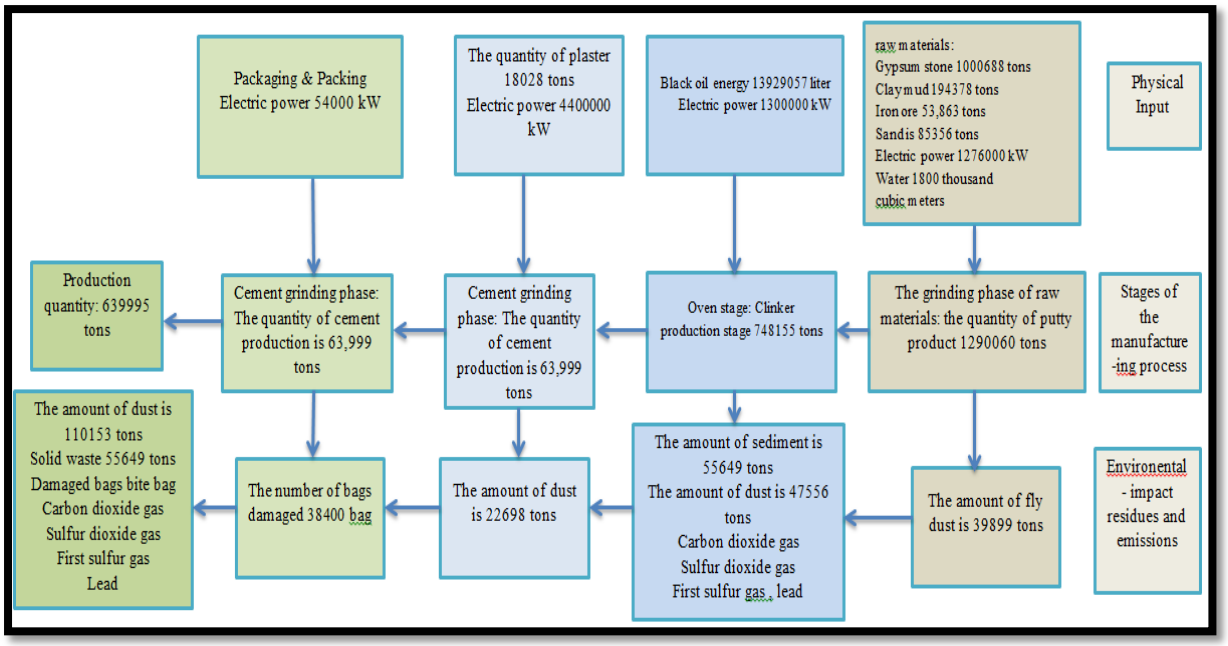
Table No. (3)
Process Flow Manufacturing process of Kufa Cement Plant

Physical Input	Main Process	Secondary Process	Physical Output
Grinding Phase: **limestone** **Clay dust** **Iron ore** **the sand** **electrical power** **waters**	Grinding of raw materials in mills of raw materials	Add water to the mixture	Production of paste The dust
Burn phase: **Putty** **Black oil** **electrical power**	Entering the paste to the oven	Using the black oil as a fuel of oven	Production of clinker Deposits the dust Carbon dioxide Sulfur dioxide gas Carbon monoxide gas Lead gas
Cement grinding phase: **Clinker** **gypsum** **electrical power**	The clinker is grinded with gypsum in the cement mill		Cement production The dust
Enrollment phase: **Cement** **Packing and packaging materials** **electrical power**	Cement is filled in paper bags		Cement and mortar Packing materials and package consumables

Source: Preparation of the two researchers based on personal interviews with specialists in the Kufa Cement Plant.

After determining the input and the physical output of the cement manufacturing process in the Kufa cement plant, a flow model for these inputs and physical outputs is required to determine the quantities of waste from the production with the environmental impact. The physical flow model can be determined in the figure No. (1) of the 2014 physical inputs and outputs As follows:

Figure No (1)
Physical flow model for (2014)



Source: by the two researchers

The quantity of raw materials, the amount of black oil used in the production, the quantity of water entering the grinding phase of the raw materials, the amount of cement produced, and the quantity of clinker sent for sale, were determined in Figure (1). The amount of electrical energy has been determined by relying on the reports of the electrical station of the plant. The quantity of sediments was determined by relying on the reports of the Environmental Division. The quantity of packaging materials consumed was determined by the reliance on the reports of the packing and packaging department. While the amount of dust was determined through the use of **the technique of accounting for the cost of material flow**, which is one of the techniques of environmental management accounting material, as the amount of dust for each stage of the production process through the use of production reports of the economic unit under consideration as follows:

The grinding phase of raw materials:
the quantity of dust product= quantity of raw material in the phase * 0.03
=1290060 * 0.03
= 39899 tons

Burn phase
Quantity of dust = Amount of putty into oven * 0.08 - Quantity of sediment
=1290060 * 0.08 -55649
=39899 tons

Cement grinding phase

Dust quantity = (clinker quantity+ Gypsum) *0.03
= (18028+738583) * 0.03
= 22698 tons
Dust quantity sum = first phase dust quantity + second phase dust + third phase dust quantity
Dust quantity sum for 2014= 39899+47556+22698= **110153 tons**

The quantities of packaging materials consumed were calculated as follows:

Packing and packaging stage

There is no dust at this stage but there are a quantity of bags damaged to the burning committee to be burned, resulting in the environmental impact of smoke rising, as well as the amounts of ash as a result of the combustion process:

The amount of packaging materials and packaging = Quantity of packaging materials * 0.003
= 12799900 * 0.003
= 38400 bag

Table No.(4)
Physical output and input quantities for Kufa cement plant (2014)

Material inputs		**Commodity outputs**	
Material	quantities	Material	quantities
limestone	1000688tons	Cement production	639995 tons
Clay dust	194378 tons	Clinker production (casual product)	93918 tons send for sale 1
Iron ore	49537 tons	Non-commodity outputs	
sand	85356 tons	Deposits	55649 tons
gypsum	18028 tons	the dust	
Packing materials	12799900 bags	Packing materials and consumables	38400 bags
Black oil energy	139290579 KW	Carbon dioxide	Uncountable because there is no device to measure it
electrical power	7030000 KW	Sulfur dioxide	Uncountable because there is no device to measure it
Water	1800000 M3	First Carbon Oxide	Uncountable because there is no device to measure it
		Lead gas	Uncountable because there is no device to measure it

Source: by the two researchers depending on Physical flow model in the figure (1)

After determining the quantities of inputs and physical outputs in the economic unit in question, the percentage of production and the proportion of waste with environmental impact (2014) as in the table (5) is determined based on the material flow model as follows:

Table No. (5)

Production percentages and percentage of waste for Kufa cement plant

Years	Production quantity	Quantity of waste with environmental impact	Quantity of production with environmental impact	Production rate	Waste rates with environment impact
2014	639995	165802	805797	79.5 %	20.5%

Source: by the two researchers

In the table, the percentage of production and the percentage of the residues with the environmental effect were determined by dividing the quantity of production by the total quantity of production and the residues with the environmental impact, as well as the percentage of waste with environmental effect. The aim is to determine the costs of environmental impact waste for raw materials, Water and system costs for production centers and production services. The costs of these wastes are considered environmental costs because they have environmental impact on air, water, soil, climate and other environmental fields.

2- Environmental Management Accounting Accounting Model

Environmental environmental management accounting produces financial and environmental information related to the activity of the economic unit. The use of environmental management accounting techniques can determine the environmental costs associated with the manufacturing processes of the Kufa Cement Plant in order to use this information in implementing the cleaner production strategy that the laboratory wishes to implement. Identification of environmental costs through the use of cost accounting technology for the flow of materials, as the costs of production and waste costs for materials, costs of control and treatment of environmental impact waste, and the costs of prevention and management are determined. In the table No. (6) as the follows:

Table No. (6)

Costs of production and residues with environmental impact (2014)

Material	Production costs		Wastes costs with environment impact	
Raw material costs except gypsum	Cost	Rate to production costs	Cost	Rate to waste costs with environmental impact
	5356947416	11.9%	1381351220	6.407%
Gypsum costs	278674167	0.62%	8618789	0.039%
Packing and Package costs	2276466210	5.07%	6846939	0.003%
Electricity Costs	3400206216	7.57%	876782735	4.06%
Water costs	3378750	0.0075%	871250	**0.004%**
System costs for production centers	20890295841	46.6%	828708370	3.l84%
System costs for production service centers	12673007865	28.238%	828708370	3.84%
Black oil costs	-	-	13329803818	61.8%
Waste supervision and treatment costs with environmental impact	-	-	946823311	4.39%
Prevention costs and environmental management	-	-	911550425	4.228%
Total	44878976465	100%	21559239388	100%

Source: by the two researchers depending on material management accountant information.

In Table No. (6), production costs and costs of environmental impact residues for raw materials except gypsum are determined by relying on the production ratios and the percentage of waste specified in Table No. (5) approved by the physical flow model of the economic unit. Calculated on the basis of the percentage of total environmental impact of the plant because the gypsum material is added in the third stage of the manufacturing process for the cement industry. Therefore, it is calculated on the basis of the residues of that stage. Environmental Pillow Top of electric power by relying on production ratios and proportions of specific residues in the table (5) based on the model of the physical flow of energy either alone economic black oil costs are the costs of Jurors Which is directly responsible for the production of gaseous emissions from the plant. As for the production costs and the costs of waste with the environmental impact of the water, it was calculated by relying on the production rates and the percentage of waste specified in the table based on the

physical flow model of the economic unit in question and the costs of production and the costs of the environmental impact of the system of production centers Was calculated by relying on the percentage of production and the percentage of waste to the production center of the laboratory based on the physical flow model of the economic unit under consideration. While the costs of production and the cost of waste with the environmental impact of the system of production service centers were calculated by relying on the production ratios and the percentage of waste specified in the table (5) based on the physical flow model of the economic unit in question. As well as the calculation of the production costs and the costs of the environmental impact of the materials of packaging by relying on the percentage of production and waste of the quantity of packaging materials specified in the physical flow model of the economic unit under consideration for the costs of control and treatment of the environmental impact of the economic unit in question was Calculated based on the costs of the production center for the ovens due to the integration of the sedimentation division within the said production center. The costs of the sedimentation division (being the Division for monitoring and treatment of environmental impact) were separated from the costs of the special production center of the ovens, While the costs of environmental protection and management of the economic unit under consideration are calculated and based on the reports of the costs of the service center of the workshop and management due to the integration of the environmental division and occupational safety, civil defense and medicine within the service centers mentioned above.

After determining the costs of production and the cost of waste with environmental impact, the ratio of production costs and the percentage of the costs of environmental impact waste to the total costs can be determined in the table (7) as follows:

Table No.(7)

Percentage of production costs and costs of environmental impact residues

Years	Production quantity	Quantity of waste with environmental impact	Total of production and wastes costs	Rate of production costs to total of wastes and productions costs	Rate of wastes costs with environmental impact to total production and wastes total
2014	44878976465	21559239388	66438215853	67.5%	32.5%

Source: by the two researchers

From this we can say that environmental management accounting works to provide management with environmental information (material and financial) which is of great importance in the implementation of environmental strategies, especially implementation of cleaner production strategy. This proves the hypothesis that **"The possibility of submitting a proposed model for environmental management accounting in Iraqi economic units"**.

Third: Employing environmental management accounting information in the implementation of the cleaner production strategy

The environmental management accounting information is used in the implementation of the strategy of environmental efficiency and economic efficiency strategy of economic unit of the research as shown in the table (8) according to the following equation:

Environmental efficiency = quantity of production / quantity of waste with environmental impact

Environmental Economic Efficiency = Sales Revenue / Environmental Costs (Environmental Impact Wastes).

Table (8)

Environmental Efficiency Strategy and Economic Efficiency of Kufa Cement Plant for the years (2014)

Production quantity	**Quantity of waste with environmental impact**	**Environmental efficiency**	**Sales Revenue**	**costs of Waste with environment impact**	**Environmental Economic Efficiency**
639995	165802	3.859	69592461870	21559239388	3.22

Source: by the two researchers

The table (8) shows the possibility of determining the economic environmental efficiency using the financial and financial management accounting information from the table (5) and (7), and therefore when comparing the economic unit in question with the economic units that applied cleaner production techniques within its production processes can observe the increase in environmental efficiency and environmental economic efficiency and thus improve the environmental and economic performance of the economic unit. For example, when comparing the economic unit in question with the Polish economic units that applied the cleaner production This reduced the amount of dust by (90%) and the amount of sediment by (56%), it can be said that the amount of dust and sediment will fall in 2014 for the economic unit under consideration as shown in table No. (9) as follows:

Table (9)

The amount of dust and sediment after implementing the cleaner production strategy of Kufa cement plant

Years	Production quantity / tons	Amount of dust and sediment / tons		Savings in reducing the amount of dust and sediment / tons	Reduce the amount of dust and sediment	Environment efficiency		Increase in environmetl efficiency
		Before implementing cleaner production	After performing cleaner production			Before implementing cleaner production	After performing cleaner production	
2014	639995	165802	35501	130301	78.5%	3.859	18.027	367%

Source: by two researchers depending on environmental management accounting information in the proposed model.

As a result of the implementation of cleaner production strategy in 2014 and the production of cement in the amount of 639995 tons, the amount of dust and sediment will decrease by 78.5% from the amount of dust and sediment before implementation. Cleaner production strategy, which proves the premise that **"The possibility of employing environmental management accounting information in the implementation of cleaner production strategy for Iraqi economic units"**.

The Fifth topic: Conclusions and Recommendations

First : Conclusions

1- The need to use environmental management accounting has emerged as a result of the lack of traditional management accounting for dealing with environmental issues.
2- Material flow cost accounting is a technique that helps measure material flows in physical and financial units to provide important information that is used to reduce environmental impacts and costs.
3- The economic unit under consideration applies the unified accounting system, which lacks the possibility of separating environmental costs from production costs, which in turn does not help in making appropriate environmental decisions.
4- The possibility of developing a proposed model for environmental management accounting in the economic unit under consideration, which provides the administration with the physical environmental information (quantity) used in the assessment of environmental costs. The environmental costs in the economic unit under consideration constitute 32% of the total production and waste costs environmental impact that were hidden within the general accounts of the economic unit.
5- The possibility of employing environmental management accounting information in the implementation of cleaner production strategy in the economic unit under consideration. When implementing the cleaner production strategy, it is possible to increase environmental efficiency and thus improve the environmental performance of the economic unit in question.

Second : Recommendations

1- Publication of research and case studies related to the subject of environmental management accounting due to the importance of this field, which has not received the appropriate attention, especially at the local and Arab levels.
2- Increasing the accounting accountant's awareness of the importance of environmental management accounting as a modern and important approach and using its techniques in providing information.
3- To develop the accounting systems in the Iraqi economic units so that they become the systems of environmental management accounting because of their ability to provide environmental information in both material and financial.
4- To implement the environmental strategies in the Iraqi economic units, especially the implementation of the clean production strategy and include them within the objectives of the economic unit as a whole to improve the performance of environmental and economic units
5- Benefiting from the proposed model of environmental management accounting in Kufa Cement Plant for providing the physical and financial environmental information and its use in the implementation of cleaner production strategy.

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