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# Using on Green Activities Based Costs to Measure Costs and Improve Management Decisions[1]

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## ABSTRACT

To move towards sustainability companies introduce "green initiatives" – ways of doing business that have fewer negative consequences for the Earth's resources, create new products and manufacturing processes that use recycled materials to reduce the amount of waste going to landfills, and also recognize the need to be socially responsible With regard to production processes, companies face pressure to become (green) or more environmentally friendly, so they had to review their production processes as a result of pressure from society and governments, and awareness of the natural environment was reflected in creativity and environmental awareness in products offered to consumers in recent years, and manufacturing is considered Green is a relatively new concept that can be considered as one of the products of the nineties. The method of green activity based costing is one of the modern management accounting techniques and one of the green accounting tools that work to define green activities in the company and determine the appropriate costs for each activity according to the consumption of each activity, and then determine the costs of products based on appropriate cost drivers, costing based on green activities helps identify and analyze activities into value-adding and non-value-adding. Adding value, which helps management in excluding non-value-adding activities, as well as helping to provide appropriate information to decision makers to help determine the optimal combination of product mix that achieves the highest profits.

**Keywords:** *costs based on green activity, cost driver, green activities*

## INTRODUCTION

The activity-based costing method has addressed the misallocation of indirect costs in standard costing systems by tracking the indirect costs and support costs of activities carried out by companies that share resources, and then assigning lower activity costs to products and customers based on the amount of all activities consumed per economic unit. (Kaplan & Anderson, 2007), however, if the economic unit manufactures products that consume the incremental factory costs in different ways, a single rate at the factory level may not accurately allocate the incremental factory costs to the products. (Warren & Taylor, 2020: 154).

And Garrison believes that the difference between activity-based costing and the traditional costing method is that the activity-based costing method differs in three ways (Garrison& Others, 2018) are as follows:

1. Indirect manufacturing costs Industrial costs may be allocated to the producer but only on a cause-and-effect basis.
2. Some manufacturing costs may be excluded from product costs.
3. Several additional cost pools are used, each of which is allocated to products and other cost targets using its own unique measure of activity.

It is clear from the foregoing that the traditional system of cost allocation focuses on the different products offered by companies, where costs are assigned equally between these products because it is assumed that each element consumes the various resources of the enterprise in proportion to the volume of products produced, activity-based costing

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(ABC) is considered one of the most innovative management accounting practices of the 21st century, this concept was initially developed in the late 1980s by Cooper and Kaplan in order to address the drawbacks of the traditional costing method.

And (Ven) looks at the green product, "is that product that has undergone substantial improvements to meet the needs of the buyer in the future, towards reducing damage, and to be compatible with environmental sustainability. (Ven, 1994) Green production processes emphasize reducing parts, rationalizing materials, and reducing components, to help make Products are more efficient in manufacturing, and green manufacturing highlights the roadmap for industries to achieve improved performance through sustainable development and its impact on organizational competitive outcomes. It also indicates strengths and weaknesses in sustainable development practices and comprehensive organizational competitive outcomes using advanced research tools. (Belekar, 2017:2667)

The method of green activity based costing is one of the green accounting tools, and the topic of green accounting consists mainly of identifying and measuring the costs of raw materials and specific environmental activities and using this information to prepare reports and internal analyzes necessary to manage the economic unit for environmental decision-making, and the goal of green accounting is Acknowledging and trying to identify ways to minimize the negative impacts of activities and regulations on the environment. (Capusneanu, 2008)

Green accounting deals with environmental and social impacts and related regulations and constraints, safe, environmentally sound and economically viable energy production and supply all of these should be an essential part of accounting issues And management, and green accounting is linked to environmental information and the ecosystem, and monitors the activities of the government and private sectors, and can help companies plan and use the best available technologies. (Mahmud et.al, 2013)

The current research will deal with a review of the literature on costs based on green activity, its concept, mechanism of action, steps to implement costs based on green activity in companies, then costs based on green activities and the allocation of environmental costs, then costs based on green activities and improvement of administrative decisions, after that. The results of the current research are explained.

## LITERATURE REVIEW

### Green Activities Based Costs Green ABC

Cooper and Kaplan (1988) conceptualized the ideas underlying these systems and coined the term ABC. Articles were created. A great deal of academics and consultants began commercializing and implementing ABC systems. Cooper and Kaplan formulated their ideas and reported further theoretical progress in articles published between 1990 and 1990. and 1992. (Drury, 2018) Kumar & Dalgobind find that the ABC approach is broadly applicable across the spectrum of functions of an economic unit and not just in the factory, and ABC reveals the links between the performance of certain activities and the demands of those activities on the resources of the organization so that it can Giving managers a clear picture of how products and brands work for customers, facilities, regions, or distribution channels that generate revenue or consume resources. (Kumar & Dalgobind, 2013) Green accounting takes into account the specific principles of the activity-based costing method. And the disadvantages of green accounting in the economic unit in the case of implementing activity-based costing. Note the basic principles of the method of activity-based costing (ABC). For those used by the activity-based costing method, terms such as: activity cost driver, process cost driver, direct costs, activity costing, cost objective, activity-based management, value chain are complementary to the activity-based costing method, macro-environment cost calculations, Green (environmental) accounting, investment management, product life cycle analysis, product life cycle calculation, logistics services, special costs for pollution prevention and the added value of the activity. (Capusneanu, 2008) The industrial revolution has evolved into the fourth generation and environmental problems have become increasingly serious nowadays. Activity-based costing is a useful accounting method that can easily track direct and indirect product costs based on activities, which may lead to different product groups of In order to reduce environmental problems. These concerns vary from one economic unit to another, and this gap can be bridged by using the activity-based costing (ABC) method for data collection, which can increase the accuracy of cost-related data to control project costs. (Tsai & Lai, 2020)

Units can use ABC in decision making to solve product mix problems and enhance the immediate and operational efficiency of distribution centers. ABC relies on two stages, which is an extension of modern cost accounting, in order to increase the accuracy of cost calculations, as common expenses

of a business are allocated to activities, and activity costs are then tracked to products. (Hsieh & others, 2020) The use of ABC activity-based costs went beyond just cost analysis, as ABC was used to track non-cost elements such as full-time (number of people) and effort (in the form of hours) equations. It also aimed to describe how the ABC method can A well-developed one can provide not only a managerial view of cost data but also a management view of greenhouse gas emissions management data (Pember & Lemon, 2012:3).

The green ABC method is applied to renewable energy management categories to provide information on identifying resources for the entire process and tracking activity, and the ABC method provides cost assessment to improve opportunities. The ABC method is applied to green electric power systems as cost targets. For additional costs, in the first stage resource costs are assigned to various activities using resource engines, each type of resource can be traced to a specific activity which becomes one cost element in the activity cost pool, thus the activity cost pool provides the total costs associated with a specific homogeneous activity, and a center is formed An activity is a related activity that is usually grouped according to a job or process. In the second stage, the costs in each activity cost pool are assigned to the cost objectives by the appropriate activity engine, which is used to measure the consumption of activities according to the cost objectives (the green electric power system). (Yang, 2018)

Yang considers that green activity based costing provide cost allocation assessments for the green electric power system, where the various resources, activity classifications, and cost drivers that have been identified contribute to measuring the costs of the green electric power system and economic benefits, which can help increase social and environmental development, and can Decision makers can use ABC for in-depth analysis of different allocations of incremental costs, thus providing more accurate costs for the power plant. On the other hand, all these related costs should be taken into account when evaluating the overall impact of the energy sector and external costs of air pollution should be integrated. (Yang, 2018:3)

Pember & Lemon considers green costs to be an effective management tool that can help managers evaluate a number of environmental issues such as polluting emissions, water use, energy use, and waste. Green costs are focused on managing the activities of an economic unit as a way to improve its performance. and improving the value received by its customers, and is based on the principle that it is not the products or services produced by the organization that generate costs, but the activities that are conducted in producing the products and services). (Pember & Lemon, 2012) and Hsieh & others consider the green activity-based costing technique, "It is a two-stage method that is an extension of modern cost accounting in order to increase the accuracy of cost calculations, and the common expenses of the business are allocated to the activities and then the activity costs are tracked to the products. (Hsieh & Others, 2020)

Wesumperuma & others consider it also (it is a method that provides accurate and reliable cost information in the representation of financial data and allows for a more realistic vision in the analysis of profitability, and is considered important when it comes to understanding the resources that are consumed and how to reduce costs, and it assumes that the cost target will consume activities and therefore activities will be consumed Resources, in ABC resource and activity drivers are used to track costs from resources to activities and then from activities to cost targets in a direct causal and proportional manner (Wesumperuma & Others, 2013)

Companies can use costing based on decision-making activities as well as the linear programming (LP) model to solve product mix problems and enhance the operational and immediate efficiency of distribution centers. ABC technology is based on two stages and is an extension of modern cost accounting in order to increase the accuracy of cost calculations, where expenses are Shared business to activities, activity costs are then tracked for products. (Hsieh& Others, 2020)

Green accounting that notes the principles of the ABC method helps measure cost savings as a result of reducing the cost of raw materials over the period of recycling or reuse. As a result, the ABC or ABM method provides an approach to understanding those target areas to consider opportunities and design costs for key environmental activities. Environmental cost design is a concept that refers to the design of an environmental goal oriented towards cost of a product or constraints, such as the design requirements of product disassembly. Recycling design refers to a product design concept that emphasizes ease of disassembly and recycling, as well as the end of a product's useful life cycle. The usefulness and advantages of the activity based activity costing method can be revealed through green accounting. Application of the principles of the ABC method is recommended to induce improved environmental outcomes.

It turns out that green activity based costing are a useful accounting method that can easily track

direct and indirect product costs based on activities, as well as tracking carbon tax on products, which may lead to different product groups in order to reduce environmental problems.

**Apply Green Activity Based Costing**

To apply the green activity based costing , the cost driver (vector) is carefully chosen, which is a reference value chosen to allocate resource costs to activities that demand this resource, and to allocate the cost attributed by activity to products, and to use ABC correctly, it is very important to choose Allocation engines with a strong relationship between resources and activities and between activities and products and the strongest relationship between cause and effect, which gives more accurate results and supports the best decisions, and the environmental and social aspects began to take on similar importance to the economic aspects, so some modifications were evaluated in the traditional ABC framework to fit better With corporate goals and how they operate. (Neto& Others, 2018) The method of green activity based costing continues to allocate costs to operations and activities, and at the activity level environmental elements must be added, and to examine the total cost and cost drivers, one can try in one of two ways: cost reduction and abstraction Environmental cost drivers. Green accounting prefers to abstract environmental cost drivers, thus avoiding total costs and high losses such as returns and product waste. (Capusneanu, 2008)

Less obvious costs that will still appear in other accounts and cost centers can be more clearly categorized as environmental related so that they can be tracked more easily. An assessment of the relative importance of environmental related costs and cost drivers for different processes and product lines in line with the general practice of ABC can help the unit. The economist determines whether the cost allocation rules used are appropriate for those costs. For the same reasons, the activity-based costing method was originally used to track overhead (indirect) costs by allocating these costs to specific activities, and this method reveals "hidden" costs by allocating these costs to activities directly. (Pember & Lemon, 2012)

The operating steps and procedures of the cost method on the basis of green activities are compatible with green accounting, because the latter believes that the Green ABC approach helps in measuring cost savings as a result of reducing the cost of raw materials during the period of recycling and reuse, and the cost method on the basis of green activities also accommodates the complexities in production and services In light of the shift from the traditional factory to the smart factory, as it helps to track resource consumption, save energy, and helps to schedule maintenance.

The successful implementation of the costing method based on green activities includes several steps, as follows (Wesumperuma & others, 2013):

1. Study operations and costs.
2. Define activities at different levels.
3. Define traceable costs.
4. Allocating remaining costs to activities.
5. Determine the allocation rates according to the activity.
6. Applying cost rates to cost targets.

The costing method is based on green activities in two stages, and it is an extension of modern cost accounting in order to increase the accuracy of cost calculations. Common business expenses are allocated to activities, and then activity costs are tracked for products. (Hsieh & Others, 2020) and (Neto& Others, 2018) showed that the use of the green activity-based costing approach by the company for internal management is useful in creating scenarios within the framework of simulating product cost, production volume, and product diversification, providing support for decisions towards increasing profits, and taking into account economic factors when applying the ABC steps, and these drivers can be replaced with those related to the environment to support decisions for sustainability by integrating environmental cost accounting and emissions inventory within the traditional activity-based costing method). (Neto.et.al, 2018)

In ABC resource and activity drivers are used to track costs from resources to activities and then from activities to cost of things in a directly causal and proportional manner (Emblemsvåg & Others ,2001; Kaplan & Others ,1992; Sedgley & Others ,2001; Turney 2008). Ravish et al. (1991) view activity drive as “a measure of the frequency and intensity of demands placed on activities by cost objectives.” This can be used to assign costs to cost elements. (Emblemsvåg & Bras, 2001)

From the foregoing, it is clear that the application of the costing method on the basis of green activities (Green ABC) stems mainly from the practical steps of applying the traditional ABC system, where resources and activity drivers are used to track costs from resources to green activities, then from green activities to cost objectives in a causal manner and directly through the use of cost drivers. appropriate, after studying the operations and costs of the economic unit and identifying the green activities within it and then tracking the additional costs and

direct costs in the economic unit and then estimating the costs and distributing them in several stages. Then the costs are allocated to green activities that cause resource consumption through allocation rates and using appropriate cost drivers, and then activity costs are allocated to the final cost targets of products or services that consume green activities according to appropriate cost drivers.

**Advantages of Green Activity Based Costing Method**

The application of the costing method based on green activities helps achieve the following advantages (Tsai & Lai, 2019) (Hsieh & others, 2020):

1- Green activity based costing enable the economic units to analyze industrialization obstacles and maximize their profits.

2- Dealing with the interactions of supply constraints and determinants through an improved product mix.

3- Helps to provide environmentally friendly products.

4- Under the method of costs based on green activities, reasonable operating activity and the cost engine used for allocation can be analyzed to increase the validity of cost information.

5- It can easily track direct and indirect product costs based on activities, as well as track carbon tax on products.

6- Costing technology based on green activities can increase the accuracy of cost data to control project costs.

Likewise, the costing technique based on green activities achieves the following benefits (Capusneanu, 2008) (Neto & Others, 2018):

1- It helps measure the cost savings as a result of reducing the cost of raw materials during the recycling or reuse period.

2- It provides an approach to understanding these target areas to consider design cost opportunities for key environmental activities.

3- The information provided by the costing technique is used on the basis of green activities for decision-making, and when environmental information is added, more accurate and effective decisions are achieved in the long term.

4- Costing technology based on green activities becomes a very effective tool for managerial accounting that determines real production costs.

5- Provide a driving force for the continuous improvement of operations in the economic unit.

6- Emissions from production processes are used as cost vectors in allocating additional expenditures to economic units that aim to support a greener fleet while reducing carbon dioxide emissions.

7- Green ABC helps identify overhead and hidden costs and allocate them directly to activities such as toxic waste resulting from a product exclusively.

8- It helps to identify the origin of each of the resources (renewable or non-renewable) as well as including this information when calculating the energy required by the production systems, this can support more accurate results about the sustainability of the systems that have been evaluated.

From the foregoing, it can be said that costing technology based on green activities is a tool for modern management accounting when applied to companies and achieves a set of benefits and benefits that help reduce and eliminate pollution, identify the main and secondary activities of the unit, track emissions and toxic substances, measure them and use them as cost drivers by allocating additional costs to activities and products. Accurately and helps in providing realistic cost information that helps in making accurate and effective decisions in the long term, as well as the method of green activity based costing helps in providing environmentally friendly products and activities and the method can be used in the processes of continuous improvement of operations in the economic unit.

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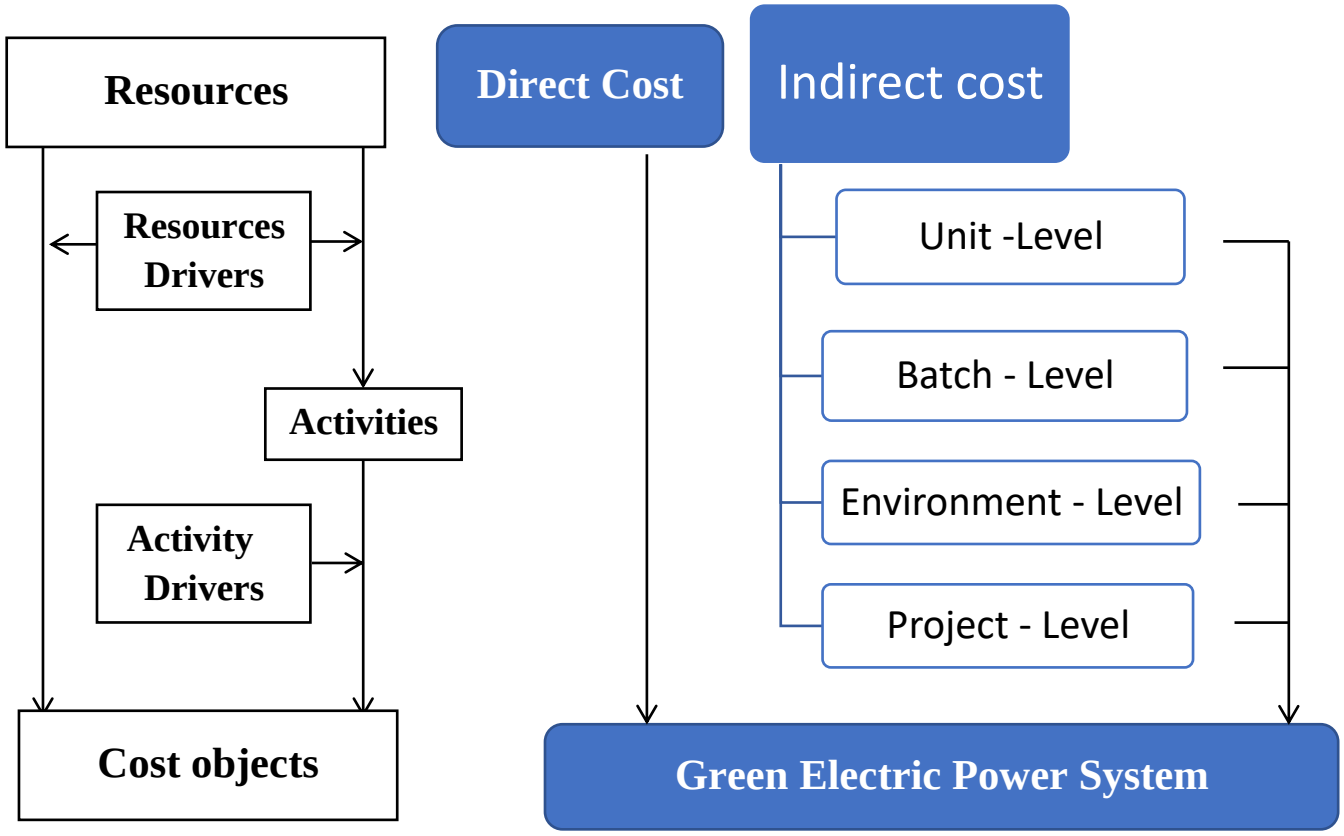


*Source : Yang , Chih-Hao ,2018, " An Optimization Portfolio Decision Model of Life Cycle Activity-based Costing with Carbon Footprint Constraints for Hybrid Green Power Strategies", Computers and Operations Research .*
Figure 2: ABC cost assignment view for green electric power system

Less obvious costs that will still appear in other accounts and cost centers can be more clearly categorized as environmental related so that they can be tracked more easily. An assessment of the relative importance of environmental related costs and cost drivers for different processes and product lines in line with the general practice of ABC can help the unit. The economist determines whether the cost allocation rules used are appropriate for those costs. For the same reasons, the activity-based costing system was originally used to track overhead costs by allocating these costs to specific activities, and this system reveals "hidden" costs by allocating these costs to activities directly. (Pember & Lemon, 2012)

**Green Activity Based Costing and Allocation of Environmental Costs**

Allocation by activity-based costing of environmental costs can be used for companies to allocate certain environmental expenditures, which constitute environmental costs of the product. However, because environmental costs are not quantifiable and difficult to match against environmental revenues, these features make it very difficult to use current accounting methods to calculate. Therefore, how to separate environmental costs from measurable indirect costs and accurately allocate different cost targets becomes an essential part of environmental cost allocation.

When defining the process, attention should be paid to the following cases: if the consumption of environmental resources can be directly determined by the consumption of a specific product, directly the cost can be directly added to the cost of the product; If the cost of some environmental resource can be determined by what the activities consume, then the cost can be added directly to the job cost basis; If the cost forms

Complex, which does not meet the needs of the above two cases, we need to determine the actual working hours from the operations to allocate the manufacturing costs of the companies, we can allocate them on the wages of cleaners The environmental costs of each operation are allocated from different cost libraries. To calculate the production environment cost, we will divide the different groups according to the characteristics that the group functions aim to reduce the number of indirect cost allocation rate in order to simplify the calculations.

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• Identify environmental cost drivers. Environmental cost drivers are the critical factor that causes environmental cost to occur, and it is also a criterion for operating cost allocation in a given product. Environmental cost drivers can usually be divided into four categories: the amount of waste or emission stuff; the intensity of toxic waste or emissions; increasing environmental impact (emissions are multiplied by the toxicity of the material product); Dealing with different types of waste or costs related to emissions.

• The environmental costs of resource consumption for each of the company's operations. For each cost pool, it is divided by the amount of the current cost drivers to obtain the rate of allocation of the cost drivers from the environmental costs to each operation.

• The operations costs are then allocated to the product or service to the company based on the cost consumption drivers of the product or service, and these cost drivers differ from the cost drivers that were used for operations, where the cost engines are chosen based on the cause-and-effect relationship between cost and resource consumption by operations and products or services.

The specific formula for cost allocation is as follows:

Environmental cost shared by a given producer = cost driver allocation percentage x process number of product consumed

Environmental costs of the product = the sum of the costs that must be shared by the products in each activity center. (Jing & Song qing, 2011)

**Green Activity Based Costing and Improving Management Decisions**

The activity-based costing method is a conceptually simple modeling technique that, when implemented well, can be a very powerful decision-support tool. The ABC provides information about the rate at which activities consume resources as well as why the resources are used and provides a link between the resources consumed and the firm's output. Including revenue in the ABC method makes it easy to complete a customer profitability analysis because it relates revenue to specific resources, activities, products, and services. The company can see the revenue and profitability of each activity, product, and service, and this concept can be extended to include non-cost metrics. The ABC model can be used to track the flow of environmental externalities such as greenhouse gas emissions, or water use by a company.

It is a proven cost management methodology and it is now clear that ABC can help a company to effectively manage its greenhouse gas emissions. Many papers and articles have been written on how ABC can improve environmental management accounting. An international guidance document issued by the International Federation of Accountants (IFAC), “Environmental Management Accounting,” discusses current challenges faced in environmental management accounting. In particular, the article notes that costs related to the environment are often "hidden" in the public accounts. The guidance states: “Organizations have taken different approaches to resolving the issue of hidden costs related to the environment. A common solution is to create separate cost classes or cost centers for more visible and distinct environmental management activities. Less obvious costs that will still appear in other accounts can be grouped into cost centers more clearly as related to the environment so that they can be more easily tracked .Assessing the relative importance of environmental-related costs and cost drivers for different processes and product lines, in line with ABC's general practice, can help an organization determine whether the cost allocation rules used are appropriate for those costs Or not .For the same reasons, AAC-based costs have been used Originally to track overhead costs by allocating these costs to specific activities. ABC reveals 'hidden' costs by directly assigning these costs to activities.

Emblemsvåg believes that the green activity-based costing method removes distortions from the traditional cost accounting system and provides more representative cost measures for better decision-making. In fact, ABC is one of the most important management innovations of the last 100 years (Emblemsvåg & Bras, 2001). It is an approach to cost management that directs the management focus of planning, control, decision-making, and product costing to a more integrated, strategic, and competition-sensitive way of looking at internal cost structures (White et al., 1995).

Currently, green activity-based costing has become an important tool for improving competitiveness in companies as attempts are being made to adopt new ways of allocating overhead costs while calculating product costs or any other cost objects. The use of the ABC system in accounting activities is not new, accountants are usually familiar with this ABC system (Moraga, 2015). Many companies have successfully used the ABC system to change their pricing scheme or to better allocate their resources. The benefits of a well-structured ABC system extend far beyond having a more accurate understanding of costs. Because the ABC system focuses attention on the

activities required to achieve business objectives, it encourages managers to improve the efficiency of activities and reduce or eliminate activities that do not add value.

## RESULTS

Most companies are facing environmental issues and are looking for a suitable way to report and disclose information to the public. The issue of environmental pollution is one of the most important problems of human society today. Therefore, it is very important to use environmental (green) accounting as an attempt to protect the environment. The activity-based costing method is a useful accounting method that can easily track direct and indirect product costs based on activities, as well as tracking activity costs to products or services, including tracking a carbon tax on products, measuring greenhouse gas emissions, or measuring non-monetary factors to Cost targets, which may lead to different product groups in order to reduce environmental problems. Activity-based costing (ABC) can improve the accuracy of cost-related data and have more control over product or service costs. ABC helps management decide on pricing and control costs and helps disclose environmental information that is favored by the public and financial communities. Where the ABC method works on identifying and analyzing the main activities and auxiliaries for the operations necessary to produce products or provide services, after that it collects costs in major cost complexes, then the costs are allocated to each activity through the resources consumed by each activity and using cost drivers for each activity and according to the cause relationship As a result, costs are then set for each of the company's products, according to its consumption of activity resources, and according to the appropriate cost vectors. Here, activity-based costs help in dividing the activities of the company's production operations into value-adding and non-value-adding activities, which helps the company to exclude activities that do not add value.

Likewise, the activity-based costing method helps provide better cost information about the activities and operations of the company's management, which helps the management in determining the optimal assortment of profitable products and excluding less profitable and losing products, as it helps in the correct allocation of indirect costs on products and according to their consumption of resources unlike The traditional method that uses a single rate of allocation leads to erroneous results in calculating product costs.

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